Delft University of Technology

Military Engineering Centre of Expertise

Water Management as a Peace Mechanism

An integrated and comprehensive new policy framework for the application of water management in stabilisation operations

APPENDICES

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The Netherlands, Delft, October 2015

Colophon

MSc Thesis Report - Appendices

Title: **Water Management as a Peace Mechanism**

Subtitle: **An integrated and comprehensive new policy framework for the application of water management in stabilisation operations**

This master thesis research has been performed to fulfil the requirements for the Master of Science degree in **Engineering & Policy Analysis, track Infrastructure & Environmental Governance, specialisation Water Management** at the Delft University of Technology.

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Contents

A

The New Policy Framework

Integrated Water Management Development Framework for Stabilisation Operations

Author: R.P. Huizinga
Version: 3.0 (22-09-2015)

FUNDAMENTAL IMPLEMENTATION PRINCIPLES

1: DO NO HARM!
- Do not create a root-cause of conflict.
- Minimum use of force.

2: A long-term engagement is crucial.

3: Common (local) interests is the starting point for cooperation.

4: Treat each actor equally and with respect. Do not exclude actors from any kind of resources, like water. Favouring or marginalisation is a root-cause of conflict.

5: Trust is the precondition for cooperation: interact equivalent, act transparent, stay neutral, have a collaborative mind-set, make difficult and delicate issues discussable.

6: Only invest in activities which have real value for the inhabitants. Manage expectations!

7: Apply a non-zero-sum multiple actor gain approach. But, keep it with water only!

8: Work "as civilian as possible and as military as necessary". However, safety and security priorities have a higher priority.

9: Apply the "Adaptive Solution Path" approach: coherent and synchronised planning of the short- and medium-term activities according to the long-term objectives which are tailored based on the Host-Nation development scenarios.

10: Exit Strategy = local problem ownership, local problem-solving responsibilities, local entrepreneurship and Host-Nation governance capacity.

PHASES

1. Is water an issue?
Or can it become an issue?
YES / NO => STOP
"Letter of Notification" publication.

2. How can water serve as an Enabler?
Is water involvement desirable within the strategic DIME scenario's?
YES / NO => STOP

3. What are the water:
- Interests?
- Goals?
- Objectives?

Political decision-making moment involvement stabilisation operation.
GO / NO GO => STOP

4. What are the water priorities and appropriate corresponding activities?

5. Priority verification, execution and optimisation of water management activities in the mission area.

6. Desired Endstate accomplished?
NO / YES => STOP
Share Lessons Learned
Follow-Up Plan

ACTIVITIES

1. ORIENTATION:
- Sharing of information within the Civil-Military Water Group (A).
- Identifying conflicts related to the Strategic Objectives & water related issue.
- Publication: Letter of Notification.

2. ANALYSIS & ASSESSMENT:
- Conflict: causes, symptoms, stage, complexity.
- Actors: which, motives, issues, powers, relations.
- Social, economic and political issues.
- Strength and tactics of insurgents & OMF.
- Hydrological system at BASIN level & water use at LOCAL level (soil & geographical properties).
- Relation: water issues and the conflict.
- Influences of past decision-making and activities.
- Risk and consequences of a possible mission.
- Mapping of DIME & Water Security scenario's.

3. INTEGRATED ACTION POSSIBILITIES:
- Formulation of common Interests.
- Formulation of Common Goals.
- Formulation of the Campaign Plan.
- Map synchronisation opportunities.
- Map joint Water Management Objectives.
- Map Factors to Mitigate, Exploit, Influence.
- Publication: Parliament 100 Letter.

4. PLANNING & PREPARATION:
- Set baseline and prepare for the operation.
- Scenario development (based on existing policies and host-nation development scenarios).
- Make synchronisation agreements.
- Assess current state Water Management Development Themes.
- Prioritisation of the Water Management Development Themes.
- Coherent mapping and planning of the Water Management Activities.

Apply the broad Water Management Portfolio for each Water Management Development Theme.

5. IMPLEMENTATION & EXECUTION:
- Verify baseline analysis.
- Maintain and improve Situational Understanding in the mission area.
- Verification of the local development conditions and prioritised Water Management Themes.
- Execution of the Short-, Middle-, and Long-term Water Management Activities based on the 'Ink Blot' strategy and a tailored approach.
- **Impact assessment and optimisation of activities = continuous activity.**

Maintain and improve the **Situational Understanding** of the mission area, regarding:
- Hydrological System & Water Usage.
- Results and effects of the executed Water Management Activities.
- Local Cultural & Political Aspects.
- Socioeconomic & Security Systems.
- Conflict: causes, symptoms, stage, complexity.
- Relation: water issues and the conflict.
- Actors: which? motives, issues, powers & relations.
- Strength and tactics of Insurgents & OMF.

6. EVALUATION:
- Evaluation of the Supporting Effects, Shaping Conditions, Objectives & Desired Endstate.
- Formulate and share the Lessons Learned.
- Is a Follow-Up necessary and desired?

STRATEGIES

STRATEGIC OBJECTIVES:
- National Security Strategy.
- International Security Strategy.
- Development Assistance & Cooperation Strategy.

SITUATIONAL AWARENESS & UNDERSTANDING

CONFLICT STAGE & RESOLUTION TECHNIQUES

DIME STRATEGIES:
- Diplomatic (political)
- Information (social)
- Military (security)
- Economic

WATER SECURITY BY:
- Water as Enabler
- Water for Conflict Resolution
- Water for Cooperation

DESIRED ENDSTATE: Self-Reliant Region

CAMPAIGN PLAN GOALS:
- Security, Prosperity & Freedom.
- Socioeconomic Development.
- Sustainable, Equitable & Reasonable Water Utilisation.
- Good Governance.
- Actor Cooperation.

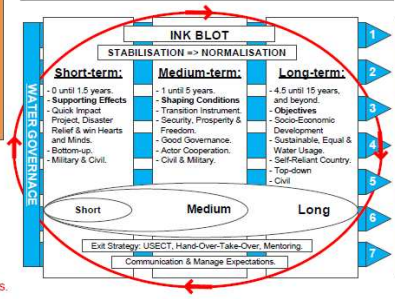
WATER MANAGEMENT & GOVERNANCE

WATER MANAGEMENT DEVELOPMENT THEMES
- 1: Water for Food
- 2: Water for Drinking
- 3: Water for Nature
- 4: Water for Health
- 5: Water for Safety & Shipping
- 6: Water for Industry & Energy
- 7: Water for Recreation & Tourism

HOST-NATION DEVELOPMENT SCENARIOS

WATER GOVERNANCE

WATER MANAGEMENT ACTIVITIES



DESIRED ENDSTATE: Self-Reliant Region
- WATER GOVERNANCE & USE
- CAMPAIGN PLAN GOALS
- STRATEGIC OBJECTIVES

IMPLEMENTATION PRINCIPLES

- Continuous process.
- Evaluation 2/year with the Civil-Military Water Group (A).

A: CIVIL - MILITARY WATER GROUP (relevant actors / partners are mission dependent). In general, these are:
- Netherlands Government: ministries of Defence and Foreign Affairs (Security & Justice, Infrastructure & Environment, Economic Affairs, General Affairs).
- Host-nation government (ambassador) and local GOs.
- Coalition & Partner nations.
- IOs: UN, NATO, EU & World Bank and other IFIs.
- Host-nation, Dutch or international NGOs, Knowledge Institutes, Private Sector actors and inhabitants (water, development, socioeconomic, safety and host-nation experts).
- Media and Journalists.

- In cooperation or coordination with all relevant actors (A).
- Perform field research in the expected area of operations.

- In cooperation with all participating actors (A) or in coordination with all relevant actors (A).
Create "Unity of Effort" by investigating the following synchronisation opportunities:
- Current and planned projects of the host-nation GOs, coalition nations, IFIs, NGOs and the private sector.
- Water development aid & cooperation programs / policies of the Netherlands, EU and UN or other IOs.

Factors to Mitigate:
- Climate Change.
- Natural Disasters.
- Unsustainable water use.
- Pollution (local).
- OMF Activities.
- Local Conflicts.

Factors to Exploit:
- Local knowledge.
- Projects & Plans of locals & Host GO's.
- Basin Programs.
- NGO Activities.
- IO Development Aid Programs.

Factors to Influence:
- Actor Cooperation.
- Regulation.
- Governance.
- Media.
- Hearts & Minds.
- Education & Awareness.
- Local Ownership.
- Key Leadership (formal & informal).

Comprehensive and jointly with all participating actors (A):
- Prioritisation & Synchronisation of the activities.
- Generic planning of the Long- , Medium-, and Short-term Water Management Activities (in this order to create coherence and strengthen relations).
- Formulate success criteria and develop an impact assessment plan.

Apply the guiding Water Management Design Principles:
- IWRM: Social Equity; Economic Efficiency; Environmental Sustainability; Subsidiarity.
- PRIMO – Chain (SMARTI).
- Robust, Resilient & Adaptive:
  - ~ Building With Nature.
  - ~ Retain-Store-Discharge.
  - ~ Reduce-Reuse-Recycle.

- Verification is based on input from the local government and population.
- Exploit the "windows of opportunity".
- Comprehensive and joint execution of the activities with all participating actors (A), the local population and the host-nation governmental organisations.

From the start, all activities need to be planned, designed and preformed together with the local population and host-nation GOs. The activities should be executed by the local population and be based on their cultural principles, methods and knowledge in order to build a self-reliant region or country through:
- Making the locals the problem owners, problem ownership and problem-solving responsibility are simulated including wise budget allocation.
- Local entrepreneurship is created.
- Local governance capacity is build by education and sharing of knowledge, so the locals can maintain and optimise the systems by themselves without support.

- In cooperation or coordination with all relevant and participating actors (A).

NOTES:
- The framework is a simplification of reality.
- Duration of the short-, medium- and long-term activities is mission dependent. The time horizons are an indication based on the experiences of the consulted experts.
- Numbering of the Water Management Development Themes does not indicate the level of priority. The Level of importance depends on the local needs and the development scenarios of the host-nation.
- The implementation phases and fields are schematised as a linear process and standalone activities. Due to the constant changing dynamics of the activities within the human an physical arena's, the implementation of the phases and activities are not linear. When needed, they can be performed less strict.

B

Civilian & Military Actors

Multiple times, early and active actor cooperation or coordination is mentioned. These means of interaction are crucial because linking the right actors with the right activities is essential to prevent conflicts, contradictions and duplications. Moreover, cooperation is essential to synchronise the short-, and medium-term activities accordingly with the long-term sustainable development objectives. By means of the Implementation Principles, the desired levels of interaction within the new *Integrated Water Management Development Framework for Stabilisation Operations* are explained. Also, the type of actors recommended to coordinate or cooperate with are mentioned per implementation phase in chapter 9. Per actor type, the specific actors appropriate for active interaction are listed in table B.1. Thereby, table B.1 provides a detailed overview which Dutch governmental organisations, international organisations, Dutch and NATO military organisations and units, Dutch non-governmental organisation, Dutch knowledge institutes and Dutch private sector companies are appropriate to interact with within the new framework. By means of figure B.1. the majority of these organisation are displayed. In addition, all possible local actors are listed in table B.1.

Regarding the implementation of the framework, the Netherlands ministries of Defence and Foreign Affairs should always be involved. Furthermore, host-nation support and integration is crucial. Thereby the precondition for a self-reliant region are set; local ownership and problem responsibility. Regarding the implementation of water management in stabilisation operations, involvement of the Netherlands Water Partnership[1] including its broad network and expertise is essential.

Per implementation phase, the Civil-Military Water Group consist of a wide range of actor types and specialties. More actors, also means more opinions and a higher level of complexity regarding the cooperation and coordination within the dialogue team. To prevent an overflow of non-essential information and to stay effective and efficient, it is strongly recommended to include only those actors who have valuable or new knowledge and expertise. Since this is location and situation dependent, a more specific actor analysis before the engagement need to be made per mission.

[1] The Netherlands Water Partnership (NWP) unites Dutch water expertise. Currently this comprehensive network consists of 200 members ranging from private companies, governmental organization, knowledge institutes and NGO's. The NWP acts as a centre of information on water expertise, policy developments, market opportunities and initiates, coordinates and executes projects for its members, like trade missions, exhibitions and conferences. Thereby, the NWP is regarded as the most significant civil and non-governmental actor to interact with.

Netherlands Governmental Organisations:

- Ministry of Foreign Affairs (MFA) & Foreign Trade and Development Cooperation:
    - Security Policy Department (DVB).
    - Stabilisation and Humanitarian Aid Department (DSH).
    - Environment, Water, Climate and Energy Department (DME).
    - **Water related Programmes:** Water Development & Assistance Programme, Partners for Water Programme.
- Ministry of Infrastructure and the Environment (I&M).
- Ministry of Economic Affairs, Agriculture and Innovation (EL&I).
- Ministry of Education, Culture and Science.
- Dutch Water Authorities (Waterboards).
- Netherlands Water Partnership (NWP).
- Dutch Risk Reduction Team (DRR-team).
- WGC; Water Governance Centre.

International Organisations:

- European Union (EU).
- GW-MATE; Groundwater Management Advisory Team (World Bank).
- IAH; International Association of Hydrogeologists.
- IUCN; International Union for the Conservation of Nature.
- HWRP; Hydrology and Water Resources Programme (WMO).
- UN; United Nations:
    - UN-WATER.
    - UNSGAB: UNSG Advisory Board on Water and Sanitation.
    - UNDP; United Nations Development Programme.
    - UNEP; United Nations Environment Programme.
    - FAO; Food and Agriculture Organisation.
- USAID; United States Agency for International Development.
- AUSAID; Australian Agency for International Development.
- DAI; International Development Company.
- WHO; World Health Organisation.
- WMO; World Meteorological Organisation.
- WRR; Scientific Council for Government Policy.
- WTO; World Trade Organisation.
- WWF; World Wildlife Fund.
- UNESCO commissions; United Nations Educational, Scientific and Cultural Organisation.
    - ISRAM (Internationally Shared Aquifer Resources Management).
    - PCCP (From Potential Conflict to Cooperation Potential).
- Permanent Court of Arbitration.
- MEDRC; Middle East Desalination Research Centre.
- MRC; Mekong River Commission.
- MRC - DCG; Mekong River Commission - Donor Consultative Group.
- GEF; Global Environment Facility.
- ADB; Asian Development Bank.
- ICPR; International Commission for the Protection of the Rhine.
- AFDB; African Development Bank.
- World Bank.
- Nile Commission & NBI Trust Fund (Nile Basin Initiative).
- UNECE; United Nations Economic Commission for Europe.

Military Organisations & Units (Netherlands & NATO):

- Netherlands Ministry of Defence / Royal Netherland Army:
  - DOPS (Directie Operaties = Operations Management).
  - Netherlands Defence Academy.
  - Land Warfare Centre.
  - Army Corps of Engineers.
  - Military Engineering Centre of Expertise.
  - 1CMIco (1 Civil Military Interaction Command).
- NATO (North Atlantic Treaty Organization):
  - Science for Peace & Security Programme - Emerging Security Challenges Division.
  - Civil Military Interaction (CMI) & Military Engineering (MILENG) branches of the Comprehensive Crisis and Operations Management Centre (CCOMC) NATO-SHAPE (Supreme Headquarters Allied Powers Europe).
  - NATO SCHOOL.
  - CCOE; Civil-Military Cooperation Centre of Excellence.
  - MILENG COE; Military Engineering Centre of Excellence.
  - CMDR COE; Crisis Management and Disaster Response Centre of Excellence.
  - JALLC; Joint Analysis and Lessons Learned Centre.

Dutch Non-Governmental Organisations:

- Cordaid.	- NAGA Foundation.
- Both ENDS.	- Act for performance.
- Oxfam Novib.	- ADRA.
- Pax Christi.	- Aqua for All.

Dutch Knowledge Institutes:

- TU-Deft; Delft University of Technology.
- TNO; Netherland Organisation for Applied Scientific Research.
- WUR / Alterra; Wageningen University & Research Centre.
- IGRAC; International Groundwater Assessment Centre.
- UT / ITC; University of Twente / Faculty of Geo-Information Science and Earth Observation.
- VU; VU University Amsterdam.
- UU; Utrecht University.
- WGC; Water Governance Centre.
- EUR; Erasmus University Rotterdam.
- UvA; University of Amsterdam.
- Watsus.
- Clingendael.
- HCSS: The Hague Centre for Strategic Studies.
- UNESCO-IHE Institute for Water Education.
- THIGJ; The Hague Institute for Global Justice
- KNMI; Royal Netherlands Meteorological Institute (including data from NASA and ESA).

Private Sector; Dutch consultancy firms, engineering companies & contractors:

- Arcadis.	- Witteveen + Bos.	- Aquaver.
- Ateagroup	- Fugro.	- WaterWatch.
- Boskalis.	- IV-Water.	- FutureWater.
- Ballast Nedam.	- Van Oord.	- Deltasync.
- BAM.	- Vitens.	- Berson Masters in UV.
- BGP Engineers.	- Royal Haskoning DHV.	- EARS.
- Deltares.	- Svasek.	- Corporation Blue.
- Grondmij.	- Acacia Water.	- HydroLogic.
- HKV Lijn in water.	- MetaMeta.	- Royal Dutch Shell.

Host-nation / local actors:

- Host-nation governmental organisations / agencies (state, province, municipality).
- Local governmental representatives: mayor, politicians, military and police.
- Local population representatives: tribe or village elders, individual residents.
- Agricultural organisations regarding food security, farmers and Fisherman.
- Water boards, water managers and water supply organisations ./ companies.
- Donors, banks, real estate developers and housing associations.
- Knowledge, research and educational institutes.
- Religious centres / communities: Churches, Mosques, Temples, etc.
- Environmental organisations,
- Industries, medium and small companies and businesses.
- Power, telecom and transportation companies.
- Engineering companies and contractors.
- Non-governmental organisations.
- Social and woman movements.
- Indigenous peoples action groups.

Table B.1: Overview of possible appropriate actors to interact with within the new framework[2].

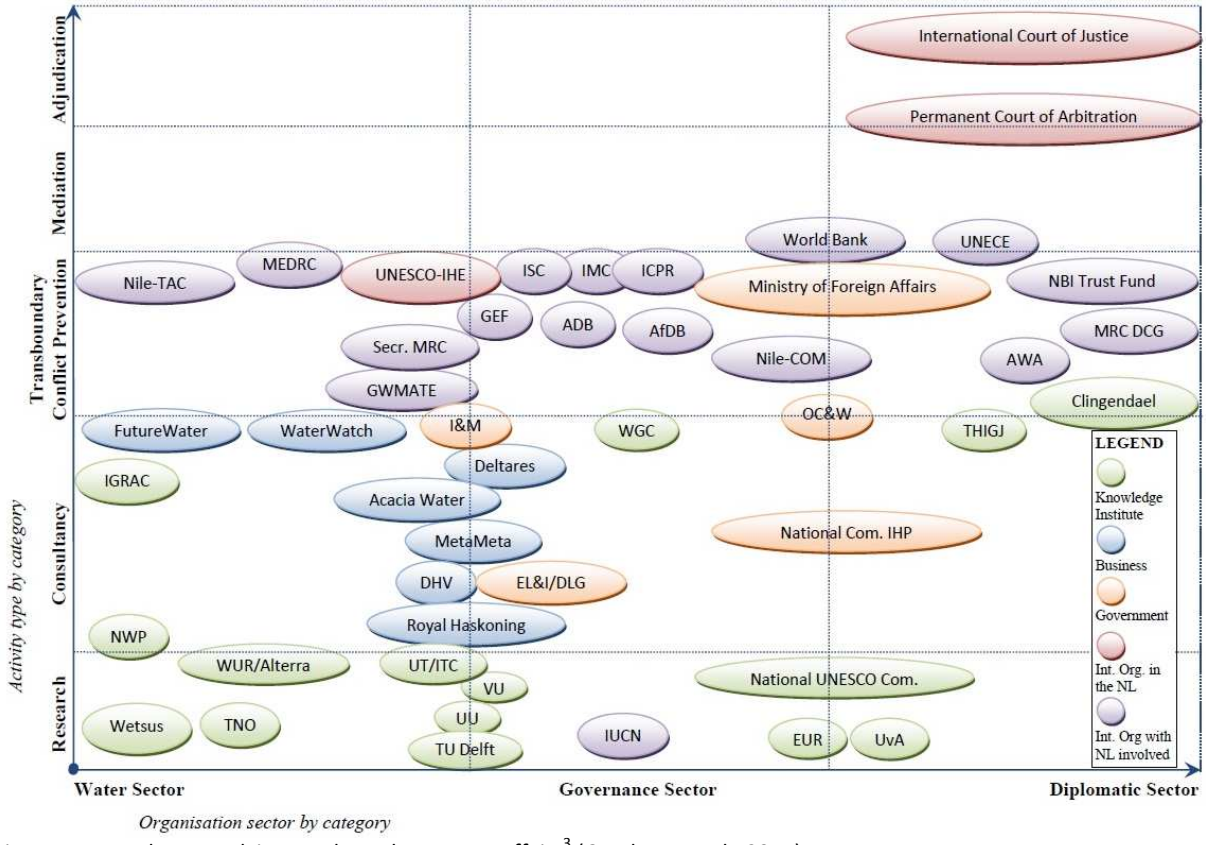


Figure B.1: Dutch Network in Transboundary Water Affairs[3] (Genderen at al., 2011).

[2] This table is based on consulting the following sources; Genderen et al., 2011; NATO, 2014; Ministry of Defence, 2014; Ministry of Foreign Affairs, 2014; Waterbouwdag, 2014; DRR-Team, 2014; NWP, 2014; Dutchwatersector, 2014; Partnersvoorwater, 2014; CCOE, 2012.

[3] Military organisations, NGOs and private companies are not presented in this figure.

C

Water Security by Allocation Prioritisation: The Netherlands Close-off Sequence.

In times of water scarcity, the Water Boards (a Netherlands governmental organisation exclusively responsible for water safety and water quality) can regulate the water intake using their own sluices, locks and siphons. In order to have a predictable water usage balance between the different users and functions, official governance prescribes the maximum water intake capacity for each usage. When these agreements cannot be complied with due to water scarcity, the national close-off sequence displayed in table C1 prescribes how the available water must be divided. Categories 1 and 2 have a strict priority sequence in order to guarantee water safety, preserve nature and to secure drinking water availability (Hoes et al., 2010).

NR:	**CATEGORY:**	**DISCHARGE:**
1	***Safety and prevention of irreversible damage:***	**[m^3/s]**
1.1	Maintaining a min. water level in main system regarding safety of dikes.	
1.2	Maintaining a min. water level in peat areas regarding settlement.	
1.3	Maintaining a min. water level regarding fragile nature reserves.	
2	***Public utilities:***	**[m^3/s]**
2.1	Withdrawal and flushing regarding drinking water facilities.	
2.2	Flushing regarding cooling water for electricity-power plants.	
3	***Local high-quality uses:***	**[m^3/s]**
3.1	Flushing regarding public health (botulism, blue-green algae, etc.).	
3.2	Withdrawal industrial process waters.	
3.3	Flushing surface water bodies from which industrial and agricultural process water is withdrawn and dumped.	
3.4	Irrigation for the high investment crop cultivation.	
4	***Other functions:***	**[m^3/s]**
4.1	Irrigation of cultivated grounds, sport fields and greens.	
4.2	Flushing regarding irrigation of cultivated grounds.	
4.3	Maintaining a min. water level in clay and sand soils.	
4.4	Maintaining a min. water level and flushing of non-fragile nature reserves.	
4.5	Irrigation of grass/corn fields.	
4.6	Raising and maintaining water level in peat districts.	
4.7	Discharge for fish migration.	
4.8	Flushing for botulism and blue-green algae prevention.	
4.9	Flushing to prevent salt intrusion North Sea channel.	
4.10	Economising by means of lockage.	
	TOTAL:	

Table C1: Water allocation prioritisation sequence within the Netherlands (Hoes et al., 2010).

Categories 3 and 4 are prioritised in order to minimize the economic and social damage. Their internal priority sequence are dependent on the local situations (Hoes et al., 2010).

The close-off sequence implementation is performed regionally by the territorial responsible Water Board and supervised by a study group of the Department of Transport and Public Works from the Ministry of Infrastructure and the Environment. Table C1 will be key for the division of fresh water. Water will be cut back pro rata. The theoretical net inlet requirement for agriculture is depending on the kind and type of crop cultivated: approximately the gross crop water requirement of a few mm/day minus the precipitation and upward seepage. This water is required for the replenishment of the soil moisture in the rooting zone. In dry periods water is also required for water level management and flushing of the surface water. In practice, more water is needed than the net inlet requirement because irrigation is not carried out efficiently (irrigation water flows into cracks and disappears from the rooting zone, hysteresis needs to be overcome and farmers tend to apply more water than needed). On the other hand, the needed water inlet is restricted due to capacity limitations and possibilities of irrigation systems (Hoes et al., 2010).

D

Water Management Portfolio

What Short-, Medium- and Long-term Water Management Activities regarding technical projects, management approaches and governance policies can be applied? Through this Appendix, this sub-research question 8 is answered.

Since local water usage, issues, problems including the hydrological and geographical condition differ per location and situation, each water management problem-solving instruments need to be tailored. To assist the Civil-Military Water Group including the local population and host-nation governmental organisations in making the generic and detailed plans, selecting alternatives, making the designs, execute the activities and implement operational, maintenance and optimisation processes within the Planning & Preparation and Implementation & Execution Phases 4 and 5 of the *Integrated Water Management Development Framework Stabilisation Operations*, a broad overview including detailed descriptions regarding possible applicable technical projects, management approaches and governance policies per Water Management Development Theme are presented in this Appendix. Thereby a flexible portfolio of possible effective Water Management Activities is provided from the start.

Since the possible appropriate Water Governance approaches and policies are generally appropriate for multiple Water Management Development Themes, a generic overview is provided including the necessary explanations in paragraph D.1. Structured by means of the seven sub-divided Water Management Development Themes, a broad portfolio of technical related Water Management Activities is provided in:

- **Water for Food:** Agriculture, Livestock & Fishery including aquaculture (paragraph D.3).
- **Water for Drinking:** Drinking Water Treatment & Distribution (paragraph D.4).
- **Water for Nature:** Ecological Protection & Reconstruction including socioeconomic ecosystem (paragraph D.5).
- **Water for Health:** Sanitation, Pollution Prevention & Waste Water Treatment (paragraph D.6).
- **Water for Safety & Shipping:** Rural and Domestic Flood Protection, Navigation & Heat Stress Prevention (paragraph D.7).
- **Water for Industry & Energy:** Hydropower & Pollution Prevention (paragraph D.8).
- **Water for Recreation & Tourism:** Relaxation & Pleasure (paragraph D.9)

The interrelationship between the seven Water Management Development Themes is explained in paragraph D.2.

By means of the Purpose, Method & Evaluation philosophy the possible applicable Water Management Activities are discussed:

- **Purpose:** What desired effects do I want to achieve?
- **Method:** Which technical projects, management approaches and governance policies can be applied to achieve the desired effects within the Short- (S), Medium- (M), and Long- (L) term duration paths?
- **Evaluation:** What key indicators and success criteria are relevant to measure the effectiveness and performance of the implemented activities?

D.1 Water Governance

In order to prevent conflicts over water usage between down- and upstream users, water management approaches and governance policies are essential. In section D.1.2 appropriate water governance aspects will be discussed. First, in section D.1.1, the design process of water management systems is elaborated. The most significant Water Governance principles are also included in figure D.8 which is presented in paragraph D.2.

D.1.1 Water Management Design Process

Within the design process of water management systems, application of the Water Management Design Principles which are elaborated in section 8.4.4 is a must. In addition, multifunctional use of land and water based on an common vision is a key for sustainable socioeconomic development. Consequently, the planning and design process of water management systems need to be holistic: all Water Management Development Themes need to be integrated with special planning, socioeconomic needs and environmental protection in one design. To create the needed flexible resilient designs and management policies, awareness creation and education are essential. Through the following step by step design principles, water management systems will be designed holistic (Ven, 2011):

1. **Safety first:**
   - No building in flood-prone areas.
   - Space for dikes and facilities => reservation for safety.
   - Retaining-buffering-draining water.
   - Retention areas and emergency flooding areas.
   - Multiple land use.
   - Retraining water in the ground including groundwater quality.
2. **Never shift problems in space or time:**
   - Never shift problems to your neighbours down- or upstream.
   - Never shift problems to the future.
   - Everyone needs to solve their own problems in their area of responsibility.
3. **Separate urban water from surrounding water, because:**
   - They have different standards in water level variation and water quality.
   - Other ground levels and land usage.
   - Other actor dependent interests.
   - Other water administrators.
   - Other operational, maintenance and optimisation requirements.

4. **Land use from clean to polluted water flow (ground & surface):**
   - As displayed in figure D.1, water flows from clean (green areas) to less polluted (residential areas) toward more polluted area (business areas / industrial zones).

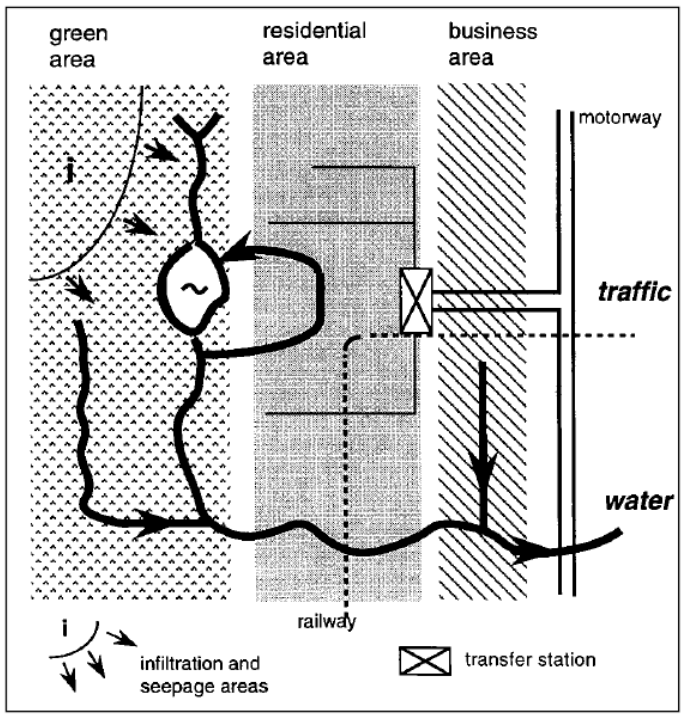


Figure D.1: Water flow from clean to polluted area (Ven, 2011).

   - Treatment by natural purification processes before it is discharged into the surface water by means of the connection model (figure D.2).

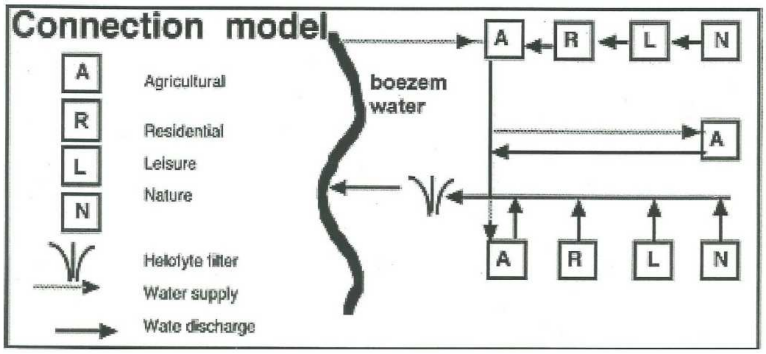


Figure D.2: Connection model (Ven, 2011).

   - To prevent pollution or deteriorated water qualities, water should be in constant circulation (figure D.3). Stagnation need to be prevented at all times.

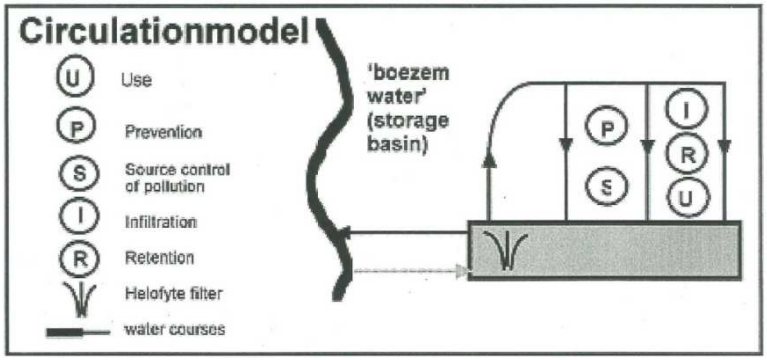


Figure D.3: Circulation model (Ven, 2011).

- The spread of pollution water is isolated and treated by "slow" natural purification systems before it is discharged by means of the Slow-down model (figure D.4).

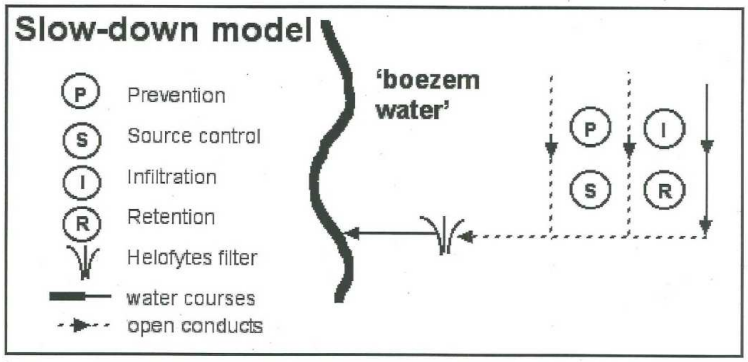


Figure D.4: Slow-down model (Ven, 2011).

5. **Keep clean water clean (act to protect):**
   - Prevention, separation, purification.
   - Clean versus polluted watercourses.
   - Concentrate all pollution sources (industrial and sewer emergency overflows) into one watercourse. The rest is kept clean. Thereby the clean water source can directly serve multiple different functions, while the polluted need to be treated first.
6. **Make water fun:**
   - Make water visible.
   - Recreation areas.
   - More understanding by the public why water is important to invest in.
7. **Build water positive by creating small / local water cycles.**

   Local small water cycles are direct influenced by how cities are planned. When land is paved, water cannot soak into the soil but it runs-off rapidly by means of canals to the nearest river. To reduce peak run-offs and to improve local groundwater recharge, it need to be prevented that surfaces are sealed off and water cannot infiltrate. Through urban green and waters, the small local water cycle is restored (see figure D.5). Thereby heat stress is prevented since local waters and vegetation are natural air conditioning systems. In addition, nutrients soil erosion is prevented, water quantity enhanced and water quality improved.

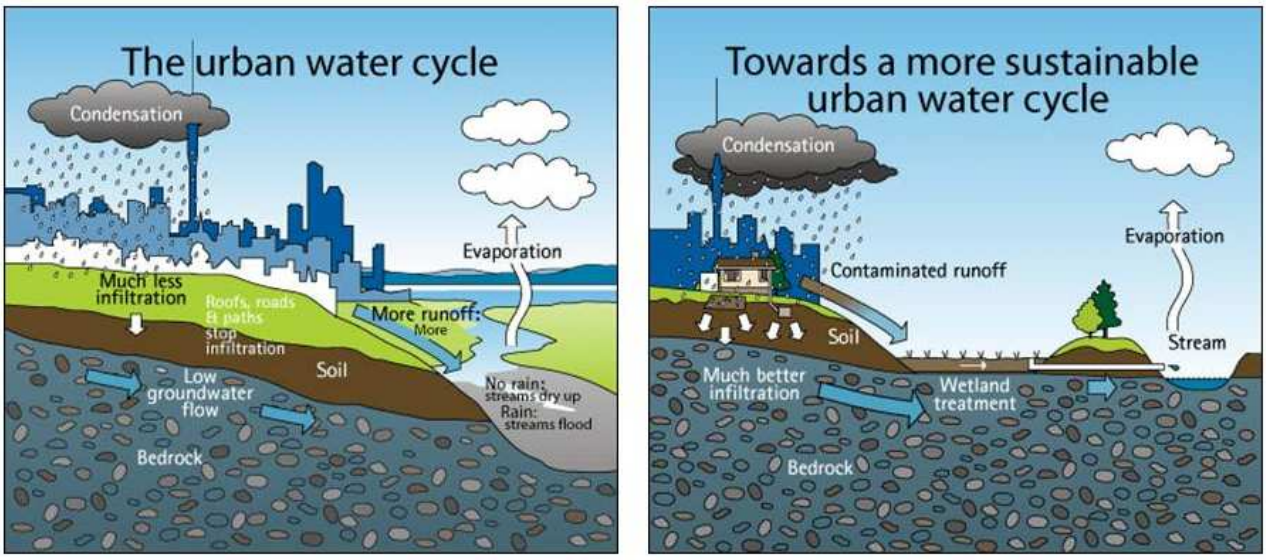


Figure D.5: Effects of a small local water cycle (SSWM, 2015).

More technical solution to create, maintain and improve a small local water cycle are presented in the paragraphs Water for Nature (paragraph D.6) and Water for Safety & Shipping (paragraph D.7).

8. **Water opportunity map to create win-win situations by multi-functional designs.**
9. **Green & Blue designs, only Gray when no other options are possible or affordable.** In paragraph D.7, Water for Safety & Shipping 113 green, blue and gray technical designs are presented.
10. **Quality improvement, focus on holistic benefits.**
11. **Risk control instead of risk reduction.**

Behind every planning, design, construction, operations and maintenance action a robust local based policy need to be present. As a backbone, standard project management tools can be applied. Since societal, political and natural environments are dynamic and constantly changing, an adaptive management approach is advised. Therefore, periodical meetings regarding the creation, implementation and optimisation of resilience through the PRIMO-Chain (see section 9.4.4) should be planned. In addition, regular inspections, maintenance and testing of the operational water management approach including its structures is essential. The approach how to create and maintain resilience is displayed in figure D.6. Periodic reviews also stimulates increasing the level of confidence in each of the participants, because each actor can "check" if the agreed upon obligations and responsibilities regarding the implementation are performed. Since all users benefit from the same water resource, the operation and maintenance cost should be shared. The same counts for water quality preservation and recreation facilities. This is especially applicable in stabilisation operations since, the local government will struggles with budget shortfalls. Therefore the financial future of the Water Management Activities should be well managed in order to continue with the positive effects (Ven, 2011; Islam, 2013)

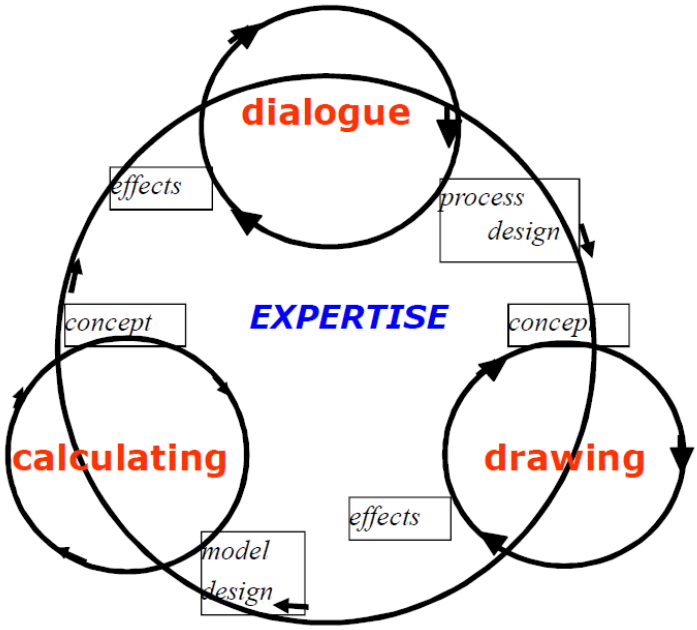


Figure D.6: Creating Resilience - A process of dialogue, design & engineering (Ven, 2011).

In order to reduce vulnerability regarding all the seven Water Management Development Themes, the in figure D.7 visualised four-step approach is applicable. Below, this approach is explained (Ven, 2011):

1. Complete a probability of failure assessment including the resulting vulnerability and stakeholder analysis. For example, no maintenance will degrease the threshold strength resulting in an higher probability of failure. This will result in an hazard map which includes the vulnerable spots and its affected actors.
2. By means of a risk analysis, the damage sensitivity is analysed. Thereby, Risk = Hazard X Potential damage of the structure or system itself including the surrounding or influenced urban areas. Also, what levels regarding risks or failure are acceptable need to be determined through the ALARA principle (As Low As Reasonable Acceptable). This is strongly society dependent.

3. The level of adaptability determines the level of vulnerability. How easier the existing area can be adapted to cope with the new conditions, how lower its vulnerability. Adaptation is enhanced through synergy of opportunities and by including multiple functions in one design. The selected vulnerability reduction strategy results in a hot spot map. Thereby the focus should be on damage sensitivity in relation with the risk of occurrence. For example, when a flood event occurs, it need to be known how the nuclear power plant, inhabitants, hospitals, critical infrastructure and infrastructure towards key facilities, etc. in the area will be affected by this flooding.
4. Finally, the appropriate set of adaptation measures is selected. This also includes regular inspections, maintenance and testing of the operational PRIMO-Chain and its structures (S, M & L term). In section 9.4.4, the PRIMO-Chain is elaborated in more detail.

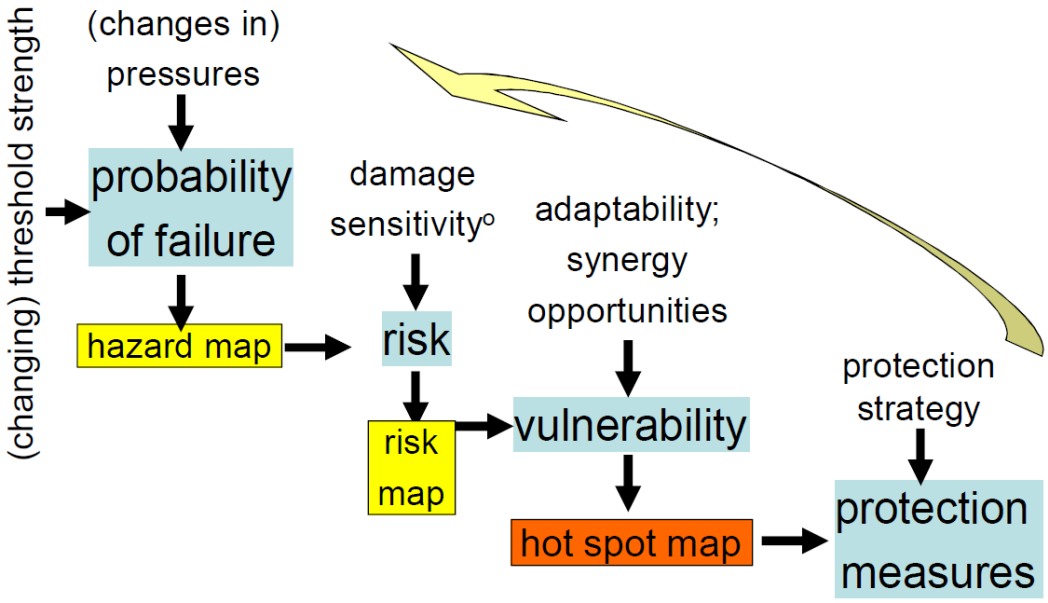


Figure D.7: Physical System Vulnerability Analysis (Ven, 2011).

D.1.2 Water Governance Aspects

This section provides a generic overview describing possible applicable Water Governance Aspects[4], since:

> ***'Governance & Water are pillars of common interests and essential needs in every society.*** *Without water there is no live and without live there is no governance. Thus make water as a pillar for governance' (Post, 2015).*
>
> ***'Infrastructure is another important key need for socioeconomic development****. Flooding can result in the destruction of bridges. During my NATO-ISAF deployment, I have experienced this events. Due to the flood, a vital bridge link was destroyed with great negative effects; a part of the local population could not reach the city resulting in the fact that they were not able to trade their products on the local market, get day-to-day live supplies including provisions and were cut off from healthcare. Because the Afghan and Dutch forces could not patrol in this area on a regular base, the area of influence of the Opposing Military Force (OMF) increased in the area which was cut-off' (Koolhof, 2014). Flooding events also cause a threat with regard to the agriculture sector, industrial activities and a safe living near rivers.* ***Mitigating or preventing floods is thus essential in order to have a constant positive loop of socioeconomic development.***

[4] This section is developed by the author based on: Wolf, 1998; Haddadin, 2002; Mostert, 2003; Michell, 2006; Zeitoun et al., 2008; Savenije et al., 2008; Gourbesville, 2008; Gerlak et al., 2011; Ven, 2011; Islam, 2013; USAID, 2013; Kleijn, 2014; Koolhof, 2014; Ven, 2014; USAID, 2014; Post, 2015.

Purpose

- Establishing, maintaining and improving a sustainable management approach and governance systems to ensure constant improvements regarding the water management systems including mediation and negotiation activities to resolve water conflicts peacefully through actor cooperation.

Method

In order to increase the overall benefits of the common pool freshwater resource, management approaches and governance systems have proven to be very effective. Especially when specific actor costs regarding water quality and water safety are shared between those up- and downstream actors who benefit as well. Furthermore, governance systems stimulate sustainable actor cooperation. Since water systems are united, actors rely on the common system. Due to actor interdependencies regarding water usages within water management governance systems, conflicts over the freshwater resource are commonly resolved peacefully.

On the short-term (S) local water users and managers can agree upon mitigation measure to prevent conflicts through allocation, scheduling and delivery management systems. These are especially effective when water demands and supply fluctuates significantly per season. Appendix C provides an example how water can be prioritised based on the level of importance water possesses within the Netherlands society. In order to prevent conflicts, water allocation prioritisation polices are an important must have. The creation of this list should be developed by the local actors, public and private stakeholders and the national government. When the basin system crosses the country boarder, all riparian nations ideally cooperate. Due to the accompanied different interests this will be a difficult process. It is emphasised that a substantial amount of afford should be used for the creation of such a list and enforcement of it from an early stage within the stabilisation operations.

On the medium- (M) and long-term (L), sustainable cooperation can be accomplished by operational management, regular inspections, maintenance activities and optimisation policies between the users within the same water system. Within the PRIMO-Chain (see section 9.4.4), a regulation system and law enforcement by an independent governmental organisation is essential.

Regarding water management approaches and governance systems best practices, the Netherlands Water Boards and International Commission for the Protection of the Rhine have proven to be very effective systems. In the paragraphs 6.3 and 6.4 Water Cooperation and Water Diplomacy Best Practices are elaborated in great detail. Additionally, more significant management approaches and governance systems are listed and explained below:

- Build cooperation between local adversaries through water resources management and environmental education. By multi-level community education programs with youth, adults and professionals from both sides, conflict resolution is improved due to mutual problem understanding (S, M & L).
- Improve actor inclusion through community consultation and infrastructure development, like: water distribution agreements regarding up- and downstream water quantity and quality or investments in water distribution networks including its operation and maintenance (M & L).
- Building water management capacities among national authorities where overall tensions are less acute in order to boost the peace building potential by cross-boundary dialogue on shared water resource (S, M & L).
- Joint data collection and information exchange between nations, communities and regions helps in creating dialogue, relationships, trust, cooperation and innovations. This brings stakeholders from the entire region together to coordinate their actions. This supports again a broader regional network of conflict de-escalation and promotes agreements. *For education purposes and to create local ownership, data collection activities need to be performed in cooperation with the local population and other water users.* (S, M & L).

- Strengthening national and transboundary water management capacities through improved data management, water quality monitoring and technical staff training for water management institutions with the aim to alleviate water access problems (M & L).
- Build relationships through technical innovation to increase water supply and decrease water competition and violent conflicts (M & L).
- Mitigate and prevent violent water conflict through a collaborative preparedness system that empowers governmental and non-governmental actors to respond to potential water issues (M & L).
- Creation and implementation of shared management plans, which includes: addressing cross-border disparities in water access and pollution, combats environmental harmful practices and the implementation of a joint watershed-based land use plan (M & L).
- Mitigate risk of conflict through improved early warning and response systems regarding cross-boundary or collective flood defence structure combined with recreation and energy production facilities, like beaches and dunes or wind and water turbines (M & L).
- Improve present organisational and institutional aspects, since management and territorial governance are the most decisive factors for progress towards self-reliance (S, M, L).
- Agreements between the down- and upstream actors with regards to water usage, water quality, flood protection and shipping navigation routes (S, M, L).
- Cross-boundary or collective ship management and navigation agreement and management systems (L).
- Transboundary crossing and trading agreements regarding shipping navigation (M & L).
- What we plan need to be in line with the natural process. Since nature cannot protect itself, regulation and law enforcement is needed to prevent over exploitation and a tragedy of the commons scenario (M & L).
- Guarantee continuation of cooperation on local, national and internationals level by means of a water management governance systems, through implementation of regulation and enforcement of water laws (L). Water laws including and law enforcement are also crucial when interventions in private (companies / industries) and public space are needed.
- Enlargement of the physical dimensions and impact of the technical projects (M & L).
- Investments of private enterprises are needed to increasing the host-nations capability in a sustainable peace and economy development (L). *'Be careful with involving the private sector. Due to other primary interests, like making a profit, these parties can disrupt or destroy the positive contribution made by the previous actors (NGOs, ministry of Defence and Foreign Affairs) when involved in a too early stage. We also have to realise that the private sector has other purposes and meanings in non-western societies. Applicability and timing of private sector involvement is thus culture based. With regard to having a sustainable transition management including sustainable local training and capacity building, private sector involvement should not take place within the short- and medium-term activities'* (Ven, 2014).
- Water pollution is one of the most serious global problems[5].

[5] Water pollution is one of the most serious global problems. Contaminants come from two sources: point or non-point sources. Landfills, leaking gasoline storage tanks, leaking septic tanks, sewer emergency overflows and accidental spills are examples of point sources. Infiltration from farm land treated with pesticides, fertilisers manure is an example of a nonpoint source. Inadequate treatment of domestic sewage and the insufficient controls on the discharge of industrial wastewaters are some of the major problems that have affected the water quality of rivers and lakes which gave rise to the leaching of nutrients and pesticides. Harmful organisms and polluted run-off continue to pose threats to health, fish, and wildlife. Another important aspect that has degraded the water quality is the environmentally destructive practices which disturbed the aquatic ecosystems and threatened the living fresh water resources. The rain forest is an example of an ecosystem that provides and regulates the quantity as well as the quality of fresh water supply (Radif, 1999; Ven, 2011).

Therefore water quality protection by means of governance policies and law enforcement through permits monitoring and testing of waste water outlets has the top priority (S, M & L). First of all the current ground- and surface water quality need to be known. *Water quality assessments of surface- and groundwater resources including sharing of information on what water resources can or cannot be used for drinking or irrigation purposes, is another important and* interesting short-term quick impact project*. This also creates a trustworthy relationship with the local population since actor* cooperation and sharing of data is included. After the base line is established, water quality tests need to be performed on a regular bases and are thus regarded as short,- medium - and long-term orientated activities (S, M, L).

- Water quality should be focussed on prevention primarily and secondly mitigation regarding the use of contaminated building material, pesticides, etc. (M & L). For both subjects awareness of the negative effects and education on possible well applicable alternatives are important tools and decisive for successful implementation of prevention.
- When groundwater is extracted a well management and governance systems is essential in order to prevent depletion by overexploitation and salinization of the groundwater resources.
- The use of natural resources need to be in balance with the cooping capacity of the natural system. This is applicable for the agricultural, livestock and fishery food provision sector including its use of water, pesticides and fertilisers. Also, the human waste disposal to the natural purification systems and the use of raw materials for construction and energy production purposes need to be in balance with the natural supply and demands. Therefore, awareness education management systems and governance policies are essential needs (M, L).
- Include strict pollution prevention measures and policies to prevent discharges of heavy metals, chemicals and biological contaminated wastewater from industrial processes. Also, warm water residue used in the cooling process from conventional fossil fuels (coal, oil, natural gas and peat) energy production power plants need to be regulated due to its negative effects on the ecosystem (S, M, L).
- Effective and equitable water pricing tariffs (M & L).

Evaluations

- Water as a conflict resolution mechanism: Amount of water conflicts solved un-violently / area.
- Water as a cooperation mechanism: Amount actor cooperating regarding water management issues / area.
- Sustainable and robust water management systems: Implementations of the of the Water Management Design Principles (see section 9.4.4) / design / area.
- Implementation of the PRIMO-Chain: Number of management systems or governance policies / area.
- Contribution to quality of the rural and urban environment: Water connectivity / livings standard improvements / area.
- Effectiveness of water regulation: Water law enforcement acts / area.

D.2 Interrelationship Water Management Themes

The interrelationship between the seven Water Management Development Themes including all significant Water Management Activities are summarised by means figure D.8. Per Water Management Development Theme, the interrelationships will be explained in the following sections.

D.2.1 Water for Food

Because water is reused for different purposes, Water for Food is directly positively linked with Water for Industry & Energy. Moreover, Water for Food is linked in a negative manner with Water for Drinking and Water for Nature due to pollutions through the use of fertilisers and salinization which is caused by excessive groundwater extraction or seepage in coastal areas.

Agriculture is much more than just one user of the water resource. Water for Food is a vital activity in providing food for a sustainable and a healthy living. This explains the connection with Water for Health. In addition, agriculture, livestock and fishery including aquaculture are a source of employment and income. Thereby it is linked with Water for Recreation & Tourism.

By its nature, agriculture also involves stewardship of the biosphere and is the principal manager of water, soils, vegetation, cultivated and pasture ecosystems. It can therefore produce essential human services, like flood risk reduction. This explains the interrelation with Water for Safety & Shipping.

D.2.2 Water for Drinking

Prevention is a significant aspect within the water quality chain. Prevention is the most sustainable solution since it will result in lower filtration and purification costs, while at the same time more fresh water is available for usage. In addition, decreasing the amount of chemicals, pesticides and fertilisers are having a high priority. Thereby pollution prevention by water treatment contributes in decreasing the risks of water conflicts. To prevent salinization of the water resources, well groundwater and land management systems are essential. This development theme is thus strongly interrelated with Water for Food and Water for Nature. For both subjects awareness of the negative effects and education on possible well applicable alternatives are important tools and decisive for successful implementation of prevention. Through drinking water treatment and distribution facilities, clean fresh water is provided. Thereby Water for Drinking positively contributes to Water for Health.

D.2.3 Water for Nature

In order to be effective pollution, contamination and salinization prevention of the natural system should start at the most early stage. Groundwater and land management are key in ecological protection and reconstruction. The development themes; Water for Food, Water for Healthcare, Water for Drinking, Water for Industry & Energy, Water for Safety & Shipping and Water for Recreation & Tourism are thus direct related regarding the desired preventive measures. If not, these development themes can easily cause irreversible damage to the natural capital including the socioeconomic functions ecosystems provide.

Commonly, ecosystem are regarded as cost. This is falls, especially when double function are created through application of the "Building with Nature" philosophy (see section 9.4.4). By reconstruction of the small and large hydrological cycles, more water will be available for irrigation accompanied with lower water allocation infrastructural investment. Thereby Water for Nature positively contributes to Water for Food. In addition, the head stress is prevented thereby positively influencing Water for Health and Water for Recreation & Tourism. Trough water treatment by riverbank, floodplain, dunes, wetlands, mangroves and forest filtration Water for Drinking is positively influenced. Moreover, by preventing stagnant water, water quality increases contributing to Water for Health, Water for Drinking and Water for Recreation & Tourism. By natural areas, wildlife, parks and water recreation, recreation and tourism is enhanced. Nature and its ecosystem produce essential raw materials for industrial purposes and the production of energy. Through conservation of soil fertility, Water for Nature directly influences agricultural yields. Last but not least, through natural floodplains, wetlands, dunes, mangroves and forest, landslides and soil erosion are prevented. This results in an increased level regarding flood protection. Furthermore, food production is enhanced.

D.2.4 Water for Health

In order to prevent contamination of the fresh water supply, waste waters should be purified through natural systems or treated in a waste water treatment facility before it is discharged. In addition, preventing direct connections and indirect leakage towards open- and groundwater resources has a high priority because the natural system doesn't have the self purifying capacity regarding point source contamination. Thereby, Water for Health is thus link with Water for Food and Water for Nature. By adding sanitation facilities, also Water for Recreation & Tourism and Water for Drinking are positively affected.

D.2.5 Water for Safety & Shipping

This development theme is primarily focussed on rural and domestic flood protection, providing shipping and navigation infrastructures and heat stress prevention. Thereby, multiple double function can be created like; infiltration fields in urban parks, sea and river defences (beaches, dikes and dunes) appropriate for recreation, floodplains in agricultural land or natural area, sewage systems to prevent urban floods, open waters in combination with recreation facilities, floodplains as natural areas or agricultural land, floodgates and navigation locks in combination with hydropower facilities and the application of riverbanks, floodplains, dunes, mangrove forests as filtration and purification systems. Thereby, Water for Safety & Shipping has strong links with all Water Management Development Themes.

D.2.6 Water for Industry & Energy

As displayed in figure D.8, Water for Industry & Energy is closely interlinked with Water for Food by means of chemical and biological pollution. This negative issue also effects Water for Drinking, Water for Nature and Water for Recreation & Tourism. Through connecting sewage systems with water treatment facilities, pollution is prevented. Since the entire water quality is thereby protected, Water for Health, Water for Food, Water for Drinking, Water for Nature and Water for Recreation & Tourism are positively affected. By creating double function with Water for Safety & Shipping, energy can be produced through hydropower. In addition, shipping and trade routes are created positively influencing Water for Recreation & Tourism.

D.2.7 Water for Recreation & Tourism

Water for Recreation & Tourism related Water Management Activities do not influence the other Water Management Development Themes directly. Only by creating double functions with Water for Safety & Shipping and Water for Nature, Water for Recreation & Tourism is established. For enhancing the entire living standard and perceived level of welfare, implementation and execution of these activities is essential.

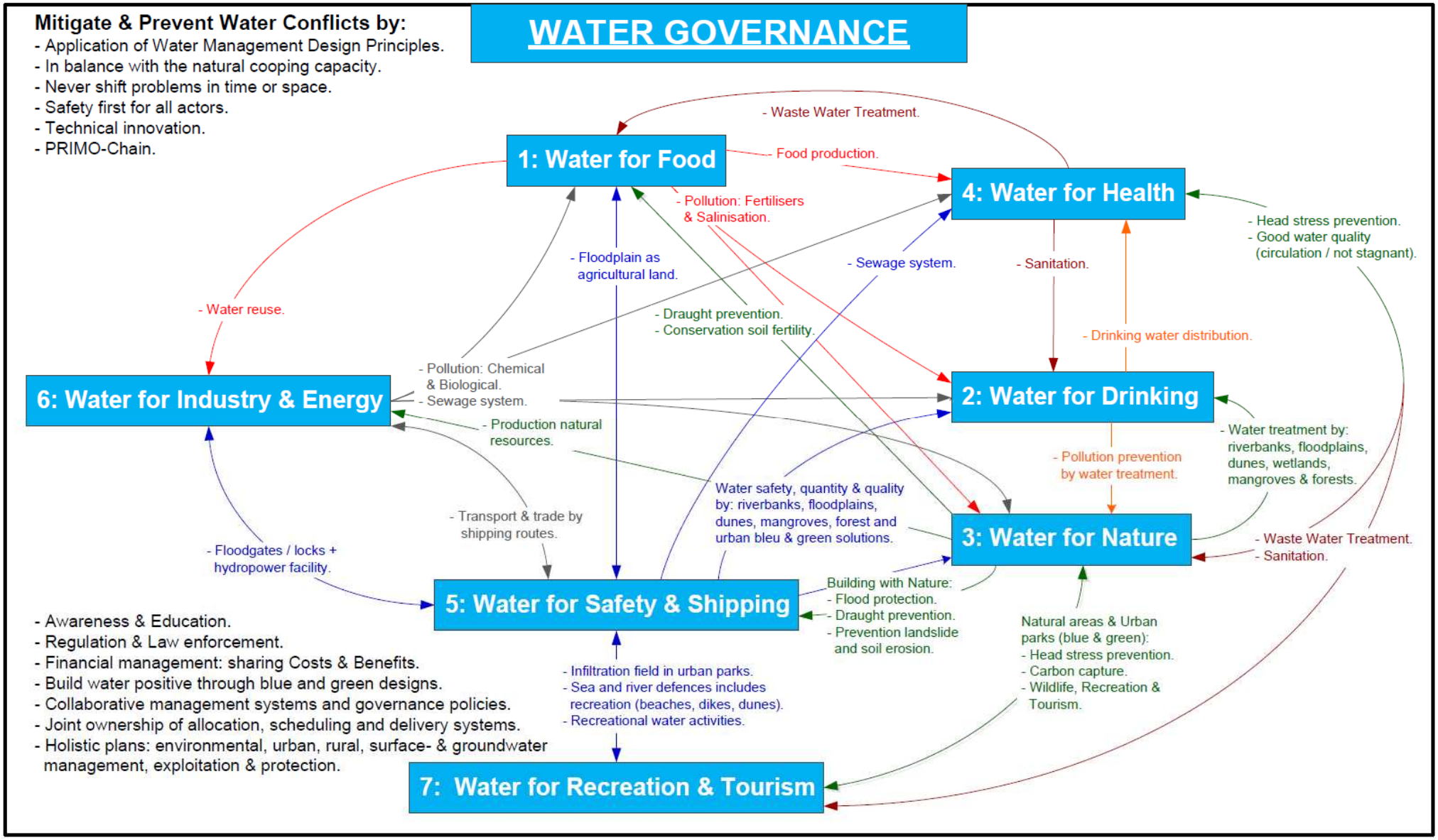


Figure D.8: Interrelationship between the seven Water Management Development Themes, including significant Water Management Activities and Water Governance principles..

D.3 Water for Food

This paragraph provides a generic overview describing possible activities within the Water for Food water management development theme which includes Agriculture, Livestock &Fishery (aquaculture, aqua farming)[6].

Purpose

- Establishing, maintaining and improving a sustainable water quantity and quality supply to guarantee a minimum set crop yield including a sustainable livestock and fishing activities.

Method

Depending on the annual inflow (dry or wet conditions), the following technical (re)construction activities and optimisations of present irrigation systems are suitable to enhance agricultural activities:

- Open canal and surface irrigation (40-50% efficiency):
  - S: water runs over land, open trenches or ditches (inefficient & losses).
  - M & L: scale enlargement of the technical channel systems also results in more complex systems. Therefore regulation structures like dams and weirs for discharge regulation are needed.
- Sprinkler irrigation (M & L): 50-70% efficiency.
- Drip irrigation (S, M, L): 70-90% efficiency.
- Terrace / cascade system, making optimum use of the Retain, Store, Discharge principle (S, M, L) In addition, the cascade structures prevent soil erosion and landslides.
- Dew catchment systems (S, M, L).
- Subsurface irrigations by means of buried drip irrigation or a tile water infiltration system (M & L): 80-100% efficiency.

These irrigation methods can be supplied with water harvested from:

- *Surface & Rainwater* from rivers, canals and reservoir systems under gravity flow. Connections need to be made with the existing system. Also present water reservoirs on a small scale local like local rainwater harvesting an retention facilities (M), large storage reservoirs or (artificial) lakes need to be linked or constructed (L). With regards to the last situation, hydropower plants can be incorporated in the irrigation system (L). Also, the surplus of irrigation water can be used for industrial purposes (M, L).
- *Groundwater* extraction vertically by means of pumps (S & M only for disaster relive) and horizontally by tunnels which are connected with aquifers (M & L, because they are better in preventing excessive extraction). These pumps can be hand, foot or animal operated. Also, pumps connected with a sustainable energy supply system, like solar power and hydropower can be applied (S & M). Pumps connected with the electricity grid or a combustion engine are also possibilities, but not a first preference. When groundwater is extracted a well management and governance systems is essential in order to prevent depletion and salinization of the groundwater resources (S, M & L).
- Natural groundwater extraction, like with Karez or Qanat systems (example is displayed in figure D.9) is more appropriated because unnatural high amount of water extractions which cannot be replenish by the hydrological cycle, are prevented (M & L).
- Earth fill water storage dams are effective as water retention facilities especially in warm climates due to a low evaporation number (M & L).
- New resources includes reusing household, industrial and drainage waters (M & L).

[6] This paragraphs is developed by the author based on: EUROCONSULT, 1989; Savenije, 2007; Arsel, et al., 2010; Hoes, et al., 2010; NATO-EAPC, 2014; Ven, 2014; Post, 2015.

In order to increase the crop and livestock yields, also the following improvements can be appropriated:

- Increase soil fertility on an natural and sustainable manner by rotation of different crop types and livestock each year. Also, other agricultural ecology (making use of the chemical composition of the organic soil matter) related techniques can be appropriated (S, M, L).
- Access to high-quality seed and mineral fertilisers can result in considerable yield improvements (M, L).

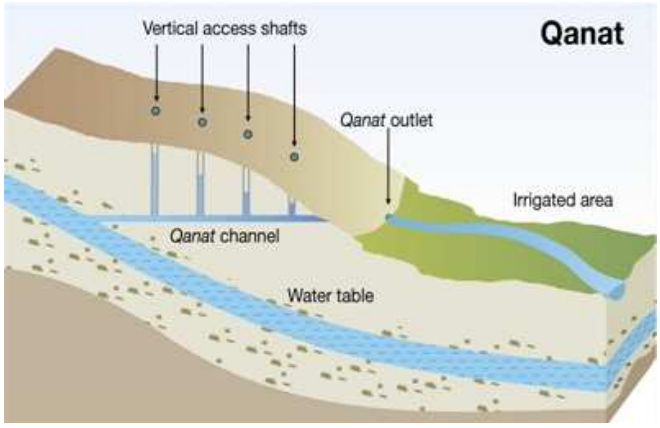


Figure D.9: Karez or Qanat system (Post, 2015).

- Using nutrients or fertilisers in a sustainable quantity (S, M, L). When fertilisers are used, it is advised to train the local farmers in sustainable use based on a land development plan in order to prevent contamination of the freshwater supply.
- Surface evaluation to decrease water runoff losses, have a stable predictable groundwater level and for the prevention of low-lying flooded fields. In combination with water retention facilities a constant flow of water in- and output over the fields is possible without the influences of the seasonal fluctuations. Because the top layer of the soil contains the soil nutrients which are essential for good agriculture, it is advised to removed this soil separately and replace it on top after levelling has been carried out (M, L).
- Allocation or changing the kind crop and animal livestock which is suitable for the surrounding it is produced in (S, M, L). The flowing parameters should be taken into account: solar energy, climate conditions, soil type and structure, available water supply, cultural habits and social plus economical structures and demand.
- Consolidation by allocation farm plots and water ways for an optimum in drainage and water supply in combination with accessibility and road improvements (L).
- Trenching the soil to increase soil porosity, enabling crop roots to fully develop and prevent stagnant water conditions (S, M, L).

With regards to aquaculture and fishery, the following activities are possible:

- Fishing ponds construction for (S, M, L). This can be combine with waters for recreational purposes and water retention facilities.
- *Assisting in establishing a higher catch of fish by means of the distribution of good fishing gear (nets, traps) including training and education (S, M, L).*

Evaluation

- Efficiency crop and livestock: Yield / m^3 water used / area.
- Efficiency of irrigation system: Yield / m^3 water discharge in the system.
- Irrigation connectivity: amount of farmers / irrigation system.
- Fishery yield: Amount of fish / fishing trip.
- Farmers level of independence: Income / harvest.
- Improvement of human health: Amount of healthy food consumed / capita.

D.4 Water for Drinking

This paragraph provides a generic overview describing possible activities within the Water for Drinking water management development theme which includes drinking water provision and treatment[7].

Purpose

- Establishing, maintaining and improving a sustainable delivery of drinkable water, which has the right quantity and quality standard for prosperous living standards.

Method:

After the military intervention, first the basic water needs need to be provided as a short-term orientated activity. In the short-term (S) this can be established by means of:

- Bottled water provision.
- Water extraction from aquifers by means of groundwater collection trenches, wells or pump systems. Also surface water can be applied. Perhaps these waters need to be purified before consumption. Multiple military water purification systems can be applied within this short-term time frame. Contaminated sources need to be avoided within the short-term orientated activities. It is advised to make use of the clean sources in a sustainable manner (demand and supply in balance with the hydrological cycle and other water functions) and protect these for possible future contamination.

With regards to the last short-term activity, first of all the current ground- and surface water quality need to be known. After the base line is established, water quality test need to be performed on a regular bases and are thus regarded as short-, medium- and long-term orientated activities (S, M, L).

When a sustainable basic water provision is established, the priority shifts towards reconstructing and improvement of the existing drinking water distribution systems. Furthermore, by connecting the more remote areas the peace dividends will be extended. Within these medium- and long-term orientated activities, maintenance and education are key activities for a successful operating system (M, L):

- Transportation to public collection points, homes and offices by pumps, water towers and pipelines (gravity or high-pressure lines, cranes, purification systems, etc.).
- Harvest rainwater locally to create a sustainable and resilient urban living environment by using non-drinkable rainwater for, toilets, gardening and agriculture.

Reconstructing, improving and maintaining water treatment facilities and / or natural purification systems, are also considered as medium- and long-term orientated activities. It is advised to apply the Building with Nature concept by making optimum use of the available natural system in an economical sustainable manner, like::

- Riverbank filtration & purification (M, L).
- Floodplain filtration & purification (M, L).
- Dune filtration & purification (M, L).
- Wetlands filtration & purification (M, L).
- Mangrove forest and forest filtration & purification(M, L).
- Helophyte filters (M, L).

In figure D.10, a simple well concept applicable in urban areas is presented. Rainwater is collected from rooftops, streets and squares and diverted into drainage tubes or infiltration boxes. The drainage tubes or infiltration boxes equally distribute the water over the filter. The main filter material will be sand. In order to prevent clogging of the infiltration boxes, they should be surrounded by a thick layer of gravel. To prevent leakage of infiltration water or contamination of the filter, the edges are sealed through a clay layer.

[7] This paragraphs is developed by the author based on: Heijman, 2014; Ven, 2011; Moel et al., 2012; Mays et al., 2013.

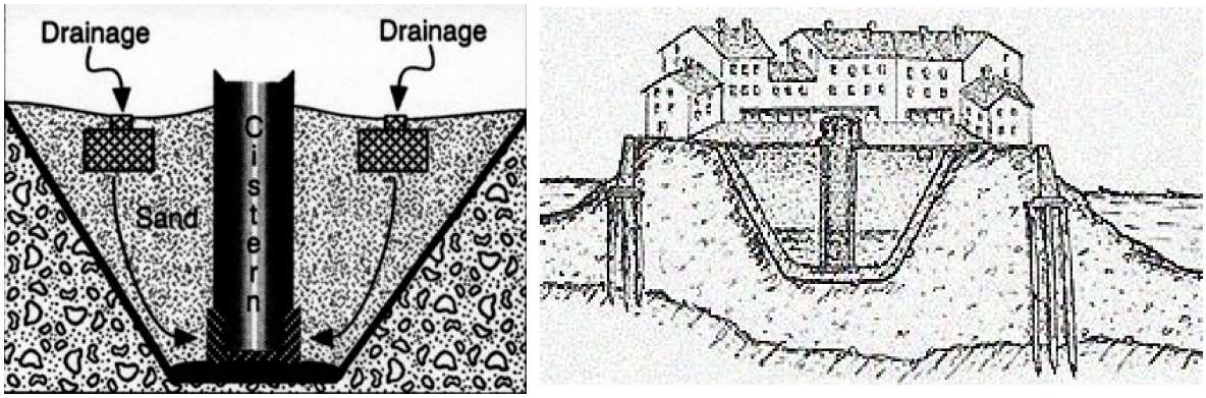


Figure D.10: Graphical section of drinking water and purification system in the Venetian period, ca. 1204-1668 (Mays et al., 2013).

These natural system listed above are applicable with regards to biological contaminated water sources. When these source are also contaminated by chemicals, on or multiple of the following systems need to be added within the purification process:

- Osmoses filtration.
- UV purification.
- Ozone purification.
- Chlorine purification.

UF purification and Osmoses filtration are the best option, but expensive. The last two are cheaper solutions but need to be averted when possible since adding these chemicals also includes a certain risk for the human health. Moreover, not all water born diseases are eliminated by the use of Chlorine.

These purification systems can be applied on a large scale by means of Drinking Water Treatment Plants, but it is preferred to keep the water treatment cycle as small as possible by means of the application of decentralised domestic systems. This is cheaper, since no infrastructural distribution systems are needed and are less complex because of a low amount of managerial policies. Therefore:

- Restoring the natural purification systems has high priority (M, L).
- Prevention of pollution by means of education and waste water treatment facilities are important to guarantee a sustainable water quality (M, L).

An schematic overview of an drinking water treatment facility is provided in figure D.11. Because the specific characteristic of a water treatment plant depends the influent quality / water contamination and salinity, the usability of the local natural purification systems and the effluent water quality, a more detailed design need to be made when a water treatment facility is needed. The same system as displayed in figure D.11, can also be applied on a small local scale.

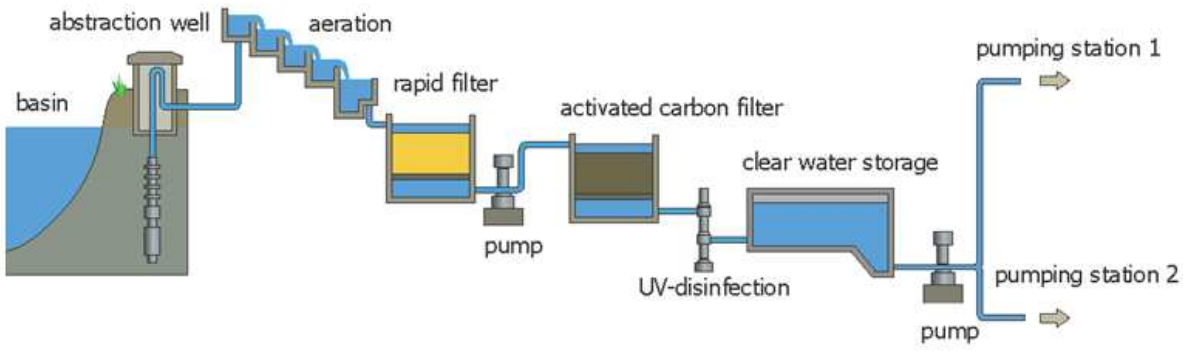


Figure D.11: Schematization of a Drinking Water Treatment Facility (Heijman, 2014).

Evaluation

- Amount of drinkable water: m3 / capita.
- Costs of the system: €, $ or local currency / capita.
- Access to drinkable water: capita with access / total population.
- Water quality: % nutrients reduction or heavy metals reduction / catchment area
- Improvement of human health: used drinkable water / capita.
- Decrease of pollution (point and diffuse): monthly water quality checks in a catchment area.

D.5 Water for Nature

This paragraph provides a generic overview describing possible activities within the Water for Nature water management development theme. This includes the impotency of ecological protection and reconstruction including its relation with how the ecosystem can serve the socioeconomic demands in a sustainable manner[8].

Purpose

Establishing, maintaining and improving a sufficient water quantity and quality for protection of the ecosystem. By having a well ecological system, the ecosystem can provide essential socioeconomic services serving human needs, like; the large and small hydrological cycle, natural water purification, flood defences, fishery, source for raw resources production and heat stress prevention.

Method

To maintain a healthy ecosystem, water quantity and quality are the key components. Also, for ecosystem conservation vegetation and forest are essential. When vegetation and forest covers are removed, this area will become hotter and drier since water is no longer circulated between plants and the atmosphere. Higher temperature and decreasing precipitation does result in a lower supplied water quantity. In combination with an equal or increasing water demand, the quality of fresh water bodies will deteriorate Moreover, the effects of heat stress especially in urban areas does effect human wellbeing and health negatively. Also, the provision of basic human needs like food, water and raw materials for construction and energy purposes will deplete. Due to water scarcity violent conflicts can occur over or populations start to migrate. By means of the following activities, the natural systems can be restored and improved in order to facilitate basic human needs due to an healthy ecosystem:

- (Re)creation of **hydrologic corridors** to restore ecology and decrease desertification. By restoring the small and large hydrological cycles and prevent soil erosion of top layer rich of nutrient by wind, water and human activities this can be accomplished (S, M & L). In table D.1 the technique behind this solution is elaborated.
- By the (re)creation of **hydrological buffers** water is stored on a natural seasonal and independent manner in vegetation and forest ecosystems. In the situation of extreme dry spells, additional water is available for (S, M & L):
    - Water for Food,
    - Water for Drinking,
    - Water for Health; circulating the systems preventing stagnant water, water quality is controlled.
    - Water for Safety & Shipping; groundwater levels are controlled resulting in minimizing land subsidence and failure of wooden foundations.
- Improvement of water quality by means of applying **natural purification system**: riverbank, floodplain, dune, wetlands and mangrove forest, forest and helophyte filtration & purification (S, M & L).

[8] This paragraphs is developed by the author based on: Ven, 2011; NAGA, 2015; Kračcík et al., 2008; Post, 2015; Verhagen, 2014; Radif, 1999.

- The natural resources **usage** need to be **in balance with the cooping capacity of the natural system**. This is applicable for the agricultural, livestock and fishery food provision sectors including its use of water, pesticides and fertilisers. Also, the human waste disposal to the natural purification systems and the use of raw materials for construction and energy purposes nature need to be in balance with the supply and demands. To prevent over exploitation of the natural system awareness, education, management systems and governance policies including international and national regulation and law enforcement based on the Reduce, Reuse and Recycle principle (see section 9.4.4) are essentials (M, L).
- As displayed in the figure D.14 ponds, parks, meadows and forest landscapes are the **natural air-conditioning of the world**. Due to vegetation, solar energy is used for evaporation and transpiration into water vapour. In not vegetated areas, solar energy is reflection or absorbed resulting in local higher temperatures. In order to reduce the negative effects of heat stress on human wellbeing and health especially in urban areas, vegetation can be (re)replanted in combination with recreation facilities, such as parks. Also, this will positively contribute to improving the small and large water cycles (M & L).

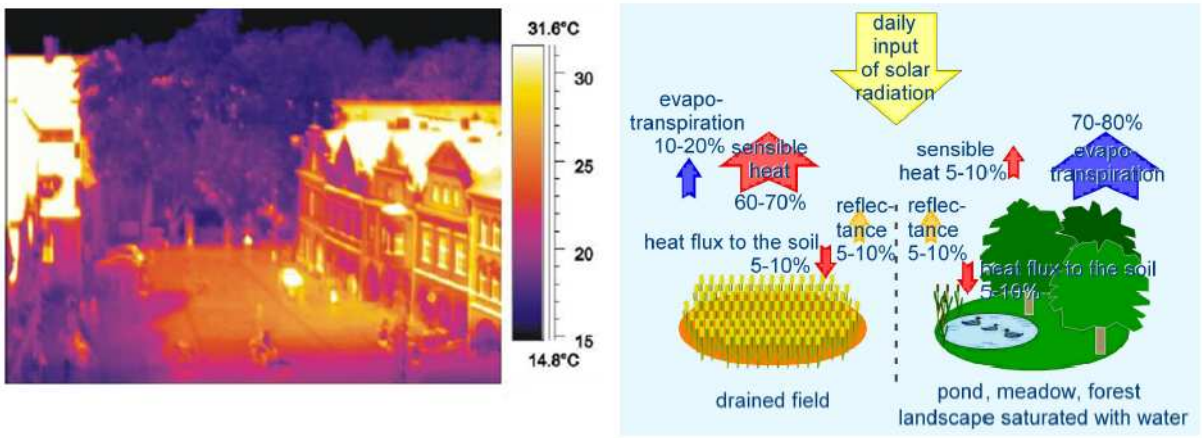


Figure D.14 (Kračcík et al., 2008):

- Right: the differences in temperatures between vegetation (low) and roofs of the houses (high).
- Left: distribution of solar energy on drained land (left) compared with landscape saturated with water (right).

A proven ecosystem rehabilitation technique.

MORE VEGETATION = MORE EVAPORATION = MORE RAIN = MORE VEGETATION

It starts by restoring the small water cycle by harvesting rainwater and enabling it to infiltrate into the soil. This process is summarised by means of figure D.16. The initial effects are displayed in figure D.15.

Figure D.15: Nature kicking in and taking over (NAGA, 2015).

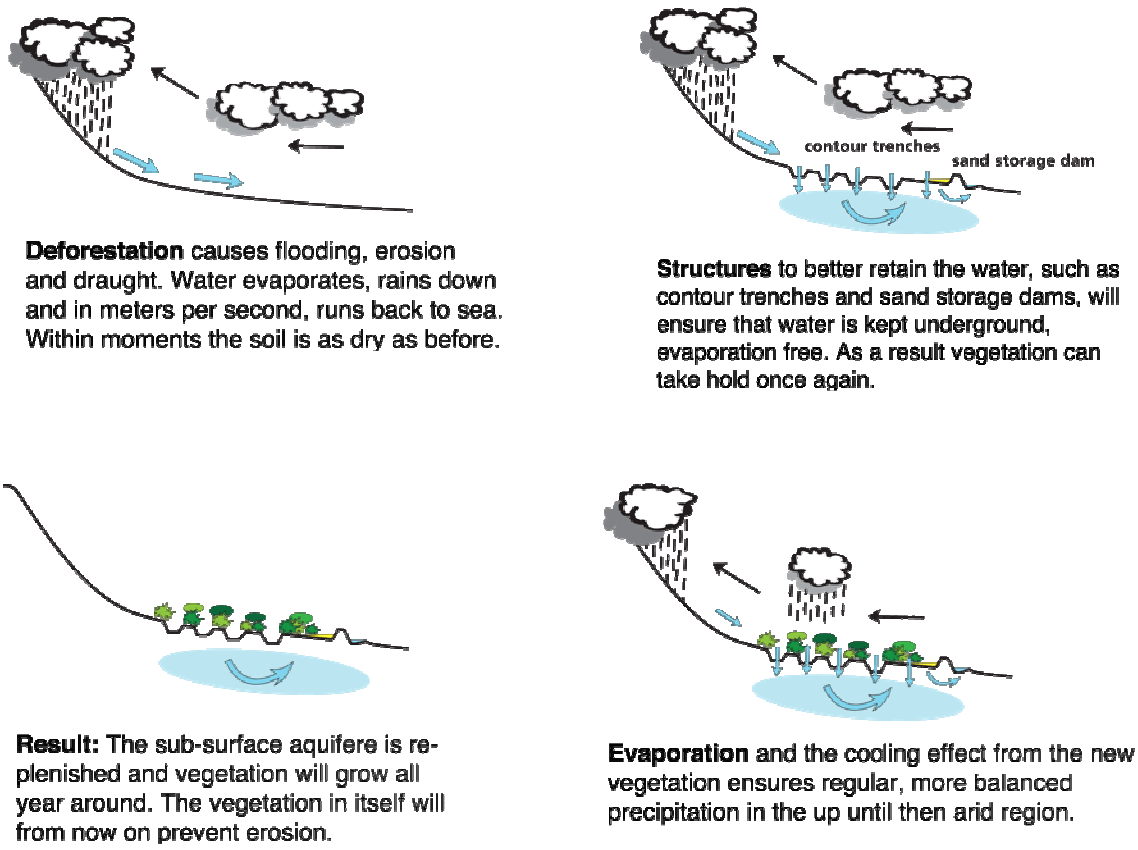
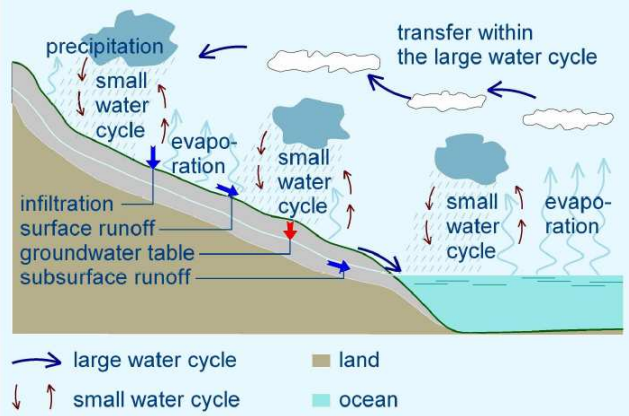


Figure D.16: Restoring the small water cycle by contour trenching, damming and fencing (NAGA, 2015).

Contour trenching, fencing and damming are proven rainwater harvesting and infiltration techniques. It consists of digging trenches following the contours of the land by means of a bulldozer or manual labour. Depth and width vary depending on the local soil conditions and available space. In most desertified areas the top 60 cm of the soil layer has become impenetrable. In the cause of a 1 meter deep trenches, water can be absorbed by the 40 cm soil layer below.

After the trench is constructed, all runoff water is collected and infiltrates. Now, the water is stored in the root zone and the groundwater table is restored. Already after the first rain, natural vegetation returns on fertile soils. This effect of 'nature kicking in an tanking over' is displayed in figure D.15. In areas where the nutrients in the topsoil are eroded due to wind, water and human activities, nature can be helped by replanting suitable vegetation including the use of organic disposals (digested, bacteria, small animals) to improve the soil structure and thereby improving the liveability of organisms and plants. Constructing intakes from an adjacent river in combination with irrigation channels toward the contour trenches, can be an effective technique to increase the absorbed water quantities in a degraded in floodplains. In some circumstances, fencing an area against cattle and wild animals is an effective way of protecting the newly vegetated area.

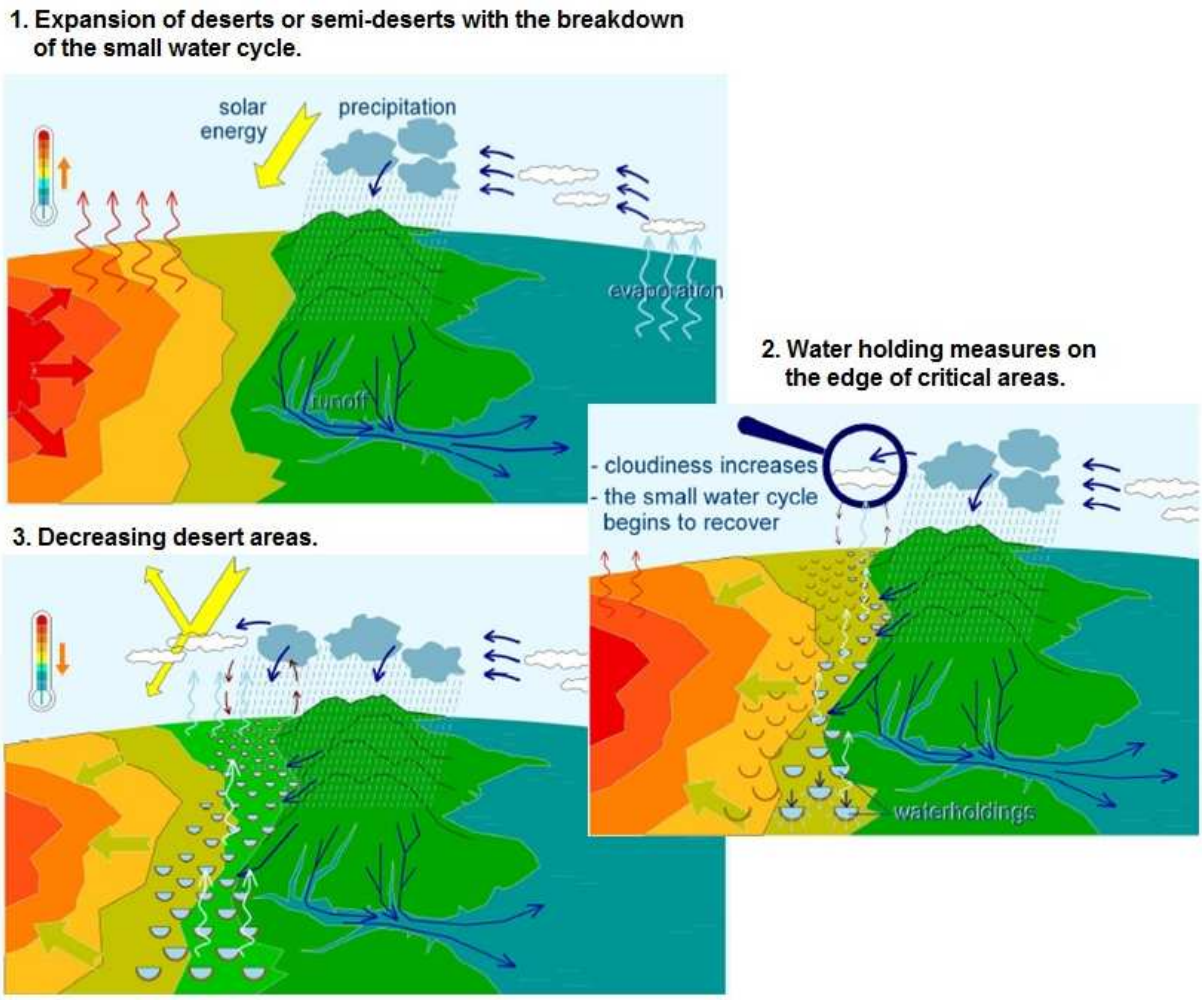


Figurer D.16: The water cycle (Kračcík et al., 2008).

The re-greened land and the saturated soil will initiate the evaporation and transpiration processes. When this water vapour cools down, clouds are formed. By means of precipitation water return again to the earth. Due to soil improvements, this precipitation can infiltrate into the soil and consumed by the vegetation, thereby completing the small water cycle (see figure D.16).

The small water cycle is a closed circulation of water in which water evaporated on land falls in the form of precipitation over this same terrestrial environment. Restoring multiple small water cycles on tactical geographical locations, results in restoration of the large water cycle. This is explained by means of figure D.16. The large water cycle is the exchange of water between oceans and land. Inflow is realised from water evaporating from the sea and travelling by atmosphere thermodynamic flows over the continents where it then precipitates in the form of rain, snow or other forms. Part of the water is used by vegetation, animals and human activities and a part evaporates.

When small and large water cycles are present at tactical location dispersed over a large areas, a self reinforcing effects is created influencing a large area due to the formation of hydrologic corridors. By means hydrologic corridors, desertification can be reduced. In the figure D.17 this process is summarised.

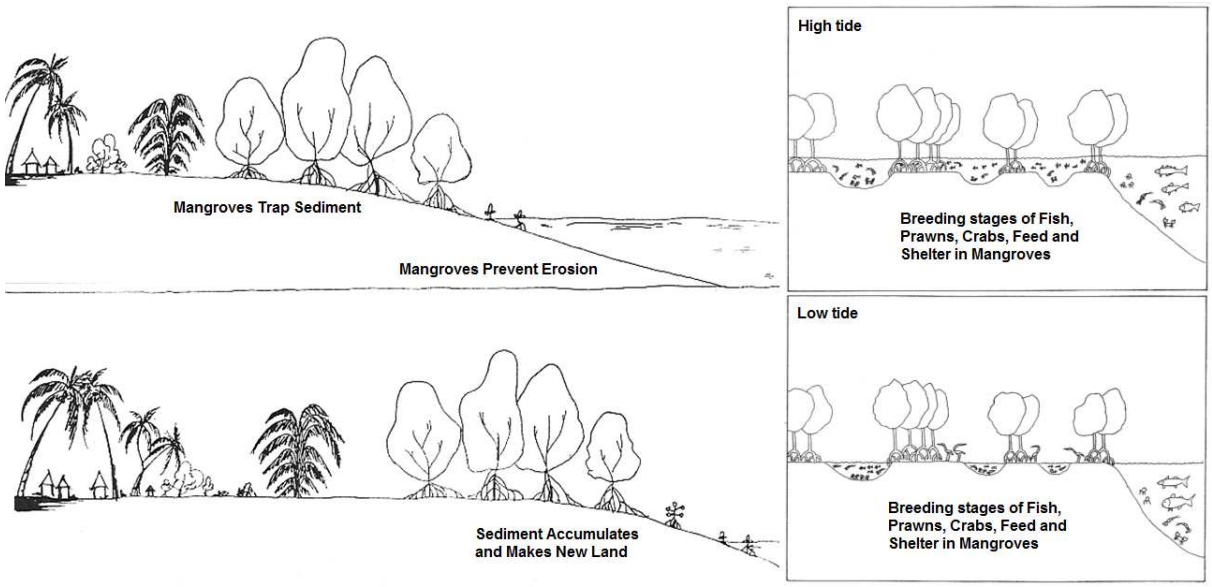


Figurer D.17: Reduction of desertification by means of hydrologic corridors (Kračcík et al., 2008).

Table D.1: The creation of hydrologic corridors to restore ecology and decrease desertification.

Due to climate change low-lying coastal, arid, and semi-arid areas are threatened by the rising sea level due to: intrusion of saline waters into estuaries, small islands and coastal aquifers and flooding of low-lying coastal areas. Also, the extreme weather scenario's resulting in floods and droughts significantly threaten stability in un prepared regions. The effects caused by climate change can be predicted with a certain amount of uncertainty, especially with regards to the long term scenario's. In addition, the same is applicable for economic and demographic process. Therefore, multi-functionality and flexibility in coastal defence designs and policies is needed.

Due to the fact that blue-green soft hydrological buffers are flexible, multifunctional and cost-effective they are ideally applicable to function as natural flood defence, water purification systems, breeding locations for animals, water supply and seasonal storage capacity in extreme dry periods and as recreation locations. As displayed in figure D.18, mangroves possesses these double functions. It is a beading place and shelter location for fish, prawns and crabs. At the same time mangroves also serve as coastal defence systems because they absorb wave impacts and function as sediment traps thereby preventing coastal erosion. The same is applicable for lagoons and coral reefs.



Figurer D.18: Mangroves, a multifunctional building with nature coastal system (Verhagen, 2014).

Per water management development theme, applicable 'building with nature' solutions are described in this Appendix.

Evaluation

- Natural purification: Water quality status / Month.
- Percentage of natural system: Nature area / Total area / Year.
- Water connectivity: amount of natural area / irrigation system.
- Biodiversity: Amount of animals and plants / Area of natural system / Year.
- Fish stock and diversity: Amount of fish / specie / Year.
- Heat stress prevention: Heat health issues / Warm period.
- Soil erosion control: Amount of soil nutrients / Area.
- Reconstruction water cycles: Amount of green area / Area.
- Reconstruction water cycles: Amount of precipitation / Month (multiple years research).
- Decrease desertification: Area of desert / Year.

D.6 Water for Health

This paragraph provides a generic overview describing possible activities within the Water for Health water management development theme. This includes sanitation and clean water regarding public health, ecologic quality and a pleasant living and working environment within a society[9].

Purpose

Establishing, maintaining and improving the level of human and ecological health including living standard improvement of the local population by means of sanitation facilities.

[9] This paragraphs is developed by the author based on: Ven, 2011; Post, 2015; Heijman, 2014; Moel et al., 2012; Radif, 1999; Lier et al., 2013.

Method

Sanitation facilities are regarded as one of the basics needs in establishing a healthy living environment. Due to its simplicity, rapid heath improvements within a stabilisation operations are possible by means of:

- Basic latrine facilities (S, M). Apply them for 1 year - close the pit with sand - after 1 year of decomposing, the sludge can be used for agriculture purposes. To prevent diseases it is important to keep the sludge dry and leakage is prevented by means of a geo-fabric or concrete construction. Figure D.19 provides an example.
- Transformation from open to a closed sewer systems (M & L).
- Domestic toilets connected with a discharging and closed sewer system (L).

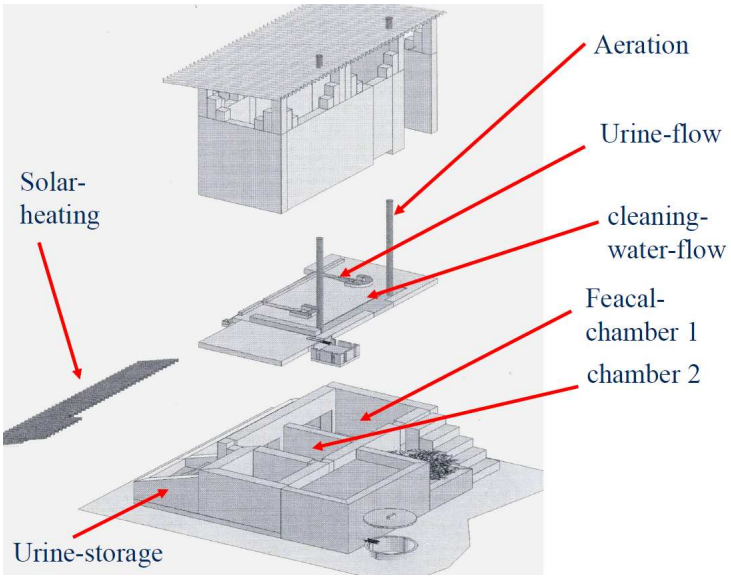


Figure D19: Example of a basic latrine facility (Lier et al., 2013).

Water pollution significantly contributes in a negative manner to human and ecological health. The contamination comes from two sources: points or non-point sources. Landfills, leaking gasoline storage tanks, leaking septic tanks, sewer emergency overflows and accidental spills are examples of point sources. Infiltration from farm land treated with pesticides, fertilisers and manure are typical nonpoint source. Inadequate or untreated domestic sewer discharges including those from industrial and energy production processes also affect the water quality negatively. In addition, environmental destructive practices disturb the aquatic ecosystems and threatening the living organisms within the fresh water resources.

Water quality protection by means of governance policies and law enforcement through permits monitoring and testing of waste water outlets have the top priority (S, M & L). Due to the different water usage and qualities, it is advised to separate the urban and rural water systems both in technical physical space as well as in regulations and governance policies.

In order to prevent water pollution, the following priority ranked measures are listed to prevent contaminations from spreading and purifying the waste water:

1. **Remove polluted sources (L)**, like: emergency overflows from industrial and energy producing processes and domestic sewer systems, building materials, heavy metals, air pollution, pesticides, nitrogen, phosphate, suspended solids, mineral oils, animals and all other human related polluting activities.
2. **Local countermeasures (S, M & L):**
    - Ecological / natural purification, by means of riverbank, floodplain, dune, wetlands mangrove forests and forest filtration & purification. Note: the ecological coping system should be in balance with the quality and quantity of the ingoing discharged polluted waste water.
    - Constant circulation, by natural gravitational processes or through using pumps a constant flow velocity is accomplished. The generated water turbulence will disturbs the perfect growing and multiplying depth of algae blooms which is based on light intensity, resulting in a better water quality of open waters. Note: dead ends should be avoided.

- Settlement: by creating sediment traps or stilling zones at the outlet of each polluted drain, pollution distribution all over the open water resources is prevented and easily removed by dredging. Note: water plants for coagulation (enlargement of particles) resulting in a faster settlement in combination with no or very low flow velocity is needed.
- Sunlight: if sunlight (UV-light) is able to penetrate deeply into the water column, a significant die-off rate of pathogenic bacteria, protozoa and viruses can be achieved.

3. **End of pipe by means of waste water treatment facilities (M & L):**
   - 'Home' processing or waste water treatment on a very local scale is regards as the most optimum because it stimulates the small water cycle, is cost efficient (no investments in large water treatment facilities including transportation systems), the gray water, nitrogen and phosphate can intently be extracted and reused. Also the remaining sludge can direct and locally by recycled as a fuel for energy production, a construction material or as a fertiliser for agricultural purposes.
   - Separate sewer system and wastewater treatment plant. When 'home' processing cannot be achieved, wastewater transportation by a sewer systems to a large scale wastewater treatment plant is the second best option. By means of figure D.20, the wastewater treatment plant process is explained. In this situation also gray water, nitrogen and phosphate can be extracted and reused. Also the remaining sludge can be recycled as a fuel for energy production, a construction material or as a fertiliser for agricultural purposes. In order to have an optimum system only for polluted water, it is advised to separate street and rooftop waters from wastewaters. In this situation the wastewater is discharged into the sewer system in order to be purified by the wastewater treatment plant. The street and rooftop waters will be purified by means of a natural purification facility.

     When the amount of pollution is too high for the natural cooping systems to purify, measures 1 or 2 should be implemented. When this turns out to be ineffective the application of an improved separate sewer system is advised. Now the first 'polluted wave' is discharged into the sewer system. After, the 'clean wave' is discharged into the natural purification facility.

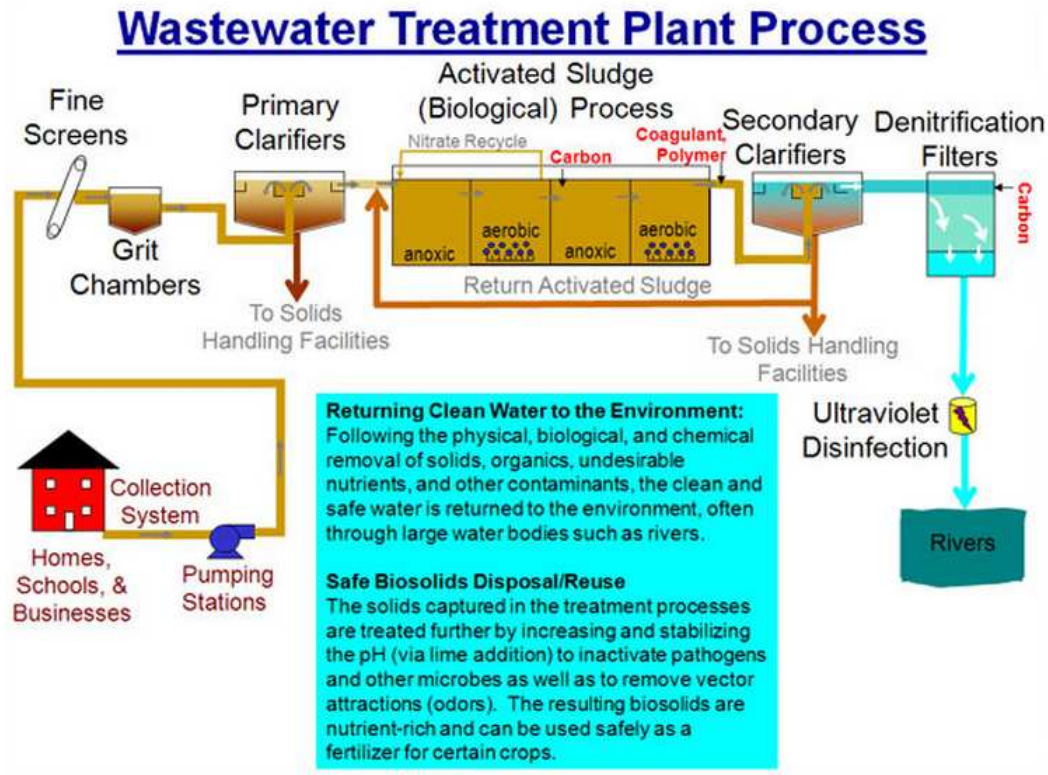


Figure D.20: Explanation wastewater treatment plant process (WSSC, 2015).

Evaluation

- Sanitation connectivity: sanitation facilities / household.
- Pollution (point and diffuse): Water quality status / Month.
- Efficiency water treatment facilities: Water quality status / Month.
- Efficiency water treatment facilities: Amount of reused and recycles materials /m^3 wastewater / Month.
- Healthcare: Diseases interlinked with sanitation usage / capita.
- Healthcare: Diseases interlinked with water quality / capita.
- Living standards: Improvement of human health / capita.

D.7 Water for Safety & Shipping

This paragraph provides a generic overview describing possible activities within the Water for Safety & Shipping management development theme which includes flood protection and shipping navigation routes[10].

Purpose

Establishing, maintaining and improving the flood and draught protection and management systems in order to prevent or minimize the damage due to coastal, river, lake and precipitation flooding events in rural and urban areas. Due to fact that waterways are also used for shipping activities establishing, maintaining and improving coastal and inland shipping navigation routes is another item within this water management development theme.

Method

For the protection against flooding events, the Multilayer Water Safety Strategy is an effective risk reduction methodology to apply. Reducing the probability of a flooding event and mitigation of the vulnerability including the negative consequences and effects when a flood event occurs by hard and soft measures, is its main strategy. Thereby one or two of the layers is allowed to fail since it combined threshold, coping, recovery and adaptive capacities by a simultaneous implementation of prevention measures in combination with spatial planning solutions and crisis management strategies. Due to its strong interdependency, the system is as strong as its weakest link. Most of the time the emphasis is on layer 1, while the layers 2 and 3 are having the same level of importance. Moreover, layer 2 is also focussed on the creation of a better urban and rural living environment. The Multilayer Water Safety Strategy is summarised by means of the figures D.21 and D.22 and explained in more detail below:

- Layer 1: Prevention, the Threshold capacity (S, M & L): decreasing the probability of a flooding by means 'hard' permanent flood defence constructions, like; dikes, seawalls, gates, locks, pumps, bed, bank and shore protection, etc. 'Soft' measures although are preferred like; floodplains, dune and beach systems and mangrove forests. Bothe measures and solutions are focussed on coastal and river floods. Also, an early warning systems which monitors water levels is a part of the prevention layer. In order to have a well functioning layer 1, regular inspections, maintenance and testing the flood defence structures and operational management operations are essential.
  Due to its flexibility, multifunctionality and its cost-effectiveness over the long term, soft solution and the "Building With Nature" philosophy are preferred. Thereby the needed Adaptation capacity to cope with future and unpredicted events is included in the initial design. When spatial space is limited like in cities, hybrid or hard solution are the second and third best prevention options.

[10] This paragraphs is summarised by the author based on: Hoss, 2010; Ven, 2011; Jonkman, 2007; Lopez, 2009; Rijksoverheid, 2009; Vellinga, 2013; Verhagen, 2014; Climateapp, 2015; SSWM, 2015.

- Layer 2: Impact Reduction by Spatial Planning & Design, the Coping capacity (S, M & L): which proactively counters floods by means of water based spatial planning solution and measures in order to save human life and decrease the economic losses due to a flooding event. Examples are; major drainage systems, flood compartments by ring dikes, construction of water robust and flood resistant infrastructures, changing land levels by strategic filling or excavations, elevated houses and buildings including flood resilient buildings (hospitals located on high grounds or protected by a dike, do not locate the energy supply in low lying basements, barriers around basements entrances), floating housing and protection of vital infrastructures (vital road and railroad infrastructures located above the expected water level during a flooding and protection of power and IT distribution infrastructures).

  Also relocation of citizens out of floodplain areas, living on the first floor and raising the ground level, all reduce the negative impacts during a flood event. Regarding layer 2, the living environment need to be adapted taking into account all dimensions of the urban development model: People, Structures / Occupations, Networks / Infrastructures, Ground / Subsurface. Thereby, vulnerable people and vital objects and networks need extra protection, like; electric power, telecom & internet, hospitals, evacuation routes, elderly homes, chemical plants etc.
- Layer 3: Crisis & Disaster Management, the Recovery capacity (S, M & L): by preparing governmental institutions and its civilians how to act during a flooding event with the help of: crisis management plans, disaster plans, risk maps, emergency rescue equipment and help, adaptation and temporary houses, buildings and physical measures such as structural strengthening of flood defences, evacuations procedures and routes, communication and information plans. Regular updates, simulations and real time training exercises with all actors need to be performed on a regular bases, since training is essential to maintain people's preparedness thereby guaranteeing a well functioning crisis management system. Also, insurance against flooding is regarded as a soft option.

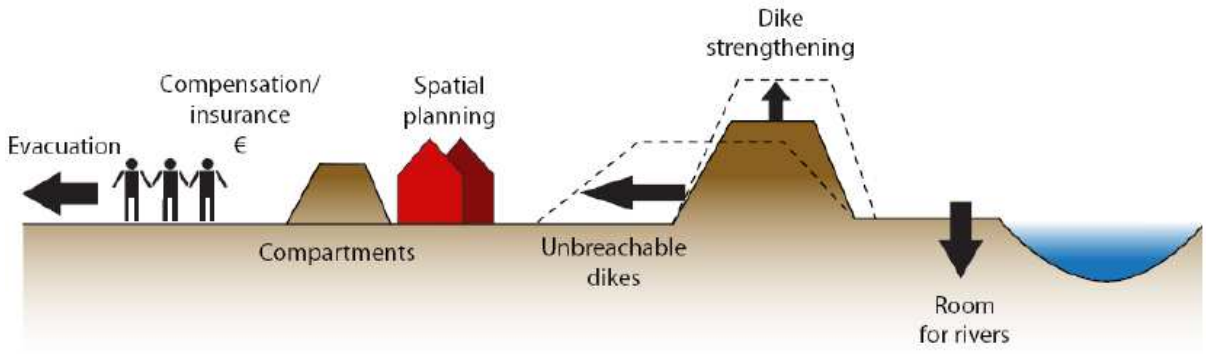


Figure D.21: Measures for prevention, constraint and disaster control of floods (Jonkman, 2007).

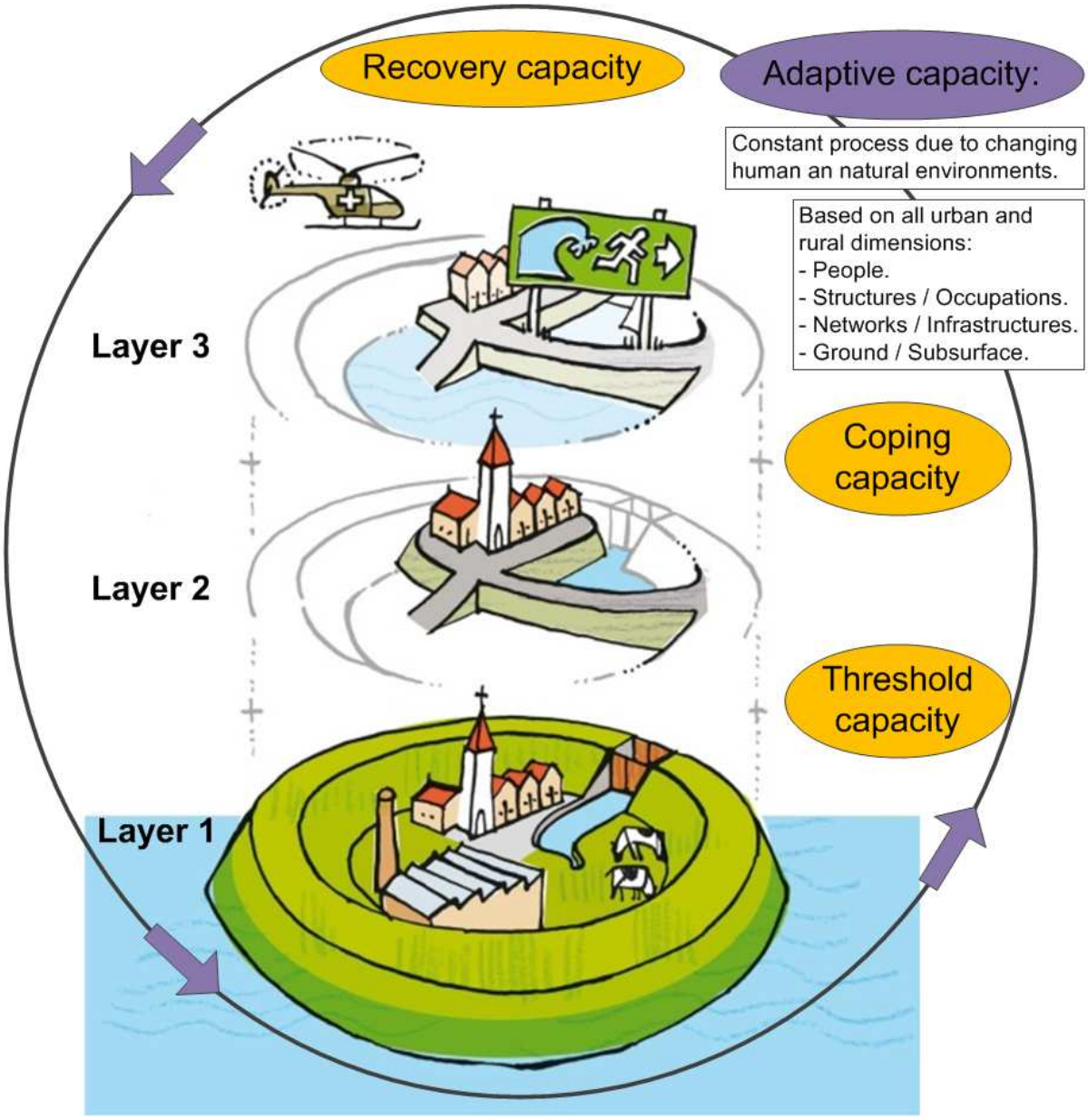


Figure D.22: Multilayer Water Safety Strategy including the four vulnerability reducing capacities (Rijksoverheid, 2009, Ven 2011; combined by the author).

Before implementing this strategy within stabilisation operations, first the existing coastal, river and lake flood defence and shipping infrastructures like dikes, ports, waterways and navigation locks should be restored (S & M). Also, the following activities are applicable:

- Reconstruction (rebuilding and dredging) of the destroyed systems (M & L).
- Agreements between the down- and upstream users with regards to water usage, water quality, flood protection and shipping navigation routes (S, M & L).
- (Re)construction and maintenance activities of locks, navigation rivers and canals by means of dredging including bad, bank and shore protection and port infrastructure like; berth locations, quay walls, cranes, storage facilities and hinterland connections (M & L).
- Ship management systems, transboundary crossing and trading agreements (L).
- Flood defence structure combined with recreation and energy production facilities, like beaches and dunes or wind and water turbines (M & L).

Moreover, within the intervention phase it is advised to apply the **DO NO HARM** peace mechanism principles. More specific, the kind of force against flood defence and shipping infrastructure should be assessed, since failing of these systems will have dramatic long-term effects on the local population including the safety and socioeconomic situation in the area of operations.

An interesting QIP is an **Early Flood Warning Assessment System (S, M & L).** In the area of operation this can be implemented fast, and thereby regarded as a short-term projects. Moreover, it can function as a cooperation system within basin systems between the involved actors on the medium- and long-term. With the help of satellite information and remote sensing assessments, prediction of a river basins and catchment flood event including its consequences can be made already in the Netherlands before the actual deployment. By having this within the initial deployment stage, an Early Flood Warning Assessment System can contribute to wining of the Hearts-and-Minds of the local population. Once in the field, data from the aeronautical industry can be applied first and later own measurements (static stations or with autonomic or remotely operated land, water, air based vehicles). Of course depending on the safety situation and local relevance. In Mali for example, wadi flash floods occur, causing people to drown in the desert. These events are spotted hours in advanced and therefore can be prevented with an Early Warning Assessment System. This also needs an operational alarming system, which need to be specified in the area of operations. The PSYOPS instruments can be used to warn the local population and explain what they need to do.

Flooding events in urban areas due to heavy precipitation are having a lower priority compared with coastal, river and lake flood event. This is explained by the fact that coastal and river floods, are having a high and direct negative impact on the society. Precipitation floods are less dramatic, but more regular especially in urban areas. Within urban areas these floods disorder day to day live and cause negative socioeconomic effects. A closed system based on the Retain, Store and Discharge principle (see section 9.4.4) is regarded as the best principle to prevent or decrease precipitation floods in urban areas. This can be accomplished by the following water based spatial planning, adaptive management and blue-green solutions:

- Large drainage systems in the form of open water canals or sewer systems to discharge the water surplus from the urban area towards local water retentions facilities or rural areas. In dry areas, retention facilities have the preferences because the water is used in an optimum way for irrigation purposes or as drinking water (M & L).
- Local retention infiltration fields like vegetated swales (wadi's), trances and boxes (S, M & L). In figure D.23, D.24, D.25 and D.26 examples are provided.
- Disconnected paved surfaces in order to stimulate local infiltration and minimizing the capacity of the wastewater sewer system (M & L).
- Enough storage on the streets in combination with porous pavements (M & L).
- Green roofs (S, M & L).
- Urban wetlands and parks (M & L).

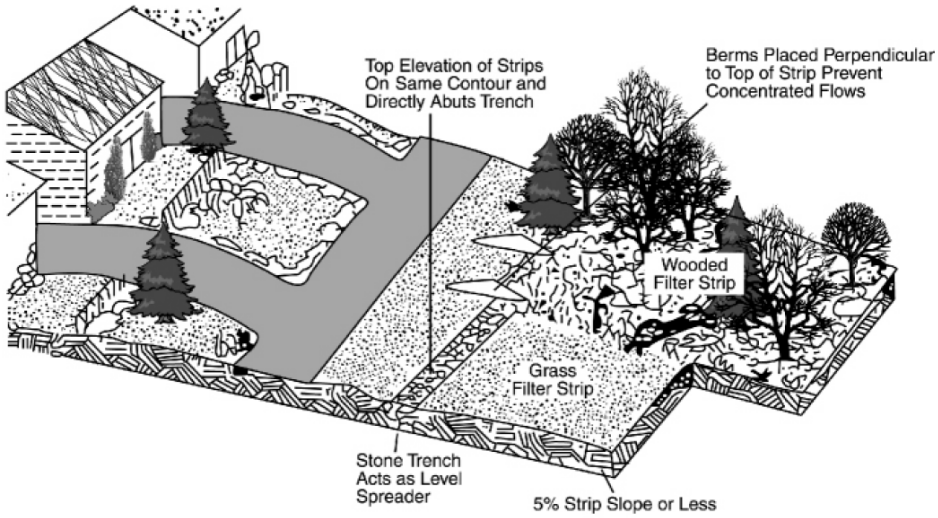


Figure D.23: Example local urban ventilated infiltration facilities (Heijman, 2014).

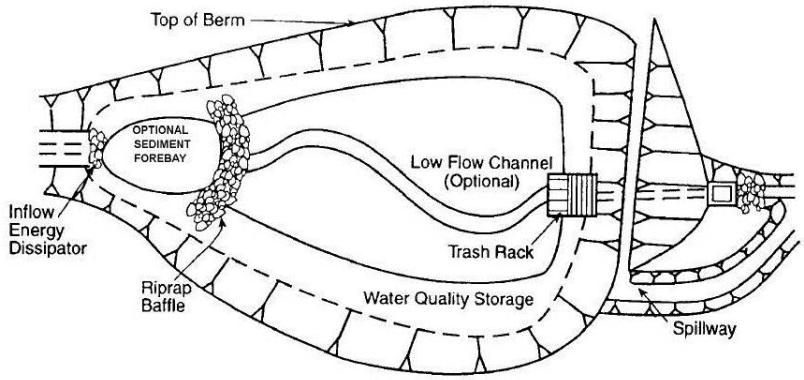


Figure D.24: Example detention pond storage device (SSWM, 2015).

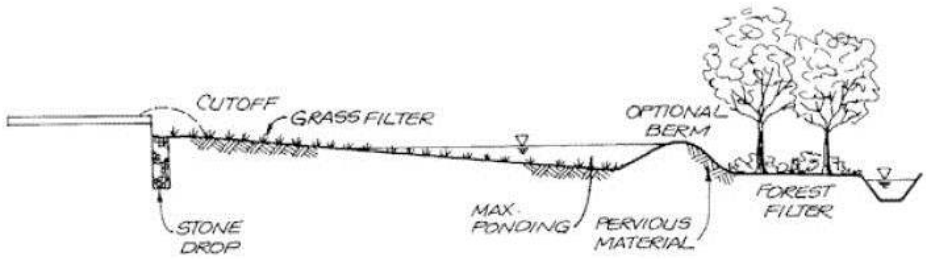


Figure D.25: Example infiltration field with grass filter (SSWM, 2015).

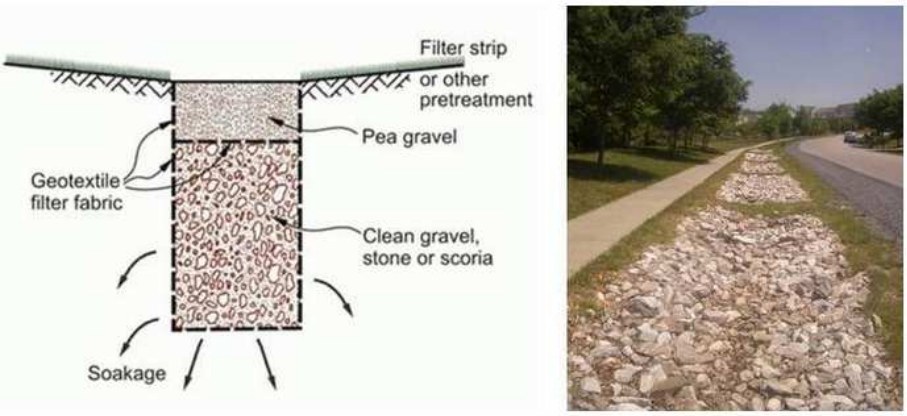


Figure D.26: Example infiltration trench (SSWM, 2015).

Smart, robust, flexible and multifunctional water designs in combination with spatial planning are key needs due to the level of uncertainty with regards to the effects of climate change and the dynamics of economic and demographic processes on the long-term. By means of blue-green solution multiple ecosystem services provide the needed hydrological buffers and recreation facilities. Thus, win-win situation for all the Water Management Development themes are created.

In order to sustain this self-reinforcing hydrological buffer system, regular updates of the water and spatial planning policy are needed (L). By means of table D.2 and D.3, 113 adaptation solutions are listed and explained.

Adaptation Target / Issues:	**Possible Adaptation Solutions & Level of Effectives:**
Coastal & Fluvial Flooding: - Cyclones and tsunamis, - Failing levees, dunes and mangroves, - Extreme rainfall in river basin systems, - Hydraulic overloaded rivers.	• Amphibious (floatable) constructions & buildings (Nr. 20): 100% • Artificial islands (Nr. 48): 100% • Building on partially elevated areas (Nr. 104): 100% • By-pass creation (Nr. 100): 100% • Check, valve, non-return valves (Nr. 22): 100% • Compartments in dike rings (Nr. 8): 100% • Compartments in inflowing large waters (Nr. 9): 100% • Construction on piles (Nr. 17): 100% • Dams / to redirect water (Nr. 10): 100% • Dikes (Nr. 1): 100% • Dismountable and temporary buildings (Nr. 87): 100% • Elevated quay/flood all at vital infrastructures (Nr. 102): 100% • Emergency exit of buildings above highest flood level (Nr. 109): 100% • Emergency overflow/retention area (Nr. 23): 100% • Emergency supplies and utilities (Nr. 84): 100% • Evacuation routes at elevated level (Nr. 84): 100% x • Floating buildings (Nr. 16): 100% • Flood shelters (Nr. 82): 100% • Floodable dike (Nr. 3): 100% • Floodplain excavation or enlargement (Nr. 44): 100% • Overtopping-proof dike (Nr. 5): 100% • Polder (Nr. 113): 100% • Power generators (Nr. 85): 100% • Protection life support facilities and dangerous goods (Nr. 88): 100% • Quay/wharf (Nr. 7): 100% • Raising land (Nr. 6): 100% • Relocation of buildings, utility facilities and infrastructure (Nr. 86): 100% • Safe ground for flood events (Nr. 111): 100% • Sealable buildings / dry proof (Nr. 15): 100% • Seepage barrier (Nr. 12): 100% • Super dike (Nr. 4): 100% • Temporary flood protection / sand bags, inflatable constructions, stoplogs (Nr. 21): 100% • Unbreakable dike (Nr. 2): 100% • Use of buildings as flood defence (Nr. 11): 100% • Wet proofing / water resistant constructions (Nr. 14): 100% • Buildings (partly) situated in water (Nr. 77): 40%

	• Dams / urban and rural cascading (Nr. 94): 40% • Deepen water bodies: 40% (Nr. 64). • Green shore, riverbank and mangroves (Nr. 66): 40% • Increase height difference between street level and ground floor level (Nr. 110): 40% • Increased pump capacity (Nr. 25): 40% • Increased storage or discharge capacity of surface water (Nr. 25): 40% • Pumping station (Nr. 95): 40% • Raised curbs / hollow roads (Nr. 19): 40% • Raising the ground floor level (Nr. 18): 40%
<u>Pluvial Flooding:</u> - Extreme rainfall in urban areas, - Insufficient storage and drainage capacity.	• Airbag Water Storage (Nr. 46): 100% • Amphibious (floatable) constructions & buildings (Nr. 20): 100% • Artificial islands (Nr. 13): 100% • Artificial urban wetlands (Nr. 48): 100% • Building on partially elevates areas (Nr. 104): 100% • Building without a crawlspace (Nr. 61): 100% • Buildings (partly) situated in water (Nr. 77): 100% • By-pass creation (Nr. 100): 100% • Canal (Nr. 112): 100% • Check valve, non-return valves (Nr. 22): 100% • Compartments in dike rings (Nr. 8): 100% • Dams / to redirect water (Nr. 10): 100% • Disconnecting paved surface from sewer system (Nr. 56): 100% • Ditches (Nr. 30): 100% • Drainage below surface level (Nr. 105): 100% • Elevated quay/flood wall at vital infrastructure (Nr. 102): 100% • Emergency overflow / retention area (Nr. 23): 100% • Emergency supplies and utilities (Nr. 84): 100% • Flexible water level management (Nr. 45): 100% • Floating buildings (Nr. 16): 100% • Green roofs (extensive) (Nr. 93): 100% • Green roofs (intensive) (Nr. 108): 100% • Gutter (Nr. 92): 100% • Helophyte filters (Nr. 49): 100% • Improve soil infiltration capacity (Nr. 34): 100% • Improved construction site preparation (Nr. 59): 100% • Inclination of roads (Nr. 98): 100% • Increase capacity of sewer system (Nr. 26): 100% • Increase height difference between street level and ground floor level (Nr. 110): 100% • Increased pump capacity (Nr. 25): 100% • Increased storage of discharge capacity of surface water (Nr. 31): 100% • Infiltration and Transport-sewer (Nr. 29): 100% • Infiltration fields and strips with above-ground storage (Nr. 35): 100% • Network of waterways (Nr. 97): 100% • Porous pavements (Nr. 33): 100% • Pumping station (Nr. 95): 100%

	• Rainwater tanks (Nr. 50): 100% • Rainwater retention ponds, with or without infiltration possibilities (Nr. 63): 100% • Rainwater storage below buildings (Nr. 42): 100% • Raised curbs / hollow roads (Nr. 19): 100% • Raising land (Nr. 6): 100% • Raising the ground floor level (Nr. 18): 100% • Reconstruct combined sewer system to separate sewer systems (Nr. 27): 100% • Reduced paved surfaces (Nr. 55): 100% • Sealable buildings / dry proof (Nr. 15): 100% • Seasonal storage (Nr. 43): 100% • Shallow infiltration measures (Nr. 38): 100% • Smart-drain / groundwater (Nr. 28): 100% • Storage / settling tank and storage basins (Nr. 24): 100% • Systems for using precipitation in buildings / rainwater harvesting (Nr. 51): 100% • Use of groundcover and shrubbery instead of unplanted surface (Nr. 32): 100% • Wadi / Bioswales / Infiltration swales (Nr. 37): 100% • Water basins (Nr. 99): 100% • Water squares (Nr. 47): 100% • Wet proofing / water resistant construction (Nr. 14): 100% • Adding green in streetscape (Nr. 65): 40% • Compartments in inflowing large waters (Nr. 9): 40% • Constructions on piles (Nr. 17): 40% • Dams / urban and rural cascading (Nr. 94): 40% • Deep groundwater infiltration (Nr. 96): 40% • Deepen water bodies (Nr. 64): 40% • Dikes (Nr. 1): 40% • Dismountable and temporary buildings (Nr. 87): 40% • Emergency exit of buildings above highest flood level (Nr. 109): 40% • Evacuation routes at elevated level (Nr. 83): 40% • Flood shelters (Nr.82): 40% • Floodable dike (Nr. 3): 40% • Floodplain excavation or enlargement (Nr. 44): 40% • Green facades (Nr. 40): 40% • Green shores and riverbanks (Nr. 66): 40% • Improved soil structure (Nr. 60): 40% • Overtopping-proof dike (Nr. 5): 40% • Polder (Nr. 113): 40% • Power generators (Nr. 85): 40% • Protection life support facilities and dangerous goods (Nr. 88): 40% • Quay/wharf (Nr. 7): 40% • Relocation of buildings, utility facilities and infrastructure (Nr. 86): 40% • Replacing leaking / draining sewers (Nr. 63): 40% • Safe ground for flood events (Nr. 111): 40%

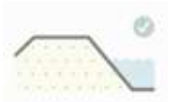
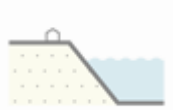
	• Super dike (Nr. 4): 40% • Temporary flood protection including sand bags, inflatable constructions and stoplogs (Nr. 21): 40% • Unbreakable dike (Nr. 2): 40% • Use of buildings as flood defence (Nr. 11): 40%
<u>Groundwater Flooding:</u> - Flooding due to seepage and high groundwater levels.	• Amphibious (floatable) constructions & buildings (Nr. 20): 100% • Building without a crawlspace (Nr. 61): 100% • Canal (Nr. 112): 100% • Constructions on piles (Nr. 17): 100% • Ditches (Nr. 30): 100% • Drainage below surface level (Nr. 105): 100% • Flexible water level management (Nr. 45): 100% • Improved construction site preparation (Nr. 59): 100% • Increase height difference between street level and ground floor level (Nr. 110): 100% • Infiltration and Transport-sewer (Nr. 29): 100% • Raising land (Nr. 6): 100% • Raising the ground floor level (Nr. 18): 100% • Replacing leaking / draining sewers (Nr. 63): 100% • Sealable buildings / dry proof (Nr. 15): 100% • Seepage barrier (Nr. 12): 100% • Smart-drain / groundwater (Nr. 28): 100% • Wet proofing / water resistant construction (Nr. 14): 100% • Amphibious (floatable) constructions & buildings (Nr. 20): 40% • Building on partially elevated areas (Nr. 104): 40% • Check valve, non-return valves (Nr. 22): 40% • Dismountable and temporary buildings (Nr. 87): 40% • Elevated quay / flood wall at vital infrastructure (Nr. 102): 40% • Floating buildings (Nr. 16): 40% • Improve soil infiltration capacity (Nr. 34): 40% • Increased storage or discharge capacity of surface water (Nr. 31): 40% • Protection life support facilities and dangerous goods (Nr. 88): 40% • Pumping station (Nr. 95): 40% • Relocation of buildings, utility facilities and infrastructure (Nr. 86): 40% • Reversed drainage (Nr. 103): 40% • Emergency supply and utilities (Nr. 84): 20% • Power generators (Nr. 85): 20%
<u>Heat Stress:</u> - Public health, - Urban heat islands, - Energy demand for cooling.	• Adding green in streetscape (Nr. 65): 100% • ATES - Aquifer Thermal Energy Storage (Nr. 81): 100% • Bedrooms at north side of the building (Nr. 78): 100% • Blinds (Nr. 75): 100% • Cool / reflective roofs (Nr. 41): 100% • Cool paving and building materials (Nr. 70): 100% • Cooling with water elements / fountains and ponds (Nr. 68): 100% • Creating swimming locations (Nr. 89): 100% • Emergency supplies and utilities (Nr. 84): 100% • Green facades (Nr. 40): 100%

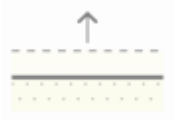
	• Green roofs / extensive (Nr. 93): 100% • Green roofs / intensive (Nr. 108): 100% • Green ventilation grids (Nr. 67): 100% • Increasing eaves (Nr. 74): 100% • Narrow streets (Nr. 76): 100% • No bedrooms in upper floor (Nr. 79): 100% • Optimise orientation to wind and sun (Nr. 73): 100% • Pergolas and canvas above streets (Nr. 71): 100% • Reduced paved surfaces (Nr. 55): 100% • Select drought and/or salt-resistant plants (Nr. 57): 100% • Sloping roof / shade (Nr. 39): 100% • Smart irrigation measures (Nr. 58): 100% • Solar water-heat pump (Nr. 91): 100% • Thermal insulation (Nr. 80): 100% • Use of groundcover and shrubbery instead of unplanted surface (Nr. 32): 100% • Use of native species (Nr. 101): 100% • Wadi / Bioswales / Infiltration swales (Nr. 37): 100% • Water inlet system (Nr. 54): 100% • Wetting surface of gardens, roofs, roads (Nr. 69): 100% • Artificial urban wetlands (Nr. 48): 40% • Buildings (partly) situated in the water (Nr. 77): 40% • Canal (Nr. 112): 40% • Ditches (Nr. 30): 40% • Green shores and riverbanks (Nr. 66): 40% • Helophyte filters (Nr. 49): 40% • High-rise buildings / shade (Nr. 72): 40% • Improve soil infiltration capacity (Nr. 34): 40% • Infiltration fields and strips with aboveground storage (Nr. 35): 40% • Network of waterways (Nr. 97): 40% • Porous pavements (Nr. 33): 40% • Power generators (Nr.85): 40% • Rainwater retention ponds with or without infiltration possibilities (Nr. 36): 40% • Use of groundwater / aquifer storage and recovery (Nr. 53): 40% • Water basins (Nr. 99): 40% • Water squares (Nr. 47): 40%
<u>Drought:</u> - Water shortages, - Land subsidence, - Water quality problems.	• Canal (Nr. 112): 100% • Compartments in inflowing large waters basins (Nr. 9): 100% • Dams / to redirect water (Nr. 10): 100% • Deep groundwater infiltration (Nr. 96): 100% • Deepen water bodies (Nr. 64): 100% • Desalination installation combined with a windmill (Nr. 90): 100% • Emergency supplies and utilities (Nr. 84): 100% • Flexible water level management (Nr. 45): 100% • Improve soil infiltration capacity (Nr. 34): 100% • Infiltration and Transport-sewer (Nr. 29): 100%

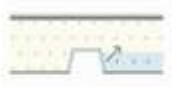
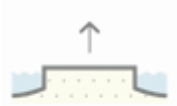
	• Infiltration fields and strips with aboveground storage (Nr. 35): 100% • Network of waterways (Nr. 97): 100% • Porous pavements (Nr. 33): 100% • Rainwater retention ponds, with or without infiltration possibilities (Nr. 36): 100% • Reconstructing wooden foundations (Nr. 62): 100% • Reduced paved surface (Nr. 55): 100% • Reversed drainage (Nr. 103): 100% • Seasonal storage (Nr. 43): 100% • Seepage barrier (Nr. 12): 100% • Select drought and/or salt-resistant plants (Nr. 57): 100% • Shallow infiltration measures (Nr. 38): 100% • Smart irrigation measures (Nr. 58): 100% • Smart-drain / groundwater (Nr.)28: 100% • Systems of using precipitation in buildings / rainwater harvesting (Nr. 51): 100% • Use of groundcover and shrubbery instead of unplanted surface (Nr. 32): 100% • Use of native species (Nr. 101): 100% • Use of treated wastewater (Nr. 52): 100% • Water basins (Nr. 99): 100% • Water circulation systems (Nr. 107): 100% • Water inlet systems (Nr. 54): 100% • Adding green in landscape (Nr. 65): 40% • Airbag Water Storage (Nr. 46): 40% • Artificial urban wetlands (Nr. 48): 40% • Building without a crawlspace (Nr. 61): 40% • Cool / reflective roofs (Nr. 41): 40% • Cooling with water elements / fountains and ponds (Nr. 68): 40% • Disconnecting paved surface from sewer system (Nr. 56): 40% • Ditches (Nr. 30): 40% • Drainage below surface level (Nr. 105): 40% • Green facades (Nr. 40): 40% • Green roofs / extensive (Nr. 93): 40% • Green roofs / intensive (Nr. 108): 40% • Green shored, riverbanks and mangroves (Nr. 66): 40% • Green ventilation grids (Nr. 67): 40% • Helophyte filters (Nr. 49): 40% • Improved construction site preparation (Nr. 59): 40% • Improved soil structure (Nr. 60): 40% • Increased storage or discharge capacity of surface water (Nr. 31): 40% • Pergolas and canvas above streets (Nr. 71): 40% • Rainwater tanks (Nr. 50): 40% • Replacing leaking / draining sewers (Nr. 63): 40% • Sealing storm water channel bed (Nr. 106): 40% • Sloping roof / shade (Nr. 39): 40% • Use of groundwater / aquifer storage and recovery (Nr. 53): 40%

	• Wadi/ Bioswales / Infiltrating filter swales (Nr. 37): 40% • Wetting surface of gardens, roof, roads (Nr. 69): 40%

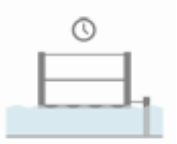
Table D.2: Possible Adaptation Solutions per Adaptation Target. The numbers correspond with the explained adaptation solutions explained in table D3 (climateapp, 2015; Ven, 2011).

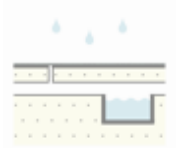
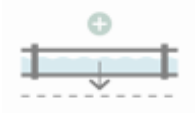
1: Dikes.  A dike is an elongated artificially constructed embankment or levee, which protects low-lying areas against higher water levels. It is usually made of clay and sand. Rock or concrete are used to protect the water facing outer slope against waves. Most dikes are constructed parallel to the course of a river in its floodplain or along low lying coastlines. Co-benefits: It can form a lingering feature in the landscape and can be used for both recreational and infrastructural needs.	**2: Unbreakable dike.**  An unbreakable dike is an over-dimensioned dike which will protect low lying land for a longer time span than a traditional dike. Most likely the dike is higher and wider than required by design standards. An unbreakable dike requires less maintenance during its lifetime.
3: Floodable dike.  A floodable dike is designed to protect a floodplain against frequent high water levels. The dikes' crest level is designed relatively low, so it is flooded in extreme high water levels. This way the flood plain can be used for instance agriculture in normal conditions and for water storage in extremely wet conditions. A secondary dike further inland is frequently used to protect the vulnerable hinterland against extreme high water levels. Co-benefits: It can form a lingering feature in the landscape and can be used for both recreational and infrastructural needs.	**4: Super dike.**  A super dike is much higher and wider than an a traditional dike. It is designed to be unbreakable and to reserve space for urban developments on top of the dike. Co-benefits: On a super dike various urban development's can take place. It combines flood protection and urban development. Specific details: The creation of a super dike is only possible in large urban developments. As maintenance in dense urban areas is complex, the superdike should be designed to be free of maintenance for at least 50 years.

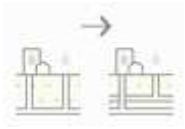
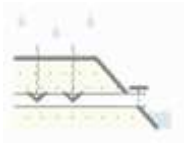
5: Overtopping proof dike.  An overtopping-proof dike is designed to withstand one of the most common failure mechanisms: overtopping of a dikes by waves. Prolonged overtopping could cause collapse of the landward slope. For better resistance against overtopping the dikes crest must be raised and the landward slope should contain a gentle slope.	**6: Raising land.**  Raising land is often used to increase the difference between water levels and construction levels. Usually sand is used to raise new roads above the existing ground level. This measure reduces the flood risk. Groundwater and surface water levels will rise too. Co-benefits: Raising land is also used to create a stable foundation for buildings and infrastructure. Details: Land raising can significantly impact the existing landscape. Geotechnical calculations are necessary to assess the probability for land subsidence.
7: Quay/wharf.  A Quay or wharf is a structure on the shore of a harbour or on the bank of a river or canal. It can be a good flood protection in locations where available space is limited. Quays are mostly reinforced concrete structures. Co-benefits: Ships can dock to load and unload cargo or passengers at the quays and wharves. Promenades are also often located along quays and wharfs. Details: Smaller and more modern wharves are sometimes built on flotation devices to keep them at the same level as the ship, even during changing tides.	**8: Compartments in dike rings.**  A compartment in a dike ring is a smaller area enclosed by secondary flood protection within a main dike ring. The main reason for dividing a dike ring in smaller compartments is to reduce damage in case of a dike failure / breach. Compartments in dike rings will also slow down a flood in case of a major dike breach to create more time for evacuation protocols. Details: Compartments limit spatial developments, because the entire compartment should always be closed.

9: Compartments in inflowing large waters.  The compartments will divide large water surfaces into smaller and better controllable segments. These segments are connected with each other through a system of interacting locks or dams. A smaller amount of water can cause damage to low level terrain in case of a dike breach. Co-benefits: Compartments in waters can also improve navigation in the specific water body as water depth can be controlled.	**10: Dams (to redirect water).**  An artificially raised dam at a strategic location in a river or stream can redirect a part of the water flow into another direction. Most dams have a section called a spillway or weir over which, or through which, water flows, either sometimes or always. Dams generally serve the primary purpose of retaining water. Co-benefits: Dams are also used to generate hydropower and are combined with other infrastructure. Details: The dams usually create lakes or water level increase upstream. This can have significant impact.
11: Use of buildings as flood defence.  New and existing buildings in flood risk areas can be used as flood defence. The buildings should be completely integrated in the flood defence to create a reliable flood defence. Co-benefits: It is an example of combining urban development and flood protection in one place. Details: Using buildings as a flood defence can be applied up to the ground floor level. Strict guidelines for building owners are necessary to safeguard flood defence integrity on the long term.	**12: Seepage barrier.**  The main purpose of a seepage barrier is to reduce the rate of seepage: for instance to reduce the loss of water from a reservoir or to reduce the water pressure on the structure. The seepage barrier can also be used as a vertical levee enforcement. Details: A seepage barrier can be created horizontally by using concrete or grouting or vertically by using sheet piles.
13: Artificial islands.  An artificial island is a man-made island, which can be integrated with flood protection. The island can be created by land reclamation, expanding existing islets, construction on existing reefs, or merging several natural islets into a bigger island. Artificial islands may vary in scale from small islets for a single structure, to islands that support entire communities and cities. Co-benefits: Combining an artificial island with urban development can be a method to finance flood protection.	**14: Wet proofing (water resistant construction).**  The interior of buildings or infrastructure in flood sensitive areas can be made waterproof. Instead of using water sensitive materials like wood or plaster-like building blocks more robust materials like concrete, steel and glass are used. If the building is flooded, damage is minimal. After a flood normal operation can restart much faster.

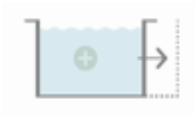
15: Sealable buildings (dry proof).  The exterior of buildings can be made waterproof to prevent flood water entering the building. All gaps and holes should be sealed below design water level. In case of a flood the building will not be damaged and normal operation can immediately restart after the water has subsided. Details: Dry proofing is usually possible if design water levels don't exceed ground floor level.	**16: Floating buildings.**  A floating building is a building which is not supported by a fixed foundation, it floats on water. The position of a floating home is permanently fixed in a horizontal direction it can flexibly follow vertical variations in water levels. The floating mechanism at the basis of the floating structure can consist of high-density EPS or a hollow, concrete structure. Co-benefits: Floating buildings combine urban development and water storage. Details: The bottom level of the entire construction should be at least 1 meter from the water bottom in order to maintain favourable water quality conditions. Infrastructure connections to floating buildings should specially be designed and be able to withstand expected water level variations, like flexible pipes allowing energy/water feeding and waste drainage.
17: Constructions on piles.  Constructions on piles are raised constructions built on piles. The piles can be used to create solid foundation and to make it possible for water to flow underneath the building. The ground flood level should be built above the design water level. Details: Piles should be built or drilled into a stable and strong soil layer.	**18: Raising the ground floor level.**  The ground floor of a building can be raised above design levels to prevent flooding in the building. Ground floor levels could be raised a several centimetres up to prevent pluvial flooding to a few meters to prevent coastal or river flooding. Details: It is usually only possible for new buildings. The more the ground floor level is raised, the more complex providing building accessibility for handicapped persons.

19: Raised curbs/ hollow roads.  Raised curbs and hollow roads are used to increase the storage and transport capacity of a road. In extreme rainfall events excess water is stored in between the curbs instead of flowing into buildings directly. Details: Providing road accessibility for handicapped persons is more complex.	**20: Amphibious (floatable) constructions & buildings.**  Amphibious buildings rest on the ground level and only start to float during a flood period. The structure is built on a float. Like in floating buildings, these floats are guided by vertical posts to avoid drift of the amphibious building. Details: Suction effects after some years of stationary position on the ground or a rapid rise in water levels could hamper the lifting of the float. Flexible piping allows energy/water feeding and waste drainage.
21: Temporary flood protection (sand bags, inflatable construction and stoplogs).  Temporary perimeter flood barriers consist of complete removable components, which are installed following a flood warning and dismounted after the end of a flood period (sand bags, inflatable construction and stoplogs). The temporary flood protection is especially interesting for use in the urban context as it takes less space than a permanent flood protection. Most likely the temporary measures are stored in special locations. Details: Training is needed to build a reliable flood protection in time.	**22: Check valve, non-return valves.**  A check valve or non-return valve is installed in pipes which are vulnerable for backflow in flood conditions. Backflow is known to take place in toilets and sewer systems. The valve will block flow if water flows in the wrong direction.

23: Emergency overflow/retention area.  A retention basin is used to manage storm water runoff to prevent flooding and downstream erosion, and improve water quality in an adjacent river, stream, lake or bay. Sometimes called a wet pond or wet detention basin, it is an artificial lake with vegetation around the perimeter, and includes a permanent pool of water in its design. Co-benefits: Sometimes they act as a replacement for the natural absorption of a forest or other natural process that was lost when an area is developed. As such, these structures are designed to blend into neighbourhoods and viewed as an amenity.	**24: Storage/settling tank and storage basins.**  Storage/settling tanks are designed to store excess runoff in urban drainage systems during wet periods, primarily if runoff exceeds the discharge capacity of the urban drainage system some. The settling tank is designed to prevent polluted runoff to be discharge in surface water.
25: Increased pump capacity.  By increasing the pump capacity water tables can be controlled better. Responding to heavy rains becomes easier, and the chance of flooding is reduced. The need for buffer capacity, translated into low water tables in rivers and channels, is also reduced as the managers have more pumping capacity. Water levels can remain at higher levels which increases the retention capacity of the system in case of droughts. Co-benefits: Slowing down the rate of soil subsidence is a co-benefit of the ability to maintain high water levels. Details: Canals or drainage pipes flowing to the pumping station should be able to accommodate the increased discharge.	**26: Increase capacity of sewer system.**  Increasing the capacity of the sewer system increases the ability of the system to drain excess surface water during heavy rains and prevent flooding. Co-benefits: Increasing the capacity of the sewer system also decreased the chance of sewage overflow into surface waters. As a result, the quality of surface water is improved.

27: Reconstruct combined sewer systems to separated sewer systems.  Old sewer systems were often constructed as combined sewers systems, collecting rainwater and waste water in one system. A separate sewer system is designed to collect sanitary and storm water runoff separately. Rainwater can be stored and/or treated, therewith creating an additional water resource. The sanitary water is in a separate sewer system is more concentrated and waste water runoff is more steady. Co-benefits: The risk of sewage overflow is limited or even prevented, and industrial waste can be managed more easily. As a result, surface water quality is improved.	**28: Smart-drain (groundwater).**  A smart drain is used to control groundwater levels. The drain operation is based on the actual groundwater levels. If the groundwater level is too high, more water is drained. If the groundwater level is too low, drainage is limited.
29: Infiltration and Transport-sewer.  An infiltration and transport-sewer (IT) can function as a underground storage and infiltration mechanism, or a storm water drain. The IT sewer is a permeable pipeline which buffers the water until it is able to infiltrates back into the soil. During heavy rain, when soils are fully saturated and water can no longer infiltrate, the IT sewer functions as a storm water drain. excess water is diverted to the ends of the pipeline where it is discharged into another water body. With this buffering capacity the IT sewer is able to reduce flooding and improve water availability during periods of droughts.	**30: Ditches.**  A ditch is usually defined as a small to moderate depression created to channel water. A ditch can be used for drainage, to drain water from low-lying areas, alongside roadways or fields, or to channel water from a more distant source for plant irrigation. A trench is a long narrow ditch. Ditches are commonly seen around farmland especially in areas that have required drainage such as low land areas. Details: Roadside ditches may prove a hazard to motorists and cyclists.

31: Increased storage or discharge capacity of surface water.



Increasing the size of a channel or pond, the discharge and storage capacity of surface water can be improved. The discharge of a river can be improved by, removing obstacles and lowering groins. Excavating floodplains, increasing the area of the water body or depoldering large areas along the river, improves the storage capacity of the water bodies. Both measures have the ability to reduce flood risk and improve the ability to manage the water.

Co-benefits:

When rearranging water bodies, the opportunity is created to improve the liveability of the area. Nature, recreation and urban planning become vocal points during such constructions.

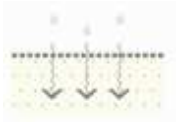
32: Use of groundcover and shrubbery (instead of unplanted surface).

Using groundcover and shrubbery has a few benefits compared to unplanted surfaces. By reducing the velocity of the water on the surface, trees and shrubs improve the infiltration of the water. In addition, plants improve the infiltration rate of the soil. In short, planted surfaces improve the infiltration capacity of the surface and thereby reduce the chance of flooding. Planted surfaces also cool the environment through evapotranspiration and by providing shade. Planted surfaces thereby have the ability to reduce the heat island effect and reduce peak summer temperatures by 1 to 5 degrees Celsius. As it provides shade reduce surface runoff as their features reduce the velocity of the water on the surface. This ability is especially interesting in urban areas where heat reduces the liveability of the city.

Co-benefits:

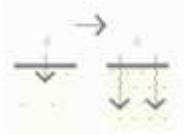
Improving air quality, improving water quality and improving the liveability of a city are other benefits planted surfaces are able to provide.

33: Porous pavements.



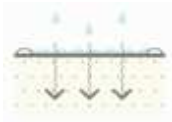
Permeable paving is a range of sustainable materials and techniques for permeable pavements with a base and sub base that allow the movement of water through the surface. In addition to reducing runoff, this effectively traps suspended solids and filters pollutants in the soil. Besides pavements examples include roads, lawns and lots that are subject to light vehicular traffic, such as parking lots.

34: Improve soil infiltration capacity.



Improving the soil infiltration capacity means improving the permeability of the soil. If the infiltration capacity of the soil is increased, more water will percolate into the soil and less water will runoff directly. This will reduce peak runoff and promoted groundwater recharge.

35: Infiltration fields and strips with aboveground storage.

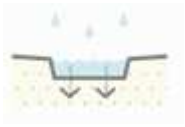


Infiltration fields and strips with above-ground storage combine infiltration and water storage. This way peak runoff is reduced.

Co-benefits:

Infiltration fields and strips can be combined with green areas in the public space.

36: Rainwater retention ponds, with or without infiltration possibilities (precipitation can be used in buildings).

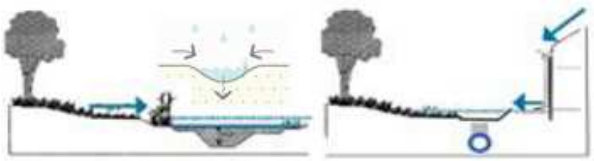


Increasing the storage can be applied on different scales. Capturing runoff from the roof of the house is seen as the smallest scale. This is followed by the retention of runoff of an agricultural field by creating small dams within small channels or depressions in the field. And ultimately large areas can be designated as a flood area to temporarily store excess discharges of the river.

Co-benefits:

Water can be used in buildings.

37: Wadi (Bioswales/Infiltrating filter swales).

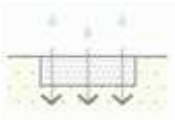


A wadi is a naturally designed buffer and infiltration filter. A wadi can be a shallow ditch or depression in the field. The wadi detaches rainwater runoff from streets and rooftops from the traditional sewer system. For the larger part of the year, the wadi remains dry. Only during heavier rain events will the wadi be filled with water. This way clean water is infiltrated into the soil and can be used during drier periods.

Co-benefits:

In addition, the overflow risk of the sewage system is limited as rainwater is separated from the sewer system. In turn this leads to a higher water quality of the surface waters.

38: Shallow infiltration measures.



Shallow infiltration measures are focussed on increasing infiltration in the shallow unsaturated zone. By increasing infiltration, run off peaks are lowered, reducing the pluvial flooding risk. Also groundwater is recharged, reducing the impact of droughts. Examples of shallow infiltration measures are infiltration crates and soakaways.

Co-benefits:

Shallow infiltration measures can reduce the discharge to the wastewater treatment plants.

39: Sloping roof (shade).

A well designed sloping roof can create valuable shade in hot conditions. In the roof design the orientation should be optimised towards the sun. It helps mitigating the heat stress in cities.

40: Green facades.

Green façades are purposely designed systems in which vines and climbing plants or cascading groundcovers grow into the structures supporting structure. Plants growing on green façades are generally rooted in a soil bed located at the base of the structure, in elevated planters at intermediate levels, or on rooftops. Depending on the climate, choice of species, depth of soil bed, orientation, nutrition and irrigation regime, green façades may take several seasons before achieving maturity. Green façades can be attached to existing walls or built as freestanding structures. They are used to shade glazed façades, to provide degrees of privacy and security, to screen or embellish parking structures, patios and walkways, and are built as baffles or fences.

Co-benefits:

A green facade adds value to a pleasant and liveable public space.

Details:

Irrigation in dry periods might be needed.

41: Cool (reflective) roofs.

Reflective surfaces are artificially-altered surfaces that can deliver high solar reflectance. This is the ability to reflect the visible, infrared and ultraviolet wavelengths of the sun and reducing heat transfer to the surface. The most well-known type of reflective surface is the cool roof. While it is true that cool roofs are mostly associated with white roofs, they come in a variety of colours and materials and are available for both commercial and residential buildings.

Details:

Savings of up to 15% the annual air-conditioning energy use of a single-story building.

42: Rainwater storage below buildings.

Large tanks underneath buildings can be used to store rainwater captured from the rooftops or along the sides of the building. Gutters and pipelines channel the water to the tank. Filters are used to keep out dirt, debris, leaves and other contaminants. Rainwater storage is able to store runoff during heavy rainfall and provides water in periods of droughts.

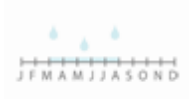
Co-benefits:

The water can be used to flush the toilet, water the garden or other non potable purposes. If treated the water can even be used as drinking water.

Details:

Should the water in the tank be suitable for drinking water purposes, additional filtration and treatment devices, like ozone, UV and/or chlorination devices need to be installed.

43: Seasonal storage.



Seasonal differentiations often lead to periods of drought and periods of excessive rainfall. This leads to imbalanced water availability as water usage remains stable throughout the year. Thereby water abundances are often followed by water shortages. To reduce water shortages in the dry season, it is necessary to store a maximum amount of water during the wet season. Besides large scale measures like dams and major water retention lakes, there are also measures which function on a smaller scale. Water can be stored in tanks underneath buildings, in small lakes within the city, on roofs, in water squares or simply a water tank alongside the house. Measures that can be implemented on a regional scale are flexible water level management, natural ponds or groundwater recharge zones.

Co-benefits:

Water bodies with natural characteristics are very attractive as living an recreational space. Water management and urban planning thereby go hand in hand.

44: Floodplain excavation or enlargement.

The floodplain can be enlarged by lowering the level or increasing the width of the floodplain. Enlarging the floodplain will create more room for the river thereby increasing the discharge capacity and provide upstream retention. The risk of flooding is decreased as the capacity of the river to convey water is increased.

Co-benefits:

The remodelling of the river and floodplains creates opportunities for natural and recreational development.

Details:

In some areas a floodplain cannot be increased in size as the river is bordered by cities. Widening the river upstream may be a solution as excessive water can be temporarily stored before it is allowed to pass through the city.

45: Flexible water level management.

By using flexible natural fluctuations in the water level can improve rainfall runoff characteristics. In wet periods water levels are allowed to rise, in dry periods water levels are allowed to lower. This reduces the use of pumping stations or water inlet systems.

Co-benefits:

Flexible water level management is ecologically friendly as it follows natural water level fluctuations.

46: Airbag Water Storage.

Airbag Water Storage can be used to increase the water storage capacity without changing the level of the water. To achieve this result a bag is located under water and fastened to a structure to prevent it from floating. When the level of the water body rises due to heavy rainfall, the airbag is emptied to an extent that the rise of the water level is eliminated. The airbag can be re-inflated when storage is no longer needed. The static water level during heavy rainfall and the increased water storage within the area, are the main advantages of the Airbag Water Storage measure.

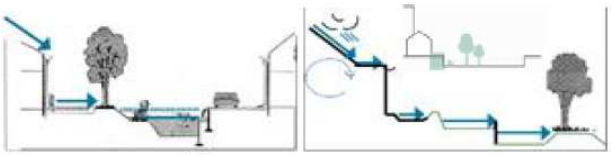
47: Water squares.

This type of square can combine water storage with quality improvement of urban public spaces. The water square can be understood as a twofold strategy. It makes money invested in water storage facilities visible and enjoyable. It also generates opportunities to create environmental quality and identity to central spaces in neighbourhoods. Most of the time the square can be used as a recreational space. When heavy rains occur, rainwater that is collected from the neighbourhood will flow into the water square for a short time span. After it has been in used as a buffering space, the filtered water is discharged into the water system.

Co-benefits:

The square can also be a measure to improve the quality of the open water in urban environments.

48: Artificial urban wetlands.

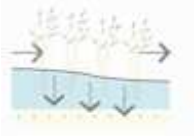


Natural wetlands function as water retention basins, sediment traps and wastewater treatment areas by filtration and immobilising harmful microorganisms. The wetlands can be implemented with or without additions which improve the treatment capacity. Would extra treatment capacity be needed due to regular overtopping of the sewage system, mining or heavy industry, additional techniques can be implemented. Aeration, alteration, soil composition or the introduction of a particular plant species in the area can all improve the treatment capacity.

Co-benefits:

Depending on the design, the implementation of an artificial wetlands improves the liveability of the city, reduces downstream flood risks and increases water availability during dry periods.

49: Helophyte filters.



Helophyte filters are artificially created zones of reeds (or other water based plants), which purify surface water in a natural way. Thanks to its extensive network of roots and large quantity of biomass, reed has a large living surface for bacteria and other micro-organisms. These are responsible for a sizeable part of the purification effect. Especially the concentration of nutrients is reduced in helophyte filters.

Details:

The beds are often compartmentalised to prevent the wind from blowing away the plants. These systems are very sensitive to seasonal changes, whereby they tend to be implemented in warmer countries. There are three types of helophyte filters: Sewage fields (Helophyte filters with surface flow), root-zone fields (Helophyte filters with underflow) and percolation fields or infiltration fields (Helophyte filters with vertical flows).

50: Rainwater tanks.

A rainwater tank (sometimes called a rain barrel in North America, or a water butt in the UK) is a water tank used to collect and store rain water runoff, typically from rooftops via rain gutters. Stored water may be used for watering gardens, agriculture, flushing toilets, in washing machines or washing cars during dry periods.

Co-benefits:

Rainwater tanks are installed to make use of rain water for later use, reduces main water usage for economic or environmental reasons, and aid self-sufficiency.

51: Systems for using precipitation in buildings (rainwater harvesting).

Rainwater can be harvested in many ways. The most common method is capturing the water on the roof of a building. Although it is not advisable to use rainwater for drinking purposes, it can be used to flush the toilet, clean the car or water the garden. However, a system needs to be installed to capture, store and distribute the water throughout the building. When installed, it will reduce the need for water from the locally provided water supply, and reduces water runoff in the city.

Co-benefits:

This system reduces the demand for drinking water.

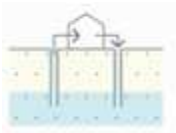
52: Use of treated wastewater.

Using treated wastewater can be a method to reduce freshwater consumption and limit the need for freshwater retention in lakes and ponds. Wastewater can be treated to certain degrees. Water can be treated up to the point that it can be used for irrigation, flushing, fire suppression and industrial cooling. In some cases wastewater will even be preferred for irrigation over other water resources, since wastewater has a high nutrient load. Waste water can also be purified up to the point that it becomes suitable to drink. Various techniques can be used to achieve this high treatment grade including, ozone, UV treatment, chlorination, membrane treatment, reverse osmosis, and others.

Co-benefits:

Recycling wastewater helps conserving water while it also prevents polluted water to enter the water cycle. Water quality can be improved when this measure is implemented.

53: Use of groundwater (aquifer storage and recovery).



Water can be stored and recovered in aquifers deep under the ground. Aquifers are underground water sources. Locked in between impermeable layers of rock and soil groundwater in aquifers is clean and often potable. The water in these aquifers can be used during periods of drought to mitigate water shortages. On the other hand, aquifers can also be used as large underground storage 'tanks' when water is in abundance. An new sustainable water resource can be created when both the water abstraction and recovery are in balance. Such a measure is particularly interesting as it requires hardly any space aboveground to implement. Using groundwater is therefore particularly interesting in densely populated and built areas.

54: Water inlet systems.

Implementing a system of water inlets enables the management of water levels throughout a water system. From large infrastructural works to small inlets on the field of a farmer, inlets can be implemented on various scales. Examples of inlets are gates, adjustable weirs or dams with an inlet and diversion channels. The ability to discharge water into the preferred channels allows an area to distribute water to areas where it is most needed. It is therefore a preferred solution when long periods of drought are a major issue in the area.

Co-benefits:

Depending on the size and design of the Inlet system, it has the co-benefit of reducing downstream flood risk and allow upstream groundwater management.

55: Reduced paved surfaces.

Paved surfaces like roofs, roads and parking lots, reduce the infiltration capacity of the soil and increase the surface water runoff. As a consequence, flood risk and the need for additional water retention capacity is increased. By decreasing the total area of paved surfaces, more water can infiltrate into the soil and extra green space is created. The increase in green space also has a positive effect on the heating of a city. Green areas help cooling the area by providing shade and the possibility of evapotranspiration.

Co-benefits:

A more liveable city through additional recreational area, greening and reduced air pollution, are benefits which make this an preferred solution in a densely populated area.

Details:

Examples for decreasing paved surface area: Replace buildings with park area, use permeable surfaces for walk- and driveways, reducing road size and parking space, multilevel parking, high rise instead of low level buildings.

56: Disconnecting paved surfaces from sewer system.

Disconnecting paved surfaces from sewer system reduces the amount of clean runoff water collected in combined wastewater sewer systems. Instead of collecting runoff in the sewer, the runoff is transported to surface water, collected for water reuse or infiltrates into the soil. Du to this methods the risk of pluvial flooding is reduced.

Co-benefits:

The amount of wastewater transported and treated in the wastewater treatment plant is reduced.

57: Select drought and/or salt-resistant plants.

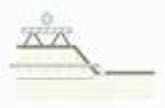
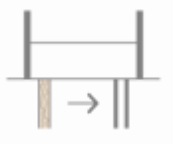
Increasing droughts and progressing saltwater intrusion also has an impact on the vegetation. Drought or salt-resistant crops are more resilient in periods of drought when water is scarce and seawater intrudes further land-inwards. Choosing these crops will not lead to yield reductions and makes farmers or parks more resilient to the impacts of increasing droughts.

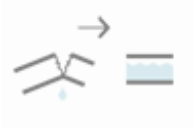
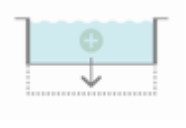
58: Smart irrigation measures.

One of the measures to safe water is by applying the water to the field in a smart way. The objective is to minimize evaporation and spillage during periods of drought. Agriculture is the largest user of freshwater in the water system. Any improvements to safe water in this sector will therefore have a large impact on the total water availability.

Details:

Examples of irrigation techniques: drip irrigation, subsurface irrigation, sprinkler system and automated irrigation.

59: Improved construction site preparation.  Improved construction site preparation is focussed on improving the strength and drainage capabilities of an area that is converted from a rural or nature area to an urban area. It should be done before construction of buildings is started. Main aspects of improved construction site preparation are investing in preloading of the soft subsoil with sand or solid soil, construction of groundwater drains and creation of a surface water system. Co-benefits: It will lead to a clear reduction of maintenance costs after the urban area has been finished.	**60: Improvement soil structure.**  Improvement of the soil structure is focussed on improving the strength and drainage of soft soils like clay and peat. Common methods are raising ground level with sand, preloading with sand or by grouting. After improvement the soil is capable of carrying heavier loads and groundwater levels are more stable. Co-benefits: Improving soil structure increases the life span of the structure that is founded on the improved soil.
61: Building without a crawlspace.  Crawlspaces vent the underside of a building and thereby prevent the moulding of dry wooden floors. However, with the introduction of concrete slabs, such ventilation is no longer necessary and compared to crawlspaces provides several benefits for water management. If concrete slabs are used, groundwater tables will no longer have an impact on the structure. As a result it becomes possible to increase the variability of the groundwater table, which results in an increased water retention capacity in the area. This reduces the chance of flooding and increases the water availability during periods of drought. Co-benefits: A reduction in subsidence, improved isolation of the building and reduction in humidity are co-benefits that improve the liveability and durability of the building.	**62: Reconstructing (wooden) foundations.**  Buildings with a wooden foundations are vulnerable for decreasing groundwater levels. When the soil is no longer saturated with water, parts of the wooden foundation are exposed to air. In time, this leads to rotting foundations. Ultimately the foundations will not be able to support the building. To prevent this from happening, wooden foundations should be replaced by materials that are not impacted by an exposure to oxygen. Details: Note that soil conditions and the uniformity are still important aspects to take into account when constructing foundations.

63: Replacing leaking/draining sewers.  Replacing damaged sewer pipes helps to improve the water drainage and storage capacity of an area. Often an aging sewer system is not completely water tight due to damages to the system. Often it unintentionally functions as a drainage or infiltration pipe. This can lead to a reduction in water levels, which can have a negative effect on the foundations of a buildings.	**64: Deepen water bodies.**  To mitigate droughts it is necessary that sufficient water can be stored during the wet period, so it becomes available during a drier period. To maximise storage capacity the volume of water bodies can be increased. One way to increase the storage volume is by increasing the depth of rivers, canals and ponds. The amount of water which can be stored in this way can become available when water is scarce. The water bodies are refilled when water is abundant during wet periods. Increasing helps reducing flood risk as rivers are able to transport a larger amount of water and ponds and lakes have a larger retention capacity.
65: Adding green in streetscape.  Adding green in the streetscape reduces the impact of the heat island effect. Trees provide shade and transform the heat through their capacity of evaporation and transpiration. This greening can be done by tree lines along streets or by creating parks in the urban area. Co-benefits: Green areas also reduce air pollution, provide recreational possibilities and can ultimately increase the liveability of the city. Closer to the city the greening can reduce the urban heat effect and provide opportunities for recreational purposes.	**66: Green shores, riverbanks and mangroves.**  Adding green to shores and riverbanks including mangrove forest are reducing the wave impact and prevent soil erosion. Moreover, it captures nutrients and soils transported in the water body. Since it is a self-supporting system, maintenance is low. Co-benefits: By applying the 'building with nature' concept multiple double function are created.

67: Green ventilation grids.

Compared to areas outside the city the lack of ventilation in combination with high temperatures can lead to an effect called urban heating. To introduce wind into a city, green areas are connected in such a way that a continuous line of green space is created. Without buildings in the flow path, wind can travel from outside into the city centre. The wind delivers fresh, cool and clean air to the city thereby reduces the temperature.

Details:

Green ventilation grids provide potential for recreation and nature and thereby improves the liveability of a city. Combined with water, this green space could also function as a water retention area.

68: Cooling with water elements (e.g. fountains and ponds).

Including water elements like fountains or ponds within an urban area leads to decreasing the temperature within the city. Evaporation of the pond water or fountain leads to an actual temperature decrease of the air temperature.

Co-benefits:

Adding water to the public space increases attractiveness and liveability of an area.

Details:

During longer periods of drought this solution could conflict with water saving measures.

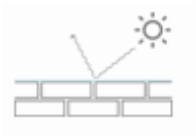
69: Wetting surfaces (of gardens, roofs, roads).

A sprinkler system could wet areas like roofs, roads or gardens so is can evaporate and cool down the air temperature. Other examples are fountains or waterfalls. This measure can be used in densely populated urban areas where the urban heat island effect proves to be a real issue.

Details:

Surface wetting could be a solution when urban heat requires urgent measures, but it requires large amounts of water. During longer periods of drought this solution could conflict with water saving measures. An assessment should determine whether surface wetting is suitable for that particular moment.

70: Cool paving and building materials.

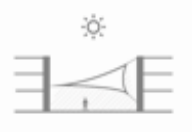


This urban heating can be mitigated by using materials and colours that reflect sunlight or are less heat absorbent. This reflecting capacity, also called Albedo, is increased by using bright colours and heat reflecting materials. Black tarmac, dark roofs, grey sidewalks and stone walls absorb a large amount of heat when exposed to sunlight.

Co-benefits:

When applying such a measure creatively, the attractiveness and thereby liveability of a city can be improved by the measure.

71: Pergolas and canvas above streets.

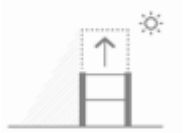


The lack of shade in the street of a city can lead to increasing temperatures within the city. streets and building absorb and reflect the heat whilst people can be exposed to direct sunlight. These factors lead to urban heating and make temperatures within the city uncomfortable. In order to reduce the impact of the sunlight large canvas sheets can be stretched out above the streets. This will create shade and prevent streets and buildings to warm. Reflective material can be used to increase the effectiveness of the canvas. Using pergolas with plants to create shade can be just as effective. The plants will even transpire, which reduces the surrounding air temperature even further.

Co-benefits:

Applying canvas creatively or using pergolas with plants, will also benefit the experience of the city and thereby improve the liveability.

72: High-rise buildings (shade).



Shade can be created by constructing high-rise buildings that create a maximum amount of shade. When covered with reflective material and placed in the correct way, incoming sunlight can be reflected back into space. High rise buildings can therefore prevent the urban heating effect when implemented properly.

Co-benefits:

A new high-rise could improve the aesthetics of a city and thereby improve the reputation of a city.

Details:

When high-rise buildings are placed in a wrong manner and applied with materials that reflect sunlight back into the city, high-rise buildings could also increase the urban heating effect.

73: Optimise orientation to wind and sun.

When applied properly, all buildings could harvest energy from the sun whilst allowing a wind flow corridor. This will cool down the city. Solar panels and water heating panels can be used to ensure some of the heat is captured.

Co-benefits:

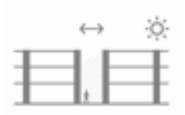
Optimum orientation can save energy in winter time. Combining with solar energy this measure will reduce fossil fuel consumption, reduces CO^2 emissions, improve air quality and thus liveability of the city.

74: Increasing eaves (overhang).

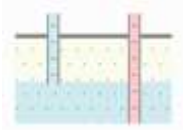
Increasing eaves is applied to the design of buildings. By enlarging the eaves of the roof, shade can be created. In hot days this can mitigate the effects of heat stress.

Details:

Eaves should be designed to create shade in summer time and to let in sunlight in winter time.

75: Blinds.  Blinds are implemented in buildings to block sunlight entering trough windows. If necessary blinds can be manually or automatically adjusted to change the amount of light entering though the window.	**76: Narrow streets.**  Narrow streets can be created to increase the amount of shade in the street and the facades of buildings. If the streets are also constructed in the main direction of the wind, natural ventilation is possible as well. This measure mitigates heat on a local scale. Details: Narrow streets can also be covered with canvas to increase the amount of shade.
77: Buildings (partly) situated in the water.  Buildings can be constructed hanging above the water or standing on piles in the water. This way combined land use is possible, room for water and urban development. Co-benefits: Combining water and urban development increases the value of the real estate. Details: The buildings should be designed to withstand extreme water levels.	**78: Bedrooms at north side of the building.**  In residential buildings bedrooms can be situated at the northern side of the building. In the Southern Hemisphere the bedroom should be located at the southern side. The objective is to reduce the amount of sunlight coming through the windows.
79: No bedrooms at the upper floor.  If no bedrooms are designed at the upper floor of the building the impact of the heat accumulating in the upper floor during heat waves is much lower.	**80: Thermal insulation.**  By using thermal insulation of facades and roofs the temperature rise during hot summer days can be reduced significantly. The climate inside the building will remain pleasant and the air conditioning demand is reduced. Co-benefits: During winter time the heat inside the building will be retained as well. This reduces the amount of CO2 emissions.

81: ATES - Aquifer Thermal Energy Storage.



Confined aquifers in the soil can be used to store cold in winter time and heat in summer time. An aquifer is a layer in the soil confined by impermeable rock or clay. It consists of sand and is completely saturated with water. For Aquifer Thermal Energy Storage a groundwater two ground water wells are made: a warm well and a cold well. During winter time cold water is stored in the cold well, warm water is extracted from the warm well. In summer time the operation is reversed: cold water is extracted from the cold well, warm water is extracted from the warm well.

Co-benefits:

By using natural heat and cold for generation of energy, CO^2 emissions can be reduced.

82: Flood shelters.

Flood shelters are created in areas which experience severe flash flooding. Elevated flood shelters should be constructed above the highest expected flood levels. They should be easily accessible and should be able to accommodate all people in the vicinity.

83: Evacuation routes at elevated level.

Evacuation routes at an elevated level are necessary for a safe evacuation in flood events. They should be constructed above the highest expected flood level. People affected by the floods can use the routes to reach safe (higher) ground.

Co-benefits:

To be combined with road development.

84: Emergency supplies and utilities.

Emergency supplies and utilities are necessary in case of a flood emergency. It should consist of food and drinks, first aid kit and other provisions to survive or continue operating for instance a hospital or business.

Co-benefits:

It is useful for all kinds of emergencies.

85: Power generators.

Power generators are a backup for the public power supply in case of flood events. Some vulnerable or vital objects need to be operational at all time. For instance life support systems in hospitals or vital infrastructure like storm surge barriers.

Co-benefits:

The generators can be useful for all kinds of emergencies.

86: Relocation of buildings, utility facilities and infrastructure.

Some public utilities or vital infrastructure could be located in vulnerable flood prone locations. Relocation to higher ground is an option to minimise flood risk.

Details:

Relocation should also benefit the regular operation of the buildings, facilities and infrastructure.

87: Dismountable and temporary buildings.

Dismountable and temporary buildings can be an option for flood prone locations. For instance temporary beach pavilions can be built along beaches to be used during summer time. During the stormy winter season the buildings are dismounted.

Co-benefits:

Buildings can easily be relocated to other places.

88: Protection life support facilities and dangerous goods.

Life support facilities and dangerous goods like nuclear plants should be well defended against climate extremes. This vital infrastructure should be up and running even during extreme conditions.

Co-benefits:

This measure can be combined with other disaster mitigation measures.

Details:

A vulnerability analysis should be made to assess main climate risks.

89: Creating swimming locations.

Swimming locations are an ideal place for cooling and recreation in summer time and mitigate heat effects.

Co-benefits:

Swimming locations also promote sports and social interaction.

Details:

Water quality is a major concern for swimming water locations. Especially algae blooms in warm periods can be a severe health threat.

90: Desalination installation combined with a windmill.

A sustainable method to produce drinking water from sea water is a desalination plant driven by wind power. A windmill will produce the energy to power the desalinisation plant.

Co-benefits:

CO^2 emissions can be reduced as fossil fuels are often used in desalination plants.

Details:

It could be a solution for arid countries located near the sea. Reliable wind conditions are necessary.

91: Solar water-heat pump.

The solar water heat pump generates solar energy via surface water. The surface water is heated by the solar radiation. Via a heat exchanger the heat in the water can be extracted and stored for later use in cold periods. It mitigates the heat in summer time.

Co-benefits:

This measure can reduce CO^2 emissions.

92: Gutter.

A gutter is a non-permeable open drain to collect transport rainwater. Usually a gutter runs along a road. It is connected to either a manhole or a surface water body.

Details:

A slope of at least 1:500 should be designed to ensure water flow.

93: Green roofs (extensive).

A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems. The extensive roofs is covered in a light layer of vegetation and are lighter than an intensive green roof. Green roofs help to lower urban air temperatures, mitigate the heat island effect and store rain water.

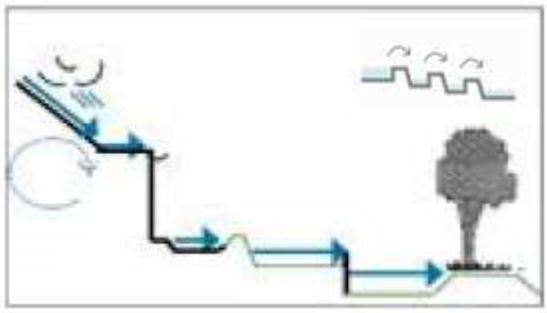
Co-benefits:

Green roofs serve several purposes such a providing insulation, creating a habitat for wildlife, and reducing air pollution.

Details:

The roof construction should be designed to support the extra load.

94: Dams (urban and rural cascading).



Dams can be used to cascade water from a higher level to a lower water level. In rural areas often a weir is used to control the water flow, while in urban areas structures and infrastructures can be applied. Cascading water can improve water quality in heat waves by aeration and mixture of the water. In addition, the cascade structures prevent soil erosion and landslides.

95: Pumping station.

A pumping station is used to discharge water out of an area. It can be used to transport sewer water in pressure mains. Another option is its use in polder systems to pump water from a low lying area into a main water body like a river or a lake. It is always applied when no natural flow of water is possible.

Details:

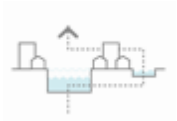
Capacity can range from a few liters per second to 500 m^3 per second.

96: Deep groundwater infiltration.

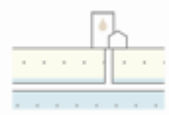
Many area deep ground water aquifers are used as a source for drinking water. Groundwater infiltration is needed for sustainable use of these aquifers. If no water is infiltrated aquifers will be emptied. Deep groundwater infiltration is focussed on infiltration of water in deep aquifers. Rain water is collected and infiltrated in deep wells.

Details::

Geohydrological assessments are necessary to determine the exact flow of water.

97: Network of waterways.  A network of water ways is mainly focussed on connecting water bodies which are located near each other. By connecting them with culverts and canals a larger water system is created. This increases the storage capacity of the system and thereby reduces the flood risk. Co-benefits: A network of waterways could increase ship navigation possibilities and promote fish migration.	**98: Inclination of roads.**  Inclining a road means a road is constructed in a slope to direct the flow of water. The flow could be directed to a gutter, a water body or an infiltration field. Details: Accessibility for disabled is a concern when using slopes in roads.
99: Water basins.  Water basins are retention ponds constructed to store water. Water storage can be used to reduce the impact of flood events or to store water for dry periods.	**100: By-pass creation.**  Creating a bypass for a river or canal can reduce flood levels in a specific location. A bypass provides extra discharge capacity for the river or canal. Thereby known bottlenecks can be solved. Details: Solving a bottleneck upstream can lead to new bottlenecks downstream.
101: Use of native species.  Use of native plant species in green areas is a good option in many ways. Native species are already adapted to the local climate and its extremes. In arid countries native species are better capable of withstanding the heat. Co-benefits. Use of native species promotes retaining cultural and ecological identity.	**102: Elevated quay / flood wall at vital infrastructure (e.g. hospital).**  A flood wall can be constructed to protect individual vital buildings/facilities against flooding. They can be either permanent or dismountable. Sometimes gates are built in a flood wall to create space for roads. These gates are only closed during flood events. Details: Accessibility in regular operation should be ensured.

103: Reversed drainage.

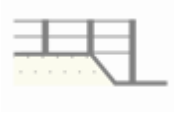


Reversed drainage is similar to drainage below the surface level. It is a solution to reduce land subsidence and the impact of drought on peat soils. The main characteristic to install the drainage pipe below ground water level.

Co-benefits:

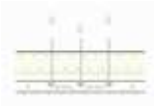
The stability of the soil is increased.

104: Building on partially elevated areas.



Building on partially elevated areas reduces the flood risk locally. A farm located in a flood plain can for instance be constructed on an elevated area. The surrounding area is allowed to be flooded while the farm and its accompanying buildings remain dry.

105: Drainage below surface level.



Drainage below the surface level usually consists of a permeable pipe in the subsurface to drain ground water. It is often connected to a surface water body to also transport excess ground water. Drainage can be made of ceramic, plastic or concrete materials.

Details:

A key component of a drainage pipe is the covering filter material as drainage pipes are prone to clogging by small soil particles.

106: Sealing storm water channel bed.

A storm channel bed can be sealed water tight. Sealing can be done for instance by construction of a clay channel bed or concrete channel bed. It will prevent infiltration of the water. This can be helpful in dry conditions when water saving is necessary.

Co-benefits:

Sealing channel beds often leads to an increase in flow speed in channel.

107: Water circulation systems.

Water circulations systems connect the water flow of neighbouring water bodies. The main goal is prevent stagnant water and to create larger surface water areas to store water in extreme flood conditions. Circulation can be done actively with the use of pumps.

Co-benefits:

Water circulation improves water quality.

Details:

Fish migration measures should be taken to ensure the survival of migratory fish.

108: Green roofs (intensive).

A green roof or living roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and a drainage or irrigation systems. Green roofs help to lower urban air temperatures, mitigate the heat island effect and store rain water. The intensive roofs are thicker and can support a wider variety of plants but are heavier and require more maintenance than extensive roofs.

Co-benefits:

Green roofs serve several purposes such as providing insulation, creating a habitat for wildlife, and to improve air quality.

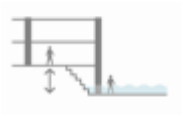
Details:

The roof construction should be designed to support the extra load.

109: Emergency exit of buildings above highest flood level.

The main exit of a building is traditionally positioned at ground level. In case of a flood this only exit may be blocked by water and debris taken by the water flow. Emergency exits should be placed at the highest possible flood level, in extremis on rooftops. Also existing windows can be redesigned as emergency exits.

110: Increase height difference between street level and ground floor level.



Rain water is usually collected in streets. To reduce probability for flood water to enter buildings the difference between street level and ground floor level can be increased. This way more water can be stored in the street profile without flooding the buildings.

Details:

Accessibility for disabled persons should be ensured.

111: Safe ground for flood events.

Safe grounds are (isolated) parts of ground that are out of reach of high water levels in case of a flood event (high locations or protected by a dike structure). These safe grounds can be naturally formed at random locations in flood risk plains or artificially shaped at specific places in the public space.

Details:

Easy access is a main concern for safe grounds.

112: Canal

Canals are man-made water bodies to store and transport water from one location to the other. Canals can be made of soil, concrete or dug in mountains. Canals also have a cooling effect in dry periods.

Co-benefits:

If canals are sufficiently wide and deep, navigation with boats and ships is possible. The value of real estate located along canals is often higher.

Details:

The canal should not cause flooding in case of high water levels in the canal itself.

113: Polder.

A polder is a low-lying area enclosed by dikes or levees and forms an artificial hydrological entity. There is no direct connection with surface water outside the polder other than through manually operated pumps or inlets. There are three types of polders: Land reclaimed from a body of water, flood plains separated from the sea or river by a dike, marshes separated from the surrounding water by a dike and subsequently drained. A polder usually has an excess of water as its ground level is often lower than surrounding water levels. Pumping or opening sluices at low tide is often necessary.

Co-benefits:

Creating a polder reduces the amount of land raising necessary to make use of the land.

Details:

Polders are at risk from flooding at all times and care must be taken to protect the surrounding dikes. An organisation should be responsible for operation of the polder. The internal water level should be chosen carefully. Polders with peat soil will subside, because of peat decomposing in dry conditions.

Table D.3: Adaptation solutions per adaptation target (climateapp, 2015; Ven, 2011).

Evaluation

- Amount of floods (urban and rural): floods / year / area.
- Scale of the floods (urban and rural): human and economic losses / flood / area.
- Prevention of floods (urban and rural): near flood event / year / area.
- Reduction of negative consequences and effects (urban and rural): evaluation of the Multilayer Water Safety Strategy / flood or near flood events / area.

In order to estimate the performance and effectives regarding the package of blue-green & grey adaptation measures, the following indicators should be applied:

- Storage in water assignment, including storm water storage (m^3).
- Run-off delay (min).
- Peak flow reduction (%).
- Retention for supply / seasonal storage, dry periods, drought resistance (m^3).
- Evaporative cooling / green areas (mm/d).
- Heat reduction (^oC).
- Groundwater recharge (mm/yr)
- Water quality improvement:
  - Nutrient reduction (%).
  - Heavy metals, PAH, min.oil reduction (%).
  - Bacteriological quality.
- Cost (development, construction & maintenance).
- Benefits and co-benefits.

D.8 Water for Industry & Energy

This paragraph provides a generic overview describing possible activities within the Water for Industry & Energy water management development theme[11].

Purpose

Establishing, maintaining and improving industrial production processes and energy supply related or dependent on water use in a sustainable manner.

Method

- Reconstruction of the destroyed industrial and energy supply systems (S & M).
- Hydropower: link open water gravity systems (irrigation cannels and rivers) with hydropower facilities. To increase the water security level, these hydropower facilities can be constructed in combination with freshwater reservoirs. By means of turbines electricity is directly produced (S, M & L). In coastal area's tides, current, waves temperature and density can be used to produce water related renewable energy (M & L). Hydropower plants, especially reservoir dams are important for water supply, flood management and electricity generation and managing migration due to the direct and indirect employment it generates. By means of figure D.27, all possible hydropower plants are displayed. In table D.4 there characteristics are summarised.

[11] This paragraphs is developed by the author based on: Vellinga, 2013; Molenaar et al., 2012; Ravesteijn et al., 2013.

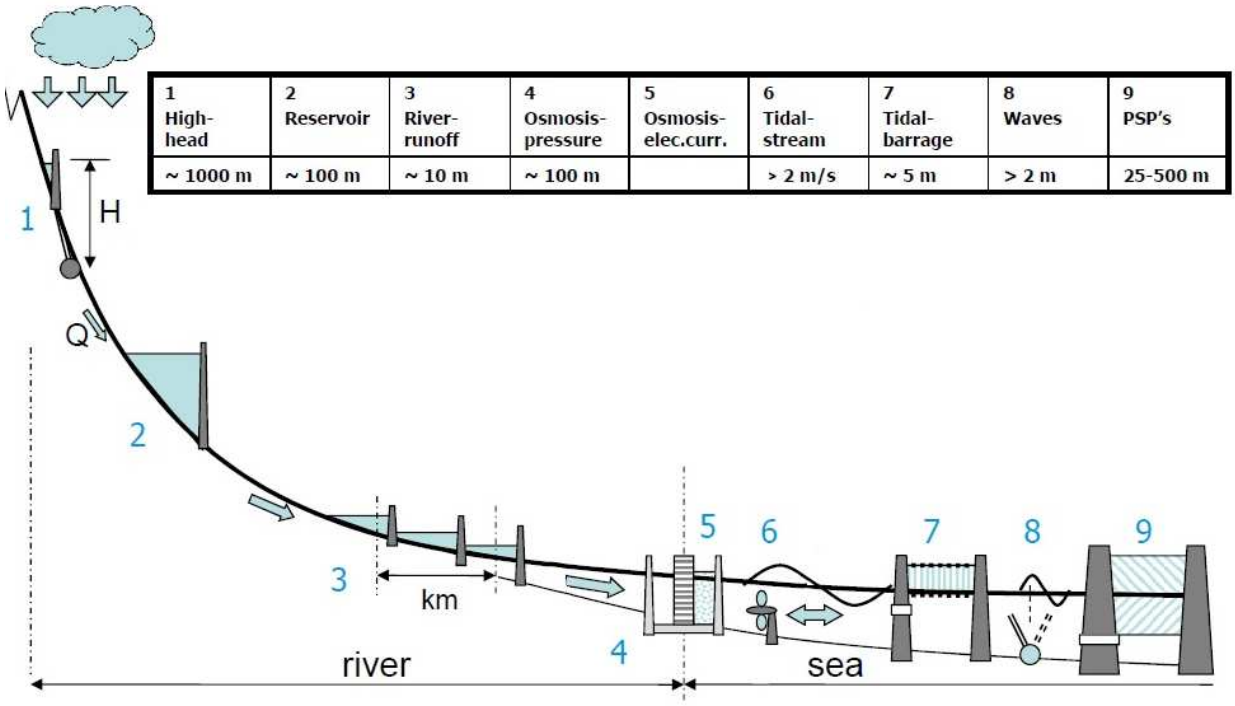


Figure D27: Characteristics regarding all Hydropower Plans types (Molenaar et al., 2012).

Hydropower plant:	Characteristics:	Multifunctionality:
1. High head	- Relative high head (H ≈ 200 m – 2000 m). - Relative small discharges (Q ≈ 1 - 100 m3/s) - Separate locations water inlet and power station. - Water is transported by very straight and steep shortcuts compared with the original riverbed. - Water is transported, through open channels, aqueducts, tunnels, syphons, low- and high pressure conduits or penstock. Relative long distances (10 – 100 km) are possible for safe operation reasons. Shortest length, is preferred. - Turbine type is often Pelton. - High head plants are often used for daily peak shaving.	- Sustainable power generation. - Stable water supply / water security for drinking and/or irrigation.
2. Reservoir	- A reservoir in combination with a dam. The reservoir dam can be constructed out of earth, rock fill, masonry or concrete. The dam includes a spillways (weirs), a middle outlet for irrigation purposes or drinking water supply, a water intake (tower) structures / tunnels toward the turbine located in the power house, a bottom outlets for sediment release, fish and shipping navigation passages. - Due to the water in- and outlet fluctuation, the reservoir volume diverge per season.	- Sustainable power generation. - Stable water supply / water security for drinking and/or irrigation. - Land reclamation. - Water level control for shipping. - Flood prevention / control. - Recreation & aquatic beauty. - Fishing. - Cross-river traffic connection.

	Notes: - Failure of the dam will cause high and strong flood waves with devastating effect downstream. - Due to its water quantity control characteristics, dams are used as geopolitical leverage instruments and causing salinization in downstream areas.	
3. Run-of-River	- Primarily for of navigation purposes. Locks and dams are build to control the water levels in rivers. The power plant is often build additionally. - Relative small heads (H ≈ 5 m up to 25 m). - Relative high discharges (Q ≈ 100 up to 2000 m^3/s). - A large number of small turbines is preferred, since they can better be adjusted to the flow of the river (H & Q differences). - Water is transported through weirs or a barrage with spillways towards to power plant. Because the river is cut off, navigation locks are needed. Also appurtenant works like fish passage / lifts, sand and gravel traps, connecting roads and bridges and dikes are needed. - The power plants located often in a cascade and in a lateral canal.	- Sustainable power generation. - Land reclamation. - Water level control for inlands shipping. - Traffic crossings and connections. - Recreation: restaurants, fishing, water pleasure like, rafting, canoeing, etc. - Flood control.
4 & 5. Osmosis	Two methods are possible: - <u>Pressure-retarded osmosis (4):</u> filtered freshwater and seawater are led into a closed system. Before entering the membrane modules unit, the seawater is pressurized to about half the osmotic pressure, (approximately 12-14 bars). In the module freshwater migrates through the membrane into the pressurized seawater. The freshwater that doesn't migrate is discharged. The excess of diluted and pressurized seawater is split into two streams. One third of this pressurized seawater is used for power generation in a hydropower turbine, and the remaining part passes through a pressure exchanger in order to pressurize the incoming seawater. The two thirds fraction is diluted seawater that will be led either back to the river mouth or into the sea. - <u>Reversed electrodialysis (5):</u> a salt solution and freshwater are let through a stack of alternating cathode and anode exchange membranes. The chemical potential difference between salt and fresh water generates a voltage over each membrane. Due through difference in ion concentration electric energy is produced.	- Sustainable power generation. - Can be constructed in saline or brackish waters combination with artificial islands and/or soft defence structures.

6 & 7. Tidal-stream & Tidal-barrage	- Tidal energy can directly be produced by tidal-stream or indirect by tidal difference with the help of a barrage. - Tidal-stream principle (6): by means of turbines located at location with high flow velocities. - Barge principle (7): by means of a dam, the tide can be controlled. To gain energy, the incoming tidal wave is stored in the estuary and released via the turbines (producing energy) located in tunnels with valves during a lower outside water level, but before the new tidal wave arrives. A double basins can be applied to have a constant energy production for an higher efficiency rate. The tidal range should be ≥5m to be feasible.	- A tidal-stream turbine can be connected at existing foundations for wind turbines at sea or bridges in estuaries. - Build in existing closure dams and sluices the tide is returning in previous closed reservoirs resulting in new socio-economic and environmental opportunities.
8. Waves	Wave energy can be used in two ways to produce electric energy: - By means of wave generators positioned at the sea bottom or floating on the water surface. Due to the pressure difference captured by a hydraulic system, land or sea based generators produce electricity. - Oscillating Water Columns (OWCs) are devices that generate energy from the rise and fall of water caused by waves and tides in the ocean. As water rises and falls around and inside an OWC, air is displaced by the water in a collecting chamber and pushed back and forth past a bidirectional turbine which converts the airflow into energy.	- OWCs can be constructed in combination with hart sea defence structures
9. PSP's: Pumped Storage Plants	- These facilities are used for energy storage. During low-cost off-peak electric power (night-time), pumps transport water from a lower elevated land reservoir to a higher located reservoir. During periods of high electrical demand, the stored water is released through turbines to produce direct available electric power. - In existing water body's like lakes and seas the opposite is applicable. During high tides, the valves can be opened filling the lake and running the turbines. During low tide, the stored water can be released again. This is also a safe option, since flood waves are not possible to occur in the situation of a dam or dike failure. - The pumps can also be powered by wind- or solar energy, making a constant electricity production possible. - Applicable on a very small / local scale.	- Sustainable power generation. - Stable water supply / water security for drinking and/or irrigation. - Land reclamation (artificial lake in a existing water body or in sea). - Recreation & aquatic beauty. - Fishing. - Reuse of old mine shafts.

Table D.4: Characteristics Hydropower Plants (Molenaar et al., 2012; Ravesteijn et al., 2013).

- Industry and Energy sectors: include strict pollution prevention measures and policies to prevent discharges of heavy metals, chemicals and biological contaminated wastewater from industrial processes. Also, warm water residue used in the cooling process from conventional fossil fuels (coal, oil, natural gas and peat) energy production power plants need to be regulated due to its negative effects on the ecosystem (S, M, L).
- Agreements between the down- and upstream users with regards to fresh water usage, water quality, shipping navigation, flood protection and hydropower facilities (S, M, L).
- Link raw material and final product transportation of industrial products with shipping navigation, like; steal and cars, cotton and cloths, barley and beer, etc. (M & L).

Due to the strong interrelation with all the other Water Management Development Themes, Water for Industry & Energy, should be integrated in the overall PRIMO-chain. Maintenance and optimisation are also constant activities. Since all are interlinked by the same water resource, the benefits and operation and maintenance cost should be shared.

Evaluation

- Industry: Water pollution / Industrial or Energy production activity.
- Hydropower: Amount of renewable water energy / Area of operations.
- Sustainability: Amount of renewable water energy / Total energy production.

D.9 Water for Recreation & Tourism

This paragraph provides a generic overview describing possible activities within the Water for Recreation & Tourism water management development theme[12]. In this situation recreation and tourism are defined as:

- Recreation: is the activity of refreshment of one's mind or body after work through activities that amuses or stimulates the host-nation population in their area of living.
- Tourism: people who travel (international or national and host- or non-host country citizens) to and staying in a places outside their usual living environment for a limited time period for leisure religious, family or business purposes.

Due to the fact that recreation and tourism are pleasure and relaxing activities indicating a certain amount of pleasure, joy and improvidence, the recreation and tourism scales are important indicator for peace, security and socioeconomic development within the area of operations.

Purpose

Establishing, maintaining and improving recreation and tourism activities related or dependent on water use in a sustainable manner.

[12] This paragraphs is developed by the author based on: Savenije, 2007; Ven, 2011; Verhagen, 2014.

Method

Since recreation and tourism are pleasure and relaxing activities which can be performed when a certain level of security and welfare is established, both are considered *medium*- and long-term activities. Examples of non-water related recreation and tourism activities are:

- Facilitating sport and music facilities (M & L)
- Facilitating children's playing grounds (M & L).
- Amusement parks and Zoos (L).
- Cinema's & theatres (M & L).
- Restaurants, bars, cafe's, disco's and clubs (M & L)
- (Re)construction of the destroyed hotels (L).
- (Re)construction of destroyed museums and cultural landscapes (M & L).

Since open water bodies in the public space increases the level of attractiveness level for socioeconomic development and liveability, these facilities can be constructed along rivers, lakes, beaches, dunes and mangrove forests. More specifically, below the kind of activities to stimulate recreation and tourism water related are listed:

- Sailing, boating, rowing and canoeing facilities (M & L).
- Swimming facilities (M & L).
- Creating double function for living and reaction with the development themes Water for Safety & Shipping and Water for Nature (see paragraphs D.7 and D.5). A couple of examples are; living in floating houses, hotels in natural areas like mangroves, beaches and dunes, walking and cycling paths in natural areas, agriculture and recreation facilities in floodplain areas, etc. (M & L).

A good water quality is the most significant condition for this water management development theme. Therefore it is direct related with the Water for Drinking, Nature and Health development themes (see paragraphs D.4, D.5 and D.6).

Evaluation

- Recreation and tourism connectivity: Amount of recreational areas and tourism locations / Area of operations.
- Peace, security and socioeconomic development: Used recreation or tourism locations / Area of operations.
- *Area's attractiveness for recreation and tourism: Amount of people / Recreation area.*

E

Emergent & Future Conflict Drivers

A conflict is a situation where two or more actors or actor groups have a disagreement. Change and different opinions, values and norms are the most common cause for conflicts. Maill (2007) discusses a wide range of emergent conflict formations of all kinds associated with political, economic, cultural and environmental change. These changes, especially when they occur rapidly and governances systems are weak, contribute to the fragility of a state (FFP, 2014; Clingendael, 2014; HCSS, 2014). Figure E.1 illustrates the current fragile states.

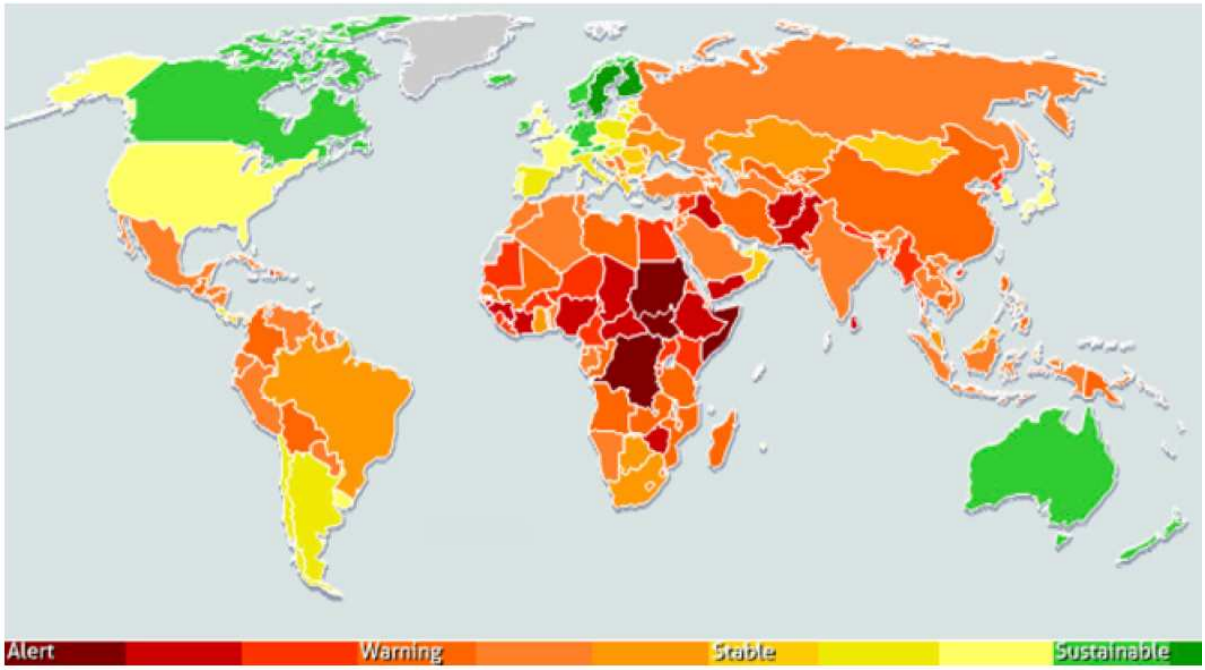


Figure E.1: The Fragile States Index 2014 (FFP, 2014).

The determinant factor in preventing violent conflicts, is institutional capacity. Institutional capacity can be split-up in three levels (Clingendael, 2014; FFP, 2014; Ramsbotham et al., 2011):

- Intentional level: in the form of international institutes, norms.
- National level: in the form of state institutions, parliaments, laws, etc.
- Sub-state levels: local communities, civil associations, etc.

As displayed in figure E.1 the institutional capacity is strong in the green zones. Here the risks of violent conflicts are low. Whereas in de orange and red zones, institutional capacity is weak resulting in an high risk for violent conflicts. Institutional capacity is especially weak or non-existent in countries where states have failed or are failing and economies are stagnating.

According to Ramsbotham et al. (2011) social change is in itself conflictual, because shifting contexts generate varying focal points for competing interests including advantage and disadvantage for specific actors or groups. But what dictates emergent conflicts and, what are the future drivers of violent conflicts? This will be discussed in the following sections.

First, in paragraph E.1 emergent conflict formations that seem to be appearing will be elaborated. After, in paragraph E.2 the predicted root-causes of future drivers of conflict will be discussed following from the identified global risks trends. In paragraph E.3 the levels of risk unpreparedness per region is elaborated. Future water challenges will be discussed in paragraph E.4 Finally, this paragraph is concluded in paragraph E.5.

E.1 Emergent Conflicts

Predicting the future is impossible. Nevertheless, the following four main types of large-scale conflict seem likely to recur (Clingendael, 2014; HCSS, 2014; Ramsbotham et al., 2011):

- **Interstate conflicts:** conflicts between states.
- **Ethnonational conflicts**: conflicts to determine the identity of the states.
- **Ideological-government conflicts:** conflicts to decide the nature of the state.
- **Economic-factional conflicts:** conflicts to control the resources of the state.

These large-scale conflicts are characterised as hybrid, multilevel, multifactorial and sometimes transforming rapidly due to the constant changes within the dynamic playing field. Next, these four main types of larger-scale conflicts are explained by means of past and present examples or future scenarios.

E.1.1 Interstate Conflict

Based on the current prediction, is seems predictable that the Chinese GDP per capita will reach half that of the United States around 2050. Given population discrepancy, this means that in 2050 the total Chinese GDP may be one and a half times that of America, perhaps even more. What will be the implications of this change? Probably this will be accompanied by a transformation of global norms and values which currently are dominated by western nations. Will the balance of power adjustment be intense as the rise of Nazi Germany, will it be a relative more peaceful eclipse like the fall of British empire and hegemony by that of the United States, or will it be as turbulent as the break-up of the Soviet Union? Furthermore, is a future war between India and China over the control of sea routes avoidable? Will war result from the growth in Chinese power and the fear this causes in America? Usually, the balance of power shifts is the most dangerous period, but it is possible to avoid armed conflicts between great powers as the breakup of the Soviet Union explains. Furthermore, since nuclear weapons are a part of the deterrence strategy, they are unlikely to be used within interstate wars (Ramsbotham et al., 2011; Clingendael, 2014; HCSS, 2014).

E.1.2 Ethnonationalist Conflict

The continuing mismatch between borders of approximately 200 states and the geographical distribution of people, according to some as many as 5.000 groups that have ambitions for independence, can result in regional political, social and economical tensions ultimately resulting in armed conflicts. Breaking-up the current state system would not help because, however small the fragments will be, there will still be smaller minorities cut off within them. At the micro-level, conflicts between social groupings down to clan and sub-clan levels, associated with different economic means of subsistence and cultures, continue to pose a challenge in containing state structures (Clingendael, 2014; HCSS, 2014; Ramsbotham et al., 2011).

This is experienced by the break-up of the former Yugoslavia. The Ukraine case is an example of an ethnonationalist conflict. Moreover, it indicates that ethnonationalist conflict can be expected in the future more often.

E.1.3 Ideological-government Conflict

Ideological-government conflicts are characterised by the struggle of determining the nature of the government, like: fascist versus democratic, communist versus capitalist, religious versus secular, and intra-religious struggles to define and impose orthodoxy. Few predicted the increase of religious conflicts over the past thirty years. The fertiliser and support for these alternatives appear when existing systems of government prove to be incapable of meeting needs and delivering the desired goods (Clingendael, 2014; HCSS, 2014; Ramsbotham et al., 2011).

The emerging fascist and communist systems during the time of the great depression in the 1930s is just an example. During the great depression the income of the middle-class was heavily decreased. This served as the fertiliser for a strong desired change, which was provided by these new political systems (Ramsbotham et al., 2011).

E.1.4 Economic-factional Conflict

Economic-factional conflict can be the underlying root cause for Interstate, Ethnonational and Ideological-government conflicts and is characterised as long-lasting. It starts to dominate when weak states can no longer control vicious political struggle to seize state assets. In these circumstances, warlords and international criminality changes the way resources are exploited. The exploitations of resources become a way of life, including a self-reinforcing 'cultures of violence' embedded in almost every aspect of civilian life (Clingendael, 2014; HCSS, 2014; Ramsbotham et al., 2011). The Taliban regime in Afghanistan showed these characteristics.

E.2 Future Drivers of Conflict

Beneath the in paragraph E.3 covered main conflict types lie deep-rooted or protracted social conflicts. The World Economic Forum has mapped the current and future global risks[13] in terms of likelihood and impact. When managed inappropriate, these risks are the drivers for future violent conflicts (WEF, 2015; Clingendael, 2014; HCSS, 2014; Ramsbotham et al., 2011). By means of the categories: Economic; Environmental; Geopolitical; Societal; and Technological the risks landscape is presented in figure E.2 and explained in more detail by table E.1 Moreover, the explained risks and their interconnections are mapped by means of figure E.10. A better understanding of these global risks and their interconnections is key to prepare, mitigate and prevent them.

The ultimate target of long-term violent conflict prevention needs to be focussed on strategies to overcome the identified global risk trends. The flowing risk trends ordered by theme are current or predicted main root-causes of conflict (WEF, 2015; Clingendael, 2014; HCSS, 2014; Ramsbotham et al., 2011):

- **Societal:** socioeconomic inequality, structural unemployment, public health inequality, effects associated with climate change, gender oppression and shifting global norms and values.
- **Geopolitical:** interstate conflicts, national sentiment, weakening of international governance, weapons of mass destruction, terrorism, weak rule of law and energy price shock to the global economy.
- **Economic:** economic bubbles, unemployment, deflation and failure of financial mechanisms, and averting decision makers attention away from continuing economic reforms.
- **Environmental:** water crisis, failure of climate-change adaptation, biodiversity loss, man-made catastrophes, large-scale involuntary population migration and movements.
- **Technological:** the rise of hyperconnectivity.

In the next sections, after the figures and table, these root-causes of future drivers of conflicts are briefly discussed.

[13] Risk is modeled: Risk = Likelihood x Impact.

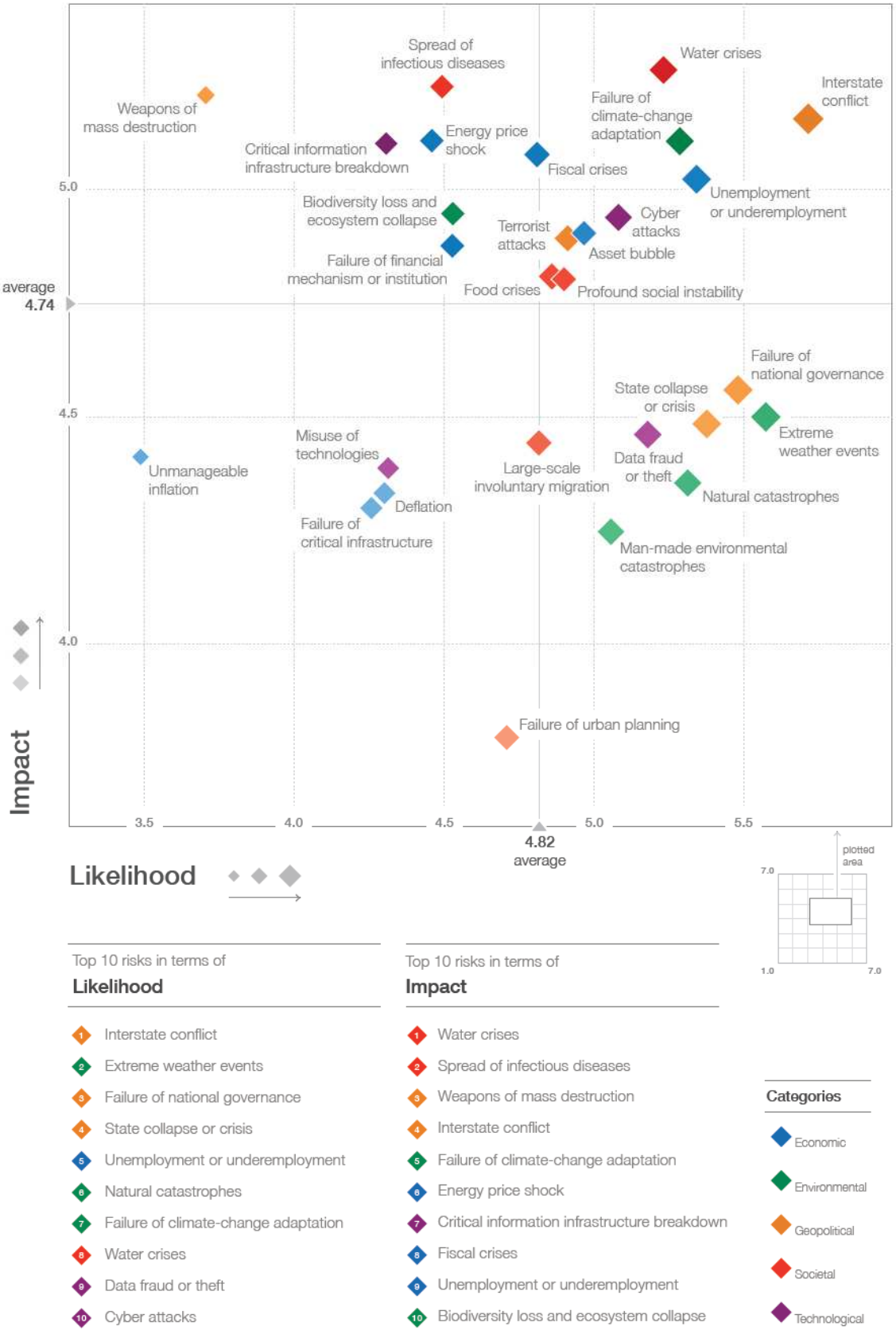


Figure E.2: The Global Risks Landscape 2015[14] (WEF, 2015).

[14] Note: Likelihood and impact of the individual risks is modeled on a scale of 1 to 7. One represents a risk that is not likely to happen or has a small impact, and seven is a risk very likely to occur and with massive and devastating impacts.

	Global Risk	Description
SOCIETAL	Failure of urban planning.	Poorly planned cities, urban sprawl and associated infrastructure create social, environmental and health challenges.
	Food crisis.	Access to appropriate quantities and quality of food and nutrition becomes inadequate, unaffordable or unreliable on a major scale.
	Large-scale involuntary migration.	Large-scale involuntary migration due to conflict, disasters, environmental or economic reasons.
	Profound social instability.	Major social movements or protests (street riots, social unrest, etc.) disrupt political or social stability, negatively impacting populations and economic activity.
	Rapid and massive spread of infectious diseases.	Bacteria, viruses, parasites or fungi cause uncontrolled spread of infectious diseases (for instance due to resistance to antibiotics, antivirals and other treatments), leading to widespread fatalities and economic disruption.
	Water crisis.	A significant decline in the available quality and quantity of fresh water, resulting in harmful effects on human health and/or economic activity.
GEOPOLITICAL	Failure of national governance.	Failure of national governance due to corruption, illicit trade, organised crime, impunity, political deadlock, etc.
	Interstate conflict with regional consequences.	A bilateral or multilateral dispute between states escalates into economic (trade/currency wars, resource nationalization), military, cyber, societal or other conflict.
	Large-scale terrorist attacks.	Individuals or non-state groups with political or religious goals successfully inflict large-scale human or material damage.
	State collapse or crisis.	State collapse of geopolitical importance due to internal violence, regional or global instability and military coup, civil conflict, failed states, etc.
	Weapons of mass destruction (Nuclear, Chemical, Biological & Radiological).	Technologies and materials are deployed creating an international crisis and potential for significant destruction.
ECONOMIC	Asset bubble in major economy or region.	Unsustainable overpriced assets such as commodities housing, shares, etc.
	Deflation in a major economy or region.	Prolonged ultra-low inflation or deflation.
	Energy price stock to the global economy.	Sharp and/or sustained energy prices increase that place further economic pressures on highly energy-dependent industries and consumers.
	Failure of a major financial mechanism.	Collapse of a financial institution and/or inefficient functioning of a financial system with implications throughout the global economy.
	Failure / shortfall of critical infrastructure.	Failure to adequately invest in, update and secure infrastructure networks leading to a breakdown with system-wide implications.
	Fiscal crisis in key economies.	Excessive debt burdens generate sovereign debt crisis and/or liquidity crisis.
	High structural unemployment or underemployment.	A sustained high level of unemployment or underutilisation of the productive capacity of the employed population.
	Unmanageable inflation.	Unmanageable increase in the general price level of goods and services in key economies.

ENVIRONMENTAL	Extreme weather events (floods, storms, etc.).	Major property, infrastructure and environmental damage as well as human loss caused by extreme weather events.
	Failure of climate-change adaptation.	Governments and businesses fail to enforce or enact effective adaption measures to protect populations and to help businesses impacted by climate change.
	Major biodiversity loss and ecosystem collapse (land & ocean).	Irreversible consequences for the environment resulting in severely depleted resources for humankind and industries such as fishing, forestry, pharmaceuticals.
	Major natural catastrophes (tsunami, earthquake, landslides, volcanic activity / eruption, geomagnetic storms, etc.).	Major property, infrastructure and environmental damage as well as human loss caused by geophysical disasters.
	Man-made environmental catastrophes (oil spill, radioactive contamination, etc.).	Failure to prevent major man-made catastrophes causing harm to lives, human health, infrastructure, property, economic activity and the environment.
TECHNOLOGICAL	Breakdown of critical information infrastructure and networks.	Systemic failures of critical information infrastructure (Internet, satellites, etc.) and networks negatively impact industrial production, public services and communications.
	Large-scale cyber attacks.	State-sponsored, state-affiliated, criminal or terrorist large-scale cyber attacks cause an infrastructure breakdown and/or loss of trust in the Internet.
	Massive incident of data fraud/theft.	Criminal or state-sponsored wrongful exploitation of private or official data takes place on an unprecedented scale.
	Massive and widespread misuse of technologies.	Massive and widespread misuse of technologies, such as 3D printing, artificial intelligence, geo-engineering and synthetic biology, causing human, environmental and economic damage.

Table E.1 : Global Risks 2015 (WEF, 2015).

E.2.1 Societal Risks

The societal root-causes of conflicts and their effects are measurable by means of the in figure E.3 displayed risk indicators. Moreover, figure E.3 gives an indication of expected risk increase or decrease associated with the societal root-causes of conflict.

Economic, societal and environmental developments are the underlying fuels for fragility of societies. A major driver of social fragility is rising **socioeconomic inequality** within countries. (WEF, 2015; Clingendael, 2014; HCSS, 2014; Ramsbotham et al., 2011). According to the World Institute for Development Economic Research and the Organisation for Economic Co-operation and Development:

> "*While the richest 10% of the adults of the world own 85% of global household wealth, the bottom half collectively owns barely 1%. Even more strikingly, the average person in the top 10% owns nearly 3.000 times the wealth of the average person in the bottom 10%*" (Rogers, 2007).

North America, Europe and the rich Asia-Pacific[15] own 88 per cent of global household wealth. It can be stated that wealth discrepancy is extreme. While extreme poverty (income is less than $1.25 per day) was reduced from 50% of the world's population in 1990 to 22% in 2010, the same reduction did not take place in those earning under $3 per day. Rapid recent economic growth in countries like China and India are lifting millions of people out of extreme poverty into the middle-class, but yet remaining poor. The rising expectations and loss of basic necessities in a society are recognised as more dangerous than poverty (WEF, 2015; Ramsbotham et al., 2011).

[15] Rich Asia-Pacific: Japan, South Korea, Taiwan, Singapore, Australia and New Zealand.

Rising structural unemployment drives both inequality and social pressures. Population growth is expected especially in the poorer parts of the word. This will concentrate an increasing numbers of unemployed young people, particularly man, in politically fragile and often autocratic and repressive states without hope for a better future. Furthermore the expected lower economic growth and technological changes are likely to keep unemployment high in the future, also in developing countries. Kept on the margins of global capitalism and largely excluded from rapid development in the richer areas, a huge amount of recruits for revolutionary movements and black market operations is continually being replenished. In combination with the spread of connectivity and the fact that these populations are increasingly concentrated in cities, protest movements can mount more quickly. These possible unrests accompanied with violence could easily spill over from individual countries to others and thereby affecting the global economy. The 'Arab Spring' is regarded as an actual outcome of this risk event (WEF, 2015; Clingendael, 2014; HCSS, 2014; Ramsbotham et al., 2011).

Also, economic inequality is having clear links with **public health** and global security. As with poverty, the world has a unequal disease burden. This global health inequality is not only a medical capacity problem. With increasing pandemics and diseases being regarded as threats of national security, it is a political problem (WEF, 2015; Ramsbotham et al., 2011).

The effects associated with **climate change** will put further pressure on societies. The expected regional ability or inability to grow food and have access to water can cause sudden and uncontrolled population migrations. Already in 2014, the number of worldwide refugees due to environmental or conflict-related causes reached the highest level since World War II putting additional socioeconomic and political pressure on the receiving countries (WEF, 2015; NATO-EAPC, 2014; Ramsbotham et al., 2011).

The continuing plight of **gender oppression**, oppressed by structures and traditions is highlighted as a deep sources of future conflict. Furthermore emancipation struggles will challenge most of the dominant power structures, attitudes and behaviours which will cause social tension, change and conflicts (Ramsbotham et al., 2011).

Western liberal values like; democracy, human rights, free markets, secularism, developed civil societies, individualism and the state system itself have been dominant for the last centuries. Due new rising economic and political powers and changing demographic weight of non-western societies[16], the **global political and culture norms will change**. Cultural and social change is always a base for conflict. If these occur to rapidly, the change itself is predicted to be a root-cause for conflict (Ramsbotham et al., 2011).

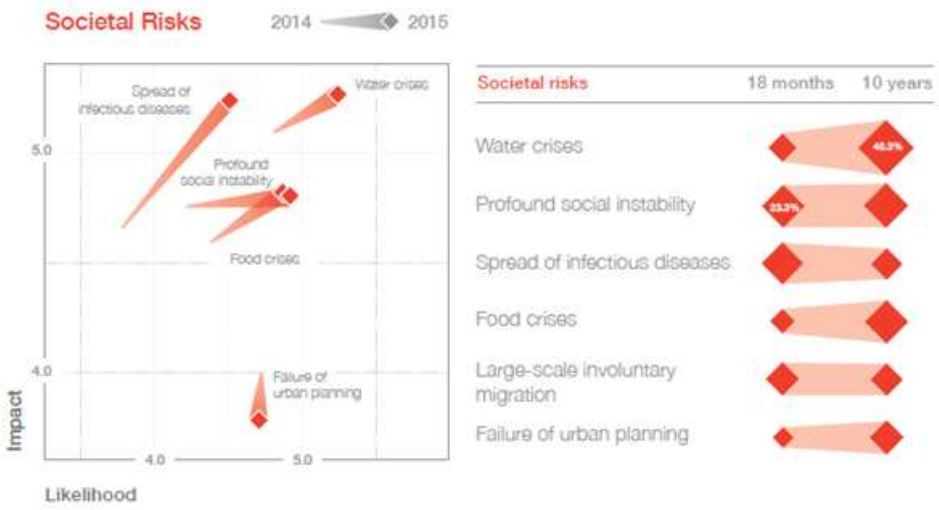


Figure E.3: Changing Societal Risks (WEF, 2015).

[16] At the beginning of the twentieth century, Europe's population counted for 25% of the world's population. By 2050 it is predicted to fall to 7.5%. In 1950 the combined Arab population was 60 million, compared with 120 million of the three main imperial powers in the region: Britain, France and Spain. By 2000 the population of Iraq alone, which had been 2 million in 1918 compared with UK's 45 million, had reached 30 million (Ramsbotham et al., 2011).

E.2.2 Geopolitical Risks

Interstate conflicts is considered the most likely high-impact risk over the next 10 years. Primarily, short-term geopolitical risks are more likely compared with the long-term (WEF, 2015; Clingendael, 2014; HCSS, 2014). Interstate conflicts are no longer physical but also uses economic means and cyber warfare to attack people's privacy as well as intangible assets. These geopolitical risks can have cascading impacts on other risks. As state structures are challenged by conflict, the risk of failure of national governance and state collapse or crisis can increase in areas where current state boundaries do not necessarily reflect popular self-identification (WEF, 2015; Clingendael, 2014).

A recent example is Iraq and Syria, where ISIS has claimed control over large territories and attracted 20,000 to 30,000 fighters. The rapid rise and brutality of ISIS as well as the response of the international community underlies the increased likelihood and impact to the risk of the deployment of **weapons of mass destruction** and the higher potential impact associated with large-scale **terrorist attacks** (WEF, 2015; Clingendael, 2014).

Due to the rise of new economic, political and military powers, it is believed that the world is entering a new era of strategic competition among global powers. In combination with the disappointment of globalisation and the rise of **national sentiment**, a more self-interested national focussed foreign policy is expected to become leading. Growing nationalism is evident around the world: in Russia, as seen in the Crimea crisis; in India, with the rising popularity of nationalist politicians; and in Europe, with the rise of far-right, nationalistic and Eurosceptic parties in a number of countries. Due to the expectation that economic growth and the creation of employment will remain below pre-crisis levels in the emerging markets as well in the advanced economies, the driver of nationalism will remain strong. More frequent and impactful conflicts among and within states due to national sentiment issues is likely (WEF, 2015; Clingendael, 2014).

Rising nationalist sentiment and declining trust among global players are contributing to a **weakening of international governance**. This is undermining the international community's ability to act decisively on issues such as conflict resolution, Internet governance, climate change and the management of oceans. Failure to collaborate and implement common solutions in these areas could significantly undermine future global growth (WEF, 2015; Clingendael, 2014).

Failure of national governance is the third most likely risk across the global risks landscape. This risk area captures a number of important elements resulting in the inability to efficiently govern, like; result of corruption, illicit trade, organised crime, the presence of impunity and generally **weak rule of law**. Over the past years, the links between many forms of global crime and corruption and their impact on global security, extremism, terrorism and fragile states have only grown stronger, and it is critical to acknowledge and address them through more effective policies that curb illegal financial flows, foster transparent governance and build capacity around anti-crime efforts at the national and local levels (WEF, 2015; Clingendael, 2014; FFP, 2014).

The growing interconnectedness of the global economy increases the economic effects of every geopolitical conflict. Supply chains that run across countries in conflict could be interrupted, leading to disruptions in the availability of goods or energy. Although the availability of alternative energy resources is increasing, the risk of an **energy price shock to the global economy** is likely to occur (WEF, 2015; Clingendael, 2014). Moreover, based on local strategic interests, nations can use economic means as a leverage point in the negotiation process or apply it as a manner of controlling other nations economies, like the gas and oil providing country actually do every day.

Within the dynamic world of emerging and potential future conflicts, **weapons mass destruction** will mainly function as a defence by deterrence weapon by the few military powers which own them (NATO, 2010).

When these are falling into the hands of governments or groups willing to use them, a catastrophic scenario is thinkable. The detonation of a 'dirty nuclear bomb' as a mean of **terrorism** in one of the metropolitan cities or contamination of the water supply by biological or chemical weapons, can be a cause for starting an large armed conflict (WEF, 2015; Clingendael, 2014; Ramsbotham et al., 2011).

The geopolitical root-causes of conflicts and there effects are measurable by means of the in figure E.4 displayed risk indicators. Moreover, figure E.4 gives an indication of expected risk increase or decrease associated with the geopolitical root-causes of conflict.

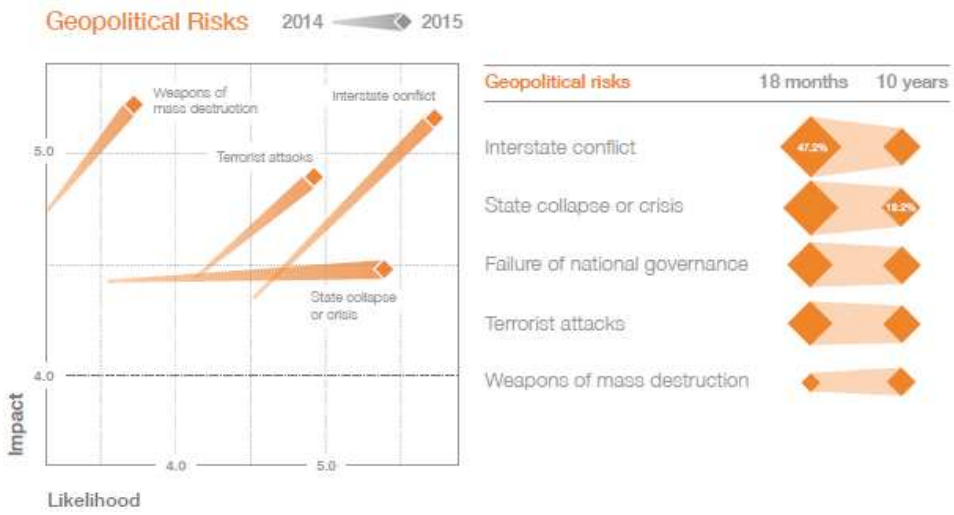


Figure E.4: Changing Geopolitical Risks (WEF, 2015).

E.2.3 Economic Risks

The global economy is slowly returning to growth. Also policies have been adopted to reducing the likelihood of another financial crisis. The most significant change, is the change in mentality how to achieve economic stability. Keeping inflation low while achieving robust growth, was the traditional goal of the central banks. Now, central banks try to preserve financial stability by means of avoiding risky bubbles through macro-prudential regulation and supervision of the financial system. However, **economic bubbles**, resulting in credit booms and asset bubble resulting in bank bailouts and recession in the real economy, are very hard to identify and macro-prudential regulation has not historically been effective because it excludes the unregulated 'shadow' monetary system. Moreover, loose monetary policy is the root-cause of all economic bubbles. Keeping strict monetary policies in both advanced and emerging markets will be a difficult issue for central banks in the years to come. Furthermore, despite recent efforts deflation pressures or the bursting of an asset price bubble could still result the failure of a major financial mechanism or institution (WEF, 2015; Clingendael, 2014) Thus, the adopted policies to prevent risky economic bubbles reflect as false sense of control (WEF, 2015).

The global **unemployment** rate is expected to remain at current levels until 2018. Hereby the growing problem of structural unemployment in the advanced economies is reflected. It is likely wages will be low and thereby maintaining deflation pressures, especially in the Eurozone. Furthermore, a build-up of public and private debt within many major economies over the past years imposes the possible risk that **deflation** can reduce the ability for repayment and thereby threatening the future stability of the financial system (WEF, 2015; Clingendael, 2014).

The risks of **failure** of major **financial mechanisms** or institution and fiscal crisis are expected to stay the same in the coming ten years. In addition, other risks such as a water crisis, interstate conflict and the failure of climate-change adaptation, have taken an strong position. The increasing awareness of these risks can result in **averting decision makers attention away from continuing economic reforms**. Maintaining the current momentum of both financial and fiscal reforms will be crucial to avoid another major economic crisis (WEF, 2015; Clingendael, 2014).

The economic root-causes of conflicts and there effects are measurable by means of the in figure E.5 displayed risk indicators. Moreover, figure E.5 gives an indication of expected risk increase or decrease associated with the economic root-causes of conflict.

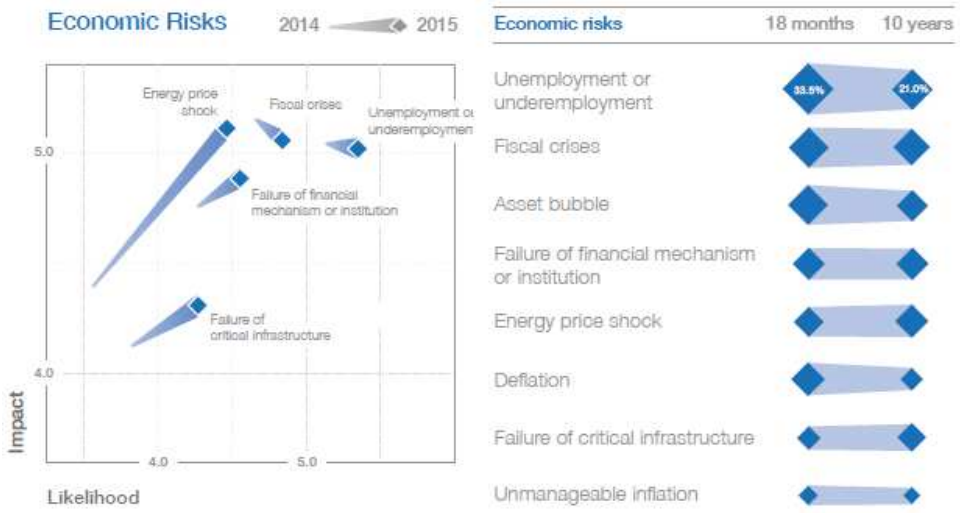


Figure E.5: Changing Economic Risks (WEF, 2015).

E.2.5 Environmental Risks

The results from environment related changes like; material scarcity, climate change and natural resources depletion are widely recognised to have major impacts on social, political and economic security strategies (WEF, 2015; Clingendael, 2014; HCSS, 2014; NATO, 2010; Ramsbotham et al., 2011). Within the top 10 global risks, 3 risk are environmental risks. A **water crisis,** is the most significant one, followed by **failure of climate-change adaptation** and **biodiversity loss** (WEF, 2015). After several decades of a worldwide food surplus, the supply was smaller than the demand. Due to the high cost of agricultural products, 'food riots' occurred in 37 countries. This is a clear example how environmental risk are related with security issues (NATO-EAPC, 2014).

Global water demand is predicted to be pushed beyond sustainable water supplies by 2030. The agriculture sector accounts for the largest proportion of 70% of total water consumption. Due to population growth and dietary habits change, food production will increase with 50% by 2030. Furthermore, water consumption for energy generation and production is expected to increase with 85% in 2035. Moreover, weather extremes causing either floods or droughts in food-producing regions are already resulting in decreasing crop yields resulting in price increases (WEF, 2015; NATO-EAPC, 2014). The situation can even intensify when more **man-made environmental catastrophes** occur. Recent examples include the Fukushima power plant disaster threatening to contaminate both freshwater and seawater, or the Deepwater Horizon oil spill contaminating large sections of coast along the Gulf of Mexico (WEF, 2015)

Overfishing, deforestation and the inadequate management of sensitive ecosystems such as coral reefs are increasing the stress on food and water systems (NATO-EAPC, 2014). The World Bank estimates that 75% of the world's poor (870 million people), make a living from ecosystems including tourism and the goods they produce, while 350 million are affected by the loss of coral reefs. Biodiversity loss is thus directly linked to economic development, food challenges and water security issues (WEF, 2015).

These effects caused by climate change and the failure of adaptation measures will disproportionately affect tropical and sub-tropical areas. Since most of the world's population lives in these areas 'group-identity conflicts' triggered by **large-scale involuntary population migration and movements** are likely to occur (WEF, 2015; Clingendael, 2014; HCSS, 2014; NATO-EACP, 2014; Ramsbotham et al., 2011).

These risks are well known and recognised. Most governments and businesses are although underprepared. The nexus of food, water, energy and climate change will have a major impact on social, political and economic security. A failure of adaption due to the changing environment, can result in a water crisis.

Since a water crisis in the number 2 in the top 10 global risks, it is preserved to be very likely and having an significant impact on the global social, economic and security systems (WEF, 2015; Clingendael, 2014; HCSS, 2014; NATO-EACP, 2014; NATO, 2010; Ramsbotham et al., 2011). In paragraph E.4 the future water challenges and their possible solutions in relation with a water crisis will be discussed.

The environmental root-causes of conflicts and there effects are measurable by means of the in figure E.6 displayed risk indicators. Moreover, figure E.6 gives an indication of expected risk increase or decrease associated with the environmental root-causes of conflict.

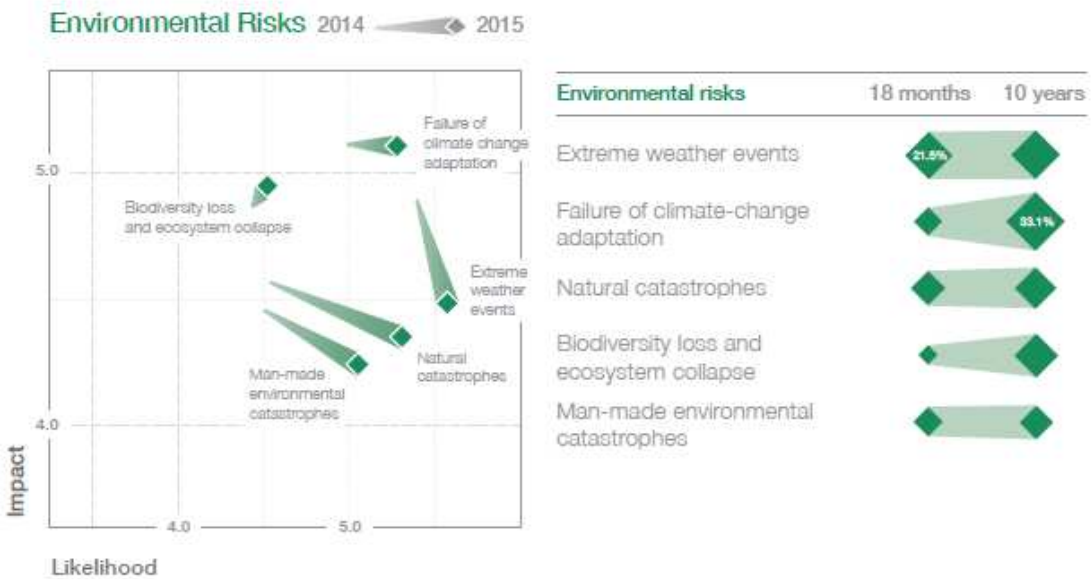


Figure E.6: Changing Environmental Risks. (WEF, 2015).

E.2.6 Technological Risks

While the world wide web thus increase the standard of living and is a driver for new innovations, it will also entail new risks. The **rise of hyperconnectivity** due to the growing number of physical objects connected to the internet, summarises the technological risks possible resulting in (WEF, 2015; Clingendael, 2014; Ramsbotham et al., 2011):

- Misuse of sensitive personal data, like health and finances (privacy security).
- Disruption of business models and ecosystems across a range of industries (data fraud or theft).
- Cyber attacks resulting in the breakdown of critical infrastructure.

In figure E.7 the risk indicators with regards to the technological risks are displayed. Moreover, figure E.7 gives an indication of expected risk increase or decrease associated with the technological root-causes of conflict.

Figure E.7: Changing Technological Risks (WEF, 2015).

E.3 Regional Risk Unpreparedness

The identified global risks are determined by national and local social, economical, political and military characteristics. Therefore, the kind of exposures are dispersed geographically. Because the risk mitigation measures are taken at national and regional levels, so the level of preparedness is. Due to the different characteristics of each region, it is obvious every region has its own set of risks including their level of unpreparedness. Figure E.8 illustrates for each region the top three risks they are least prepared for (WEF, 2015).

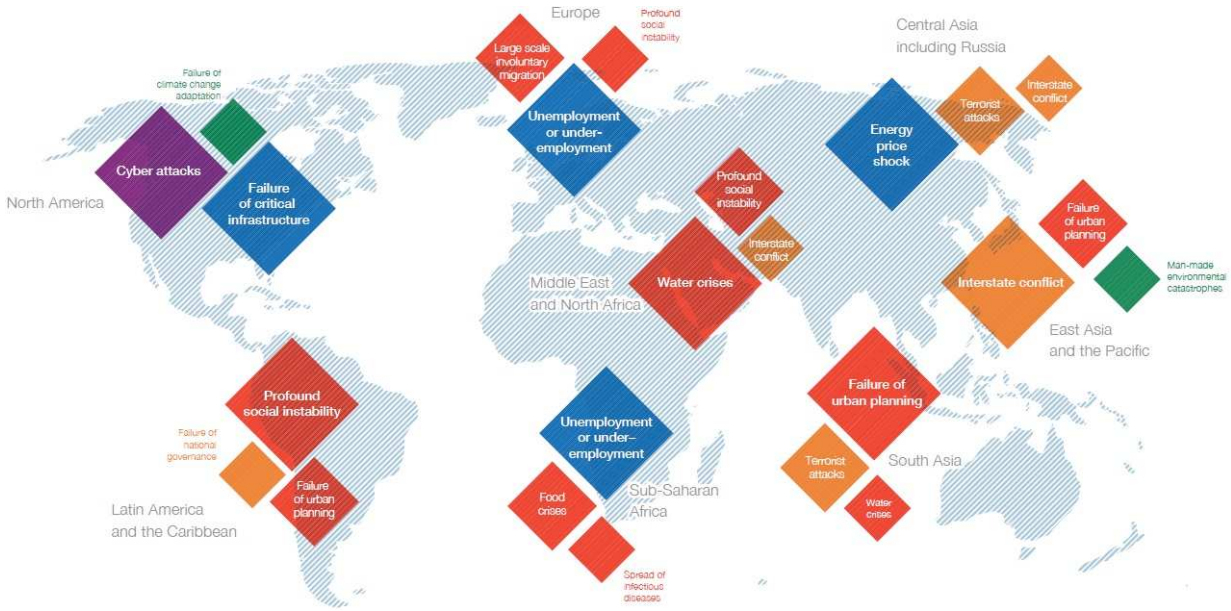


Figure E.8: Global Risks the region is least prepared for (WEF, 2015).

North America top three is represented by failure of critical infrastructure, cyber attacks and failure of climate-change adaptation. This is illustrated by previous major breakdowns of infrastructure due to hurricanes and the large accounted number of cyber attacks (WEF, 2015).

Profound social instability, failure of urban planning and failure of national governance are the first, second and third risk **Latin America and the Caribbean** are least prepared for (WEF, 2015).

High structural unemployment or underemployment is the main risk in **Europe**. Large-scale involuntary migration and profound social instability, are second and third. Unemployment and migration flows into Europe are expected to remain high on the agenda and thereby fuelling social instability (WEF, 2015).

Due to the current and predicted water scarcity, a water crisis is the number one risk the **Middle East and North Africa**. Profound social instability and interstate conflict follow as second and third (WEF, 2015). As figure E.10 illustrates, multiple risks are interlinked with the water scarcity fact. These interrelations also influence the top three identified risks in Europe, Sub-Sahara Africa and Asia.

Sub-Saharan Africa is considered least prepared for unemployment, food crisis and the spread of infectious diseases. Despite expected economic growth, these risks will stay the main future topics due to the expected strong population growth (WEF, 2015).

Central Asia and Russia are highly dependent on nonrenewal resources. Therefore an energy price shock is the most significant risk there are least prepared for. Terrorist attacks and interstate conflict follow as second and third (WEF, 2015).

East Asia and the Pacific is least prepared for interstate conflict and failure of urban planning. Due to the Fukushima incidence in 2011, this region is regarded least prepared for man-made environmental catastrophes (WEF, 2015).

E.5 Future Water Challenges

Today, a fifth of the world's population, 1.2 billion people, are living in areas facing direct freshwater scarcity. In these regions there is simply not enough freshwater to meet all agricultural, industrial and domestic water demands including environmental ones. Almost one billion people do not have access to safe water supplies and three billion people do not have access to adequate sanitation facilities (WWAP, 2003; Wolf, 2007; Ministerie van Buitenlandse Zaken, 2012; OCHA, 2014).

Consequently five to ten million people, most of them children, die each year from water-related diseases, lack of clean drinking or inadequate sanitation. In these vulnerable areas people struggle against draughts while floods take lives, destroy assets and disrupt the regional economy. Due to the rapid population increase and changing consumption patterns, two thirds of humanity will live in areas facing water scarcity by 2025. The increasing water requirements of rapidly growing metropolises, pollution of surface- and groundwater, depletion of groundwater in major food-producing regions, disappearance of wetlands and uneven and often uncontrolled economic development of the few remaining wetlands in Africa and Central Asia are expected to result in loss-loss trade-offs (WWAP, 2003; Wolf, 2007; Ministerie van Buitenlandse Zaken, 2012; OCHA, 2014).

In 2030, the global demand for water is predicted to outweigh the supply by 40% (Brears, 2014). Figure E.9 gives an indication of the forecasted water withdraw and consumption per continent. Trends suggest a population growth of an additional 1.5 billion people by 2050, resulting in a global population of 8.9 billion people (UNEP, 2008). This rapid global population growth primarily causes the steep demand increase regarding freshwater (UNEP, 2008). Consequently drinking water, domestic, healthcare, industrial, economical and energy production related water usages will show strong magnifications. Increasing food demands due to population growth accompanied with the change in diet towards more meat consumption causes that the agriculture sectors will be the largest water user. The strong increase of urbanization, migration from rural to urban areas especially in the developing countries of Africa and Asia, will be accompanied with land-use changes including an increase of water pollution from industrial, organic, chemical and domestic waste. The ecosystem serves as a vital hydrological buffer in absorbing water to prevent flooding, releasing it in times of droughts and functions as the natural air-conditioning by means of forests and vegetation. Its destruction due to pollution will result in even more water management challenges regarding flood and drought control. The effects caused by climate change in combination with the uneven natural freshwater supply and storage over different parts of the world, are regarded as a threat multiplier which need to be mitigated. **Climate change** will increase the frequency and magnitude of precipitation, resulting in more frequent and intense floods and droughts events. Furthermore, sea level rise, deforestation and land subsidence are direct negative and measurable effects of climate change which can be mitigated by human actions (Wolf, 1998; Radif, 1999; Mitchell, 2006; Wolf, 2007; Savenije, 2007; Salman, 2007; Savenije et al., 2008; Hoes et all, 2010; Swain, 2011; Brears, 2014; NATO-EAPC, 2014; OCHA, 2014; WEF, 2015).

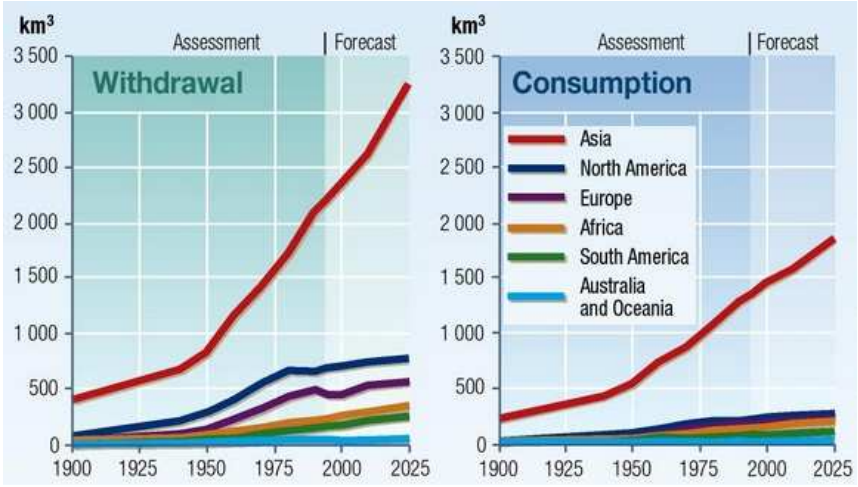


Figure E.9: Prediction water withdrawal and consumption per continent (UNEP, 2008).

Water problems of the future will continue to become increasingly complex and more and more interlinked with other actors in multiple sectors such as agriculture, energy, industry, transportation and communication, education, the environment, health and rural or regional development (Biswas, 2008; Brears, 2014). The above listed factors are strongly interconnected and intertwined with social, economic, environmental, legal and political issues at local and national levels and sometimes even at regional and international levels (Savenije et al., 2008; Biswas, 2008). If water problems are not managed successfully, food supplies will decline, energy available for economic growth will be reduced, the risk of certain diseases will increase, poverty will increase and the environment will degrade. Ultimately, these events can result in social tensions (ICA, 2012; WEF, 2015).

The future water challenges can only be managed by means of cooperation with all the affected water management related stakeholders, disciplines and sectors within an overall societal and development context. Just the proper use of existing technologies will minimize vulnerability, reduce water losses, increase the production and improve the productivity of water used in agriculture, electrical power generation and industrial processes. Moreover, management and planning with respect to further water exploitation should be done comprehensively taken the water demand, water quality, water safety and water supply of the multiple different purposes and functions of water into account (Mostert, 2003; Gourbesville, 2008; Mostert et al., 2008; Bruijn et al., 2008; Zeitoun et al., 2008; Savenije et al., 2008; Weinthal et al., 2011).

E.6 Conclusion

Interstate conflict is the largest identified global risk, followed by a water crisis on the second place. Europe, Latin America and the Caribbean, and the Middle East and North Africa, also include profound social instability among the risks they are least prepared for. Moreover, failure of urban planning is among the first three risks in East Asia and the Pacific, Latin America and the Caribbean, and South Asia. In these regions, urbanization is rapidly increasing. Failure of urban planning can lead to a wide range of catastrophic scenarios, like social unrest or a pandemic outbreak. (WEF, 2015; Clingendael, 2014; Ramsbotham et al., 2011). The identified risks, root-causes and future drivers of conflict are thus interconnected with each other. Some causal relation are stronger than the others. These interconnections are illustrated by means of figure E.10.

As displayed in figure E.10 the occurrence of a strong or a combination of risk events, can be the trigger for future conflict. To resolve conflicts, primarily political and economical strategies are applicable. When these don't have the satisfying results, the possibility exists that police or military means will be applied, resulting in escalation and violent conflicts (WEF, 2015; Clingendael, 2014; Ramsbotham et al., 2011). An example: failure of regional climate change adaption and the global socioeconomic unequal distribution of wealth and opportunities is predicted to accelerate large-scale involuntary migration over the next decades. Existing political structures and policies may be unable to control them, resulting in failure of national governance with an interstate (violent)conflict, a state collapse and a local/regional crisis as result. In addition, inequality and unemployment contributes strongly to social instability and social instability has again an negative impact on equality, employment and wealth creation, closing the cycle of cause-and-effect relationships.

Rising socioeconomic inequality, weak economic growth, food price volatility and food insecurity, unemployment, large-scale migration and the growing heterogeneity and interdependence of societies are among the key drivers of social fragility. Underlying social fragility is also the accelerating pace of change, growing complexity and the increase of global interdependence. All together, these issues reduces people’s feeling of control over their living environment including their feeling of stability and security. A common psychological response to insecurity and perceived loss of control is the desire to turn inwards towards smaller groups that have a stronger sense of identity. The growing social polarization, isolationism and nationalism have the potential to trigger geopolitical conflicts. At the same time, increased global connectivity allows people to make their voices heard and interact with like-minded individuals. Furthermore, the interplay between geopolitical and economic risks related to the challenges of urbanization in developing countries and the rise of technological hyperconnectivity are strong (Clingendael; 2014; WEF, 2015).

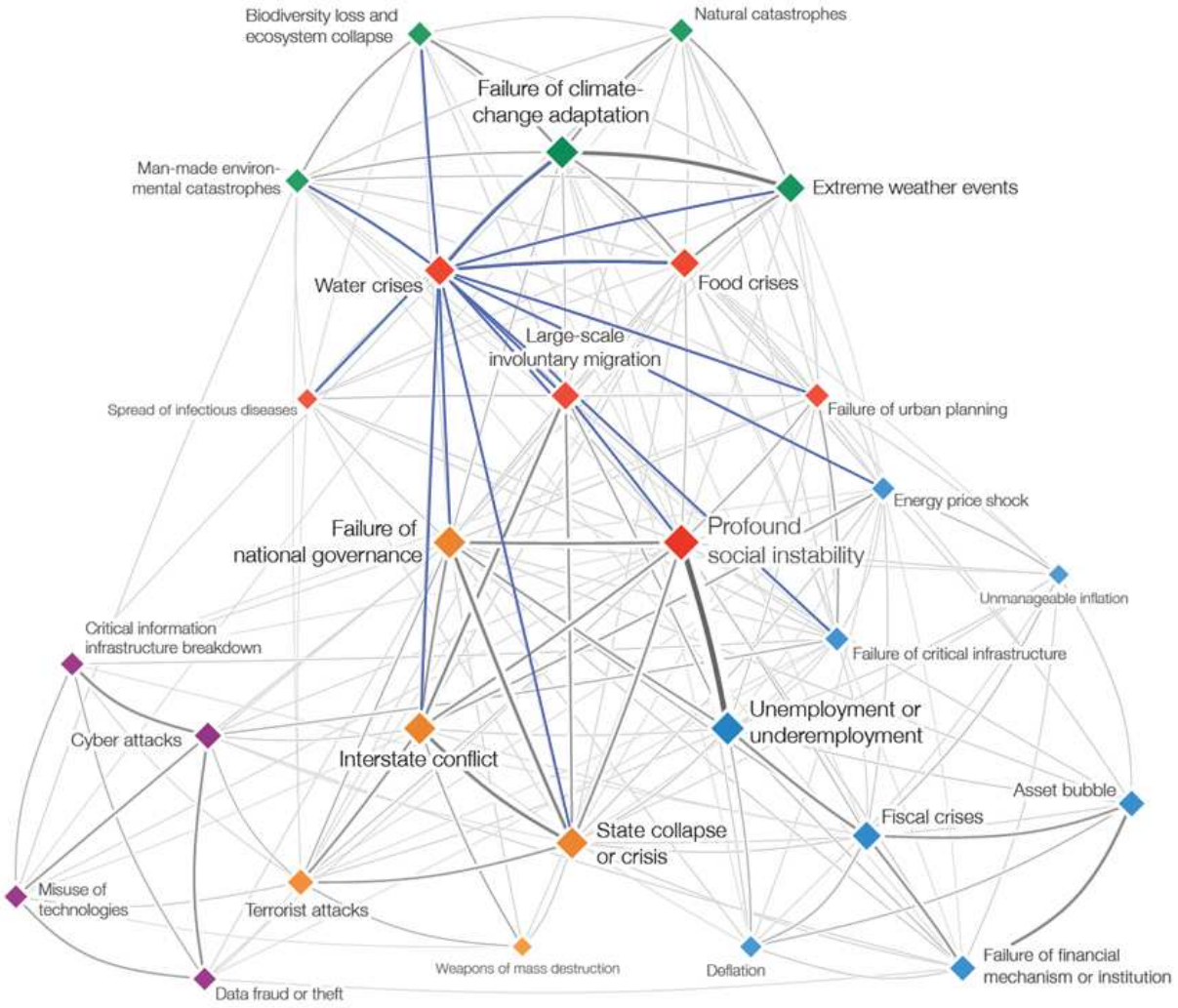


Figure E.10: Global Risks Interconnections Map (WEF, 2015).

Based on these findings, political, social and economic inequalities due to an uneven distribution or exclusion of one actors by another from these resources including humiliation and belittling of (groups of)people, are the root-cause of every conflict (Lucius, 2015; Post; 2015; Berg, 2014). Due to the multi interrelated cause-and-effect relationships within the global risk landscape (see figure E.10), effective governance and risk mitigation needs a coherent and holistic approach where the combination of common interests, cross-cutting identities, international institutions, dispute settlement mechanisms and membership of common security bodies will reduce the risk of violent conflicts. Since water is a transboundary resources vital for the survival for every society, it has the enabling function to act as a peace mechanism since it influences multiple risk and has proven to function as a base of common interests resulting in cooperation. How water functions as a cooperation mechanism is discussed in chapter 6. In addition, the positive potential water management possesses in stabilisation operations is explained in paragraph 1.3.

F

Potential Conflicting River Basins

Table F1 provides a specific overview with regard to potential conflicting river basin systems including the involved riparian states, the type of water issues, expected impacts and their management capacity level. Thereby, management capacity is divined as the strength and resilience of its institutional factors, such as: treaties and river basin organisations that can provide stability, increase cooperation and mitigate political grievances over water.

River Basin:	Type of Water Issues:	Impact/Expected Time:	Management Capacity:
Indus: • China • India • Afghanistan • Pakistan	• Poor water management. • Inefficient agricultural practices. • Soil salinization. • Inadequate infrastructure. • Greater variability in water availability. • Water pollution.	• Degraded regional food security: present to 2040. • Reduced resiliency to floods and droughts: present to 2040.	**Moderate**
Jordan: • Lebanon • Syria • Jordan • Israel • Palestinian (West Bank)	• Depleted shared groundwater resources. • Greater variability in water available. • Water pollution. • Poor coordination between countries.	• Reduced resiliency to floods and drought: present to 2040. • Degraded regional food security: present to 2040. • Continuing regional tensions over water: present to 2040.	**Moderate**
Mekong: • China • Myanmar • Laos • Thailand • Cambodia • Vietnam	• Increased development and demands. • Greater variability in water available. • Changes in sediment flows.	• Reduced regional food security (to include fisheries) and negative impact on livelihoods: present to 2040. • Reduced resiliency to floods and droughts: present to 2040. • Increased regional tension over water development activity: present to 2040.	**Limited**
Tigris-Euphrates: • Iraq • Turkey • Iran • Syria • Saudi Arabia • Jordan	• No multilateral water-sharing agreement. • Increased variability in water supply. • Reduced water flow near-term. • Altered sediment flows to downstream agricultural and marshlands.	• Reduced resiliency to floods and droughts: present to 2040. • Reduced regional food security: present to 2040. • Continued regional tensions over unilateral water development projects and management: present to 2040.	**Limited**
Nile: • Burundi • Rwanda • Tanzania • Kenya • Zaire • Uganda • Ethiopia • Eritrea • Sudan • Egypt	• Decreasing per capita water available. • Inadequate water agreements and management structure. • Greater variability in water available. • Water flow impeded as new dam reservoirs are filled. • Delta erosion.	• Degraded food security: present to 2040. • Reduced resiliency to floods and droughts: present to 2040. • Increased regional tensions over water and use of water as leverage: present to 2040.	**Limited**

Amu Darya: • Afghanistan • Kyrgyzstan • Tajikistan • Turkmenistan • Uzbekistan	• Inadequate water agreements. • Degradation of water quality and disruption of flows some states. • Poor water management.	• Degraded regional food security: present to 2040. • Increased regional tensions over water: present to 2040. • Decreased health of populations around dried Aral Sea.	**Inadequate**
Brahmaputra: • India • China • Nepal • Bangladesh • Bhutan	• Uncoordinated land use and development plans. • Insufficient water agreements. • Reduced water flows. • Saltwater intrusion into the delta.	• Continuing regional tensions over unilateral water development projects: present to 2040. • Reduced potential for hydropower generation in some states: 2020 to 2040. • Reduced regional food security, especially fisheries: present to 2040.	**Inadequate**

Table F.1: Potential conflicting River Basins - Issues, Impacts & Management Capacity (ICA, 2012; FAO, 2015).

G

Stabilisation Operations

The international community has been and remains engaged in a variety of stabilisation operations aimed at improving the security situation and promoting sustainable socioeconomic development in post-conflict areas. Today's stabilisation operations are complex: a diverse mix of peacemaking, peacekeeping; peace enforcement humanitarian operation; reconstruction activities; and diplomatic conflict prevention actions are performed at the same time and in the same area of operations. In addition, the multiple involved local-, national- and international civil- and military organisations are performing the needed activities in an hostile environment with regular violent outburst. The overall level of violence is although decreasing over time (Royal Netherlands Army, 2003; Gabriëlse, 2007; Grandia, 2009; Ministry of Defence, 2013).

The newly developed *Integrated Water Management Development Framework for Stabilisation Operations* is presented in Part III. Since this framework is designed to be applied in stabilisation operations by the Netherlands Armed Forces and its civilian and military partners, it is essential to understand the aim and characteristics of stabilisation operations including effective methodologies. The aim and characteristics of stabilisation operations are discussed in paragraph G1 and its methodologies in paragraph G2.

G1. Aim & Characteristics of Stabilisation Operations

'The aim of every stabilisation operation is to decrease the level and number of violent conflicts and shape the conditions for a self-reliant society including rebuilding the host-nation governmental organisation' (Cooten, 2015). This is accomplished through sustainable, long-term orientated socioeconomic development accompanied with short-term reconstruction acts. Thereby the incentives of the insurgency fuelled by public dissatisfactions are significantly reduced by implementation of the DIME strategy. A safe environment is the crucial precondition. (Royal Netherlands Army, 2003; Koninklijke Landmacht, 2014b; Lucius, 2015; Post; 2015; Berg, 2014). In addition, stabilisation operations should be '*as civil as possible and as military as necessary*' (Gabriëlse, 2007).

These quotes summarise the aim- and approach of stabilisation operations. First, a generically accepted process how a country or region transforms from stable to unstable ultimately resulting in a war[17] or insurgency[18], is described in section G.1.1. The characteristics of an insurgency are elaborated in section G.1.2. Finally, detailed information is provided regarding the aim of stabilisation operations including its approach in section G.1.3.

G.1.1 From Stability to Insurgency.

By means of the flowchart displayed in figure G.1, a generic example is provided of how public dissatisfaction regarding political, economical and social prospects, or a general lack of prospects can escalate to a local, regional or national armed resistance (Royal Netherlands Army, 2003). This type of armed resistance occurring solely within a nation is an insurgency. The same phenomenon can occur between countries or at an international level. In this case, the violent armed conflict is defined as war (Joint Chiefs of Staff, 2013).

[17] War is an armed violent conflict between two or more nations or countries (Joint Chiefs of Staff, 2013).
[18] Insurgency or civil war is an armed violent conflict only within one nation or country (Joint Chiefs of Staff, 2013).

The root cause of every conflict lies in political-, social-, and economic inequalities due to the uneven distribution of resources between groups of actors or the exclusion of one group from resources by another. This also includes the humiliation and marginalisation of (groups of) people (Royal Netherlands Army, 2003; Ramsbotham et al., 2011; Koninklijke Landmacht, 2014a; Berg, 2015).

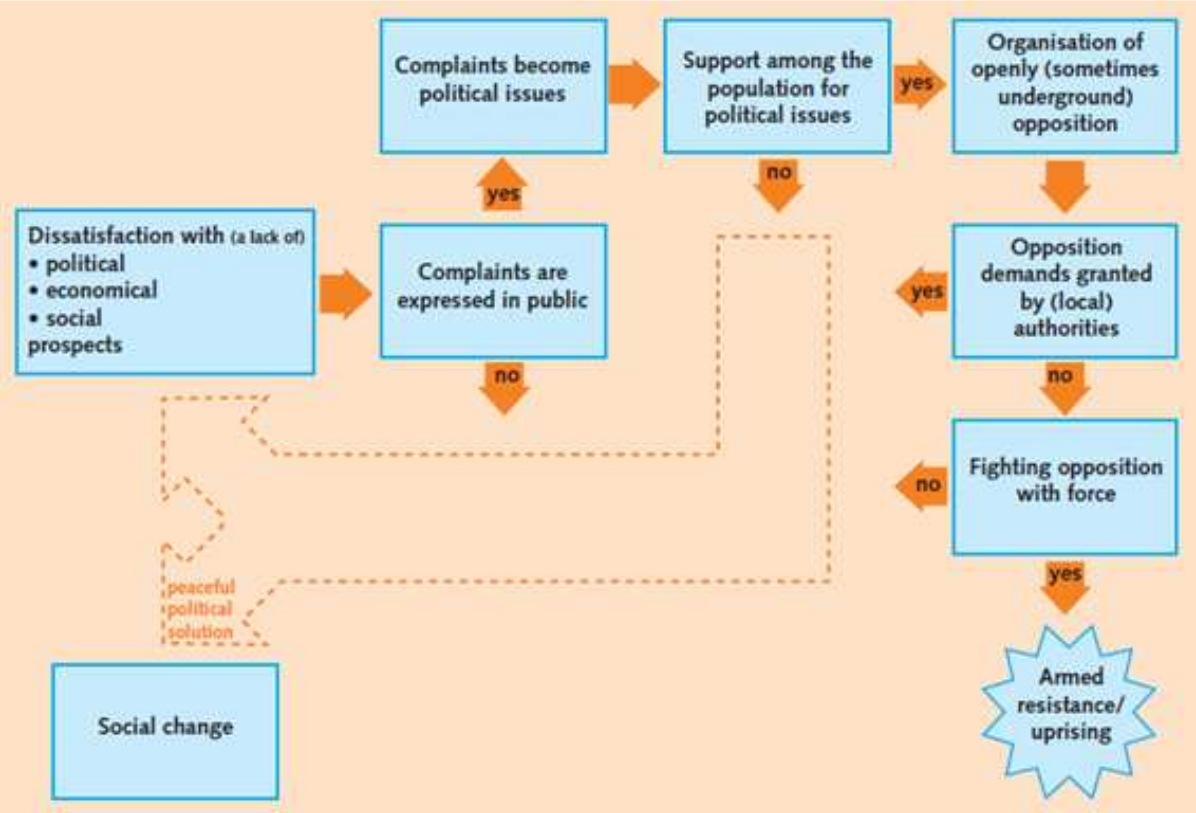


Figure G.1: Example how an armed resistance or insurgencies might develop (Royal Netherlands Army, 2003).

In addition, this example shows the relationships, interactions and consequences of decision-making. If the popular unrest does not lead to public demonstrations, there will be no trigger that ultimately results in an armed resistance. When public manifestations regarding the dissatisfying political situation transform into widely held grievances among the population, then a breeding ground forms for insurgency (Royal Netherlands Army, 2003).

At this stage, the government can take action by addressing some or all of the dissatisfaction. If not, there will be sufficient support among the population for an open opposition. The government may consider the activities of the opposition as a threat and declare them illegal. Through prohibiting political assemblies, suppressing critical media, and imprisoning opposition leaders for sedition, the possibilities for the opposition to express itself democratically are reduced substantially. At this stage, the government can decide to meet some or all of the opposition's demands. If so, the protestors are less likely to take up arms. Instead, the opposition will express its grievances in the form of a political opposition movement. If the government does not meet the demands for change, a dangerous situation will arise. The question is which forms and means the opposition movement may take. Additionally, the extent of force the government is willing to use to suppress the opposition will be a determining aspect. If the opposition decides to continue its political struggle and the government responds with further repressive measures, there is a strong likelihood that the opposition movement will go underground and continue the struggle with military means. Consequently, the situation escalates into an violent uprising against the government. Thereby, the armed insurgency is born. (Royal Netherlands Army, 2003). As displayed in figure G.1, the level of violence increases rapidly from this point onwards.

During the insurgency, a ceasefire including a negotiation process resulting in a joint problem-solving agreement between the government and opposition movement, is an possibility the international community will always support. When the local government in not able to protect their citizen from genocide, war crimes, ethnic motivated exterminations or crimes against humanity, the international community can impose peacemaking in a sovereign state through a stabilisation operation based the responsibility to protect stated in the Charter of the United Nations - Chapter VII[19] (Royal Netherlands Army, 2003; AIV, 2009). Afghanistan, the former Federal Republic of Yugoslavia, and Mali are nations where stabilisation operations are currently conducted. The next section will elaborate on the characteristics of an insurgency.

G.1.2 Insurgency Characteristics

Based on political, social and/or economical dissatisfaction, accompanied with the lack of better prospects, the social opposition can result in armed resistance. This armed resistance is characterised as an insurgency. The insurgency provides a "window of opportunity" to achieve their interests. Their root-causes and operating characteristics differ per country, but can generally be characterised as (Royal Netherlands Army, 2003; Joint Chiefs of Staff, 2013):

- The conflict usually is about freedom, identity and power of certain groups in relation to other groups and/or the government. This could manifest itself in a struggle within the state for territory with the aim to establish autonomy or independence.
- The insurgency is normally characterised by anarchy and chaos. It is often conducted by irregular, guerrilla-type actors that do not answer to a central authority. They are prepared to endure prolonged fights to achieve their goal and accept great losses in terms of personnel and equipment.
- The distinction between the combatants and the civilian population is not always clear. Civilians could be actively involved in the conflict and combatants can merge into the local community.
- Reaching settlements is often arduous and agreed ceasefires are frequently violated. This is also the case with regard to human rights and the humanitarian law of war.
- Insurgency groups often operate from a position of relative weakness. This results in modified combat methods like boosting of their strength by social fear through terrorist activities. They often use mobility and surprise in their operating methods. Their operations are usually designed to cause confusion, demonstrate the impotence of the government or local authority, and inflict damage. The intensity and scale of the operations can vary enormously.
- Insurgency is often ideologically charged and could in that respect have a conservative character (driving out an occupying force and returning to the pre-war situation) or it could be revolutionary in nature (ousting the country's own government).
- Insurgency groups are not always politically or ideologically motivated. There are also insurgents who are acting in their own interests, like criminal gangs and warlords.
- The level of force can differ greatly. Insurgents usually fight with light and relatively unsophisticated weapons. Heavy and highly sophisticated weaponry including weapons of mass destruction, could however be deployed by the conflicting parties.
- Insurgent groups, in particular terrorist organisations, criminal organisations and gangs can solidify their positions in areas which are not or no longer under the control of the government. These regions are usually virtually uninhabited and the insurgents leave the few inhabitants alone or suppress them. Thus they can conduct their state like behaviour to full their insurgency without any hindrance like in the form of training camps, poppy or coca cultivation to generate income and logistic bases.

[19] Charter of the United Nations - Chapter VII: Action with respect to threats to the peace, breaches of the peace, and acts of aggression (UN, 2015).

In table G.1, a comparison is displayed regarding regular and irregular conflicts. Since stabilisation operations are characterised as the fight against an irregular force, a mix of tailored operations is conducted by the stabilising force, including both regular and irregular operations.

Regular Conflict:	**Irregular Conflict:**
Desired military end state derived from desired political end state.	Desired military and political end state directly and closely linked to each other.
Territory, raw materials.	Power, territory, ethic / racial.
Security of the state.	Security of the group.
Ideology, greed.	Ethnicity, political / religious fundamentalism.
Symmetrical warfare.	Asymmetrical warfare.
Large unit under central control.	Small units under local control.
Combined arms.	Individual weapon systems.
Manned weapons.	Armed men.
Large-scale deployment of fire power and manoeuvre.	Hit-and-run, guerrilla tactics and terrorism.
Humanitarian law of war observed.	Humanitarian law of war not always observed.
Civilian population in principle only passively or unwillingly involved in the conflict.	Civilian population virtually always directly involved in the conflict.
Position of (local) authorities clear.	(Local) authorities may sympathise with or even belong to the insurgent group.

Table G.1: Comparison of regular and irregular conflicts (Royal Netherlands Army, 2003).

Disrupting a society is the most significant tactic of the insurgency. By attacking the stability of the government and disrupting society through focussing on its weakest points, the insurgents attempts to create a favourable environment in which they can achieve their political, nationalistic, religious or criminal goals and objectives (Royal Netherlands Army, 2003; Joint Chiefs of Staff, 2013).

A lack of governmental control, vulnerable populations, and revolutionary leadership available for direction are the prerequisites for any insurgency to occur. As displayed in figure G.2, the prerequisites of an insurgency can be grouped into opportunities, motives and means (Royal Netherlands Army, 2003; Joint Chiefs of Staff, 2013). In order to defeat the insurgency and be able to anticipate their future activities, understanding its background is essential. Therefore, the three prerequisites will be elaborated upon briefly.

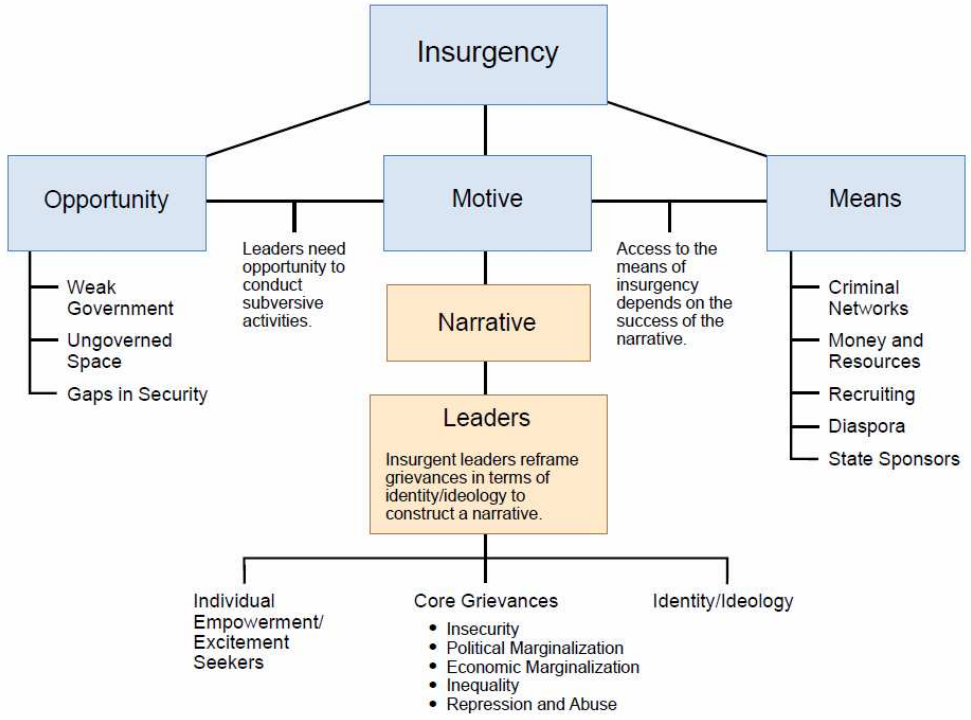


Figure G.2: Prerequisites of an insurgency (Joint Chiefs of Staff, 2013).

Opportunity

Irregular conflicts are often caused by unfulfilled aspirations. If the local population, or some parts of it, feels a sense of dissatisfaction with the existing situation, it may feel justified in a particular course of action. Due to the lack of government control and its inability to provide security for its territory and population, insurgent groups thrive in this opportunity gap. They will use the sense of unrest to achieve their own objectives that may be very different from such groups'. Specific causes for the emergence of insurgent groups are (Royal Netherlands Army, 2003; Joint Chiefs of Staff, 2013):

- A dominant majority within an area that is nationalistic, (radically) ethnically- and/or culturally separatist, possessing a strong sense of group identity combined with antipathetic thoughts towards others.
- A poorly functioning government, corruption, criminality, discrimination, abuse of power and oppression.
- Economic failure: neo-colonialism / misuse of the local economy and extremes of wealth and poverty particularly in countries where the various classes are of different ethnic origins.
- Unfulfilled expectations, resulting in frustration. Particularly among the middle class and the intelligentsia, the aspiration to an improved living standard is the strongest.
- Insufficient capabilities and/or capacity of the governmental security forces to detect the early stages of insurgency and suppress it in a way that deters other potential rebels while not feeding the insurgent narratives and provoking wider resistance to the government.
- Religious fundamentalism.

Motive

Grievances alone do not cause an insurgency. Poverty, unemployment, economic inequality, inadequate basic services, and political marginalization and -repression unfortunately exist in many places, where insurgency does not occur. Hence, there must be a driver to organise an insurgency, like (Royal Netherlands Army, 2003; Joint Chiefs of Staff, 2013):

- **Compelling narratives** explaining who is to blame for the grievances, how the grievances will be addressed, how the population will benefit under the insurgents' ideology and how the population and insurgency should work together to accomplish that goal.
- **Leadership** that successfully crafts and delivers a narrative linking grievances to a political vision is a crucial determinant to gaining popular support, resources (means) and eventual success.
- **Adopting grievances.** While grievances on their own are not sufficient to cause an insurgency, they are relevant to understanding its origins, evolution, and dynamics. Stabilisation operations and negotiated settlements that fail to adequately address the underlying grievances rarely create durable stability.
- **Failed security** provided by governmental security forces is also a common driver of instability. Frequently this leads communities or groups filling the gap. Such groups may be concerned only securing their own values and objectives.
- **Abusive behaviour** by governmental officials, security forces or local supporters concerning disputes over political power and/or economic interests, sometimes includes corruption and abuse, can become one of the most potent grievances contributing to the emergence of insurgencies. Some insurgencies actually create or exacerbate grievances by deliberately provoking retaliation against the insurgents' and its supporters.
- **Individual empowerment** regarding a simpler desire for adventure, status, opportunity or a sense of control over one's own destiny. Particularly where traditional social systems have broken down or fail to provide prospects for youth, insurgent movements may offer an attractive escape from boredom and stagnation.
- **Social mobilisation and allegiance** typically draws on existing ethnic, religious, racial, socioeconomic, geographic, and/or political identities and the symbols associated with them.

The degree to which their behaviour is shaped by membership in any of these groups depends on multiple factors. Important in determining which identity will define the primary loyalty of both individuals and communities is based on which actor is perceived most likely to further their interests and which actor they expect to win. This pattern of shifting allegiance to ensure survival tends to emerge over the course of the conflict and hold true regardless of the community's political preferences. In this case, "control" means establishing predictable and tolerable conditions for the population and a clear set of rules that are consistently enforced under which they feel they can reasonably survive.

Means

Insurgent objectives can be generally be categorized as reform, revolution, secession, nullification, and resistance. The leaders of emerging insurgencies must assemble and organise personnel, funding, weapons, equipment and systems of secure communications, and logistics. Compared with the counterinsurgency force, irregular conflict for the insurgency is cheap and demands a limited amount of financial-, material-, and personnel-related resources. Also, the insurgency's focus is long-term, while the time resource, especially for the counterinsurgency or the stabilisation force, is limited due to political constrains (Royal Netherlands Army, 2003; Joint Chiefs of Staff, 2013).

G.1.3 The Aim & Approach of Stabilisation Operations.

Starting a crisis is not hard, yet ending one is extremely difficult. Since the origin of most conflicts is not military, neither can be the permanent solutions to it. Stabilisation operations must therefore always serve the political aim to stop violent armed conflicts (Royal Netherlands Army, 2003; AIV, 2009). A nation can only be self-reliant when it has well-functioning political-, security-, social- and economical systems. Restoring these systems is not a soldier's job. Nevertheless, only soldiers can perform this task initially since peacemaking within the intervention phase and peacekeeping within the stabilisation phase can only be enforced by military assets (Royal Netherlands Army, 2003; Ministry of Defence, 2013; Cremers, 2014). As displayed in figure G.3, a wide set of military and non-military approaches are simultaneously applied within the full spectrum of Crisis Management Operations.

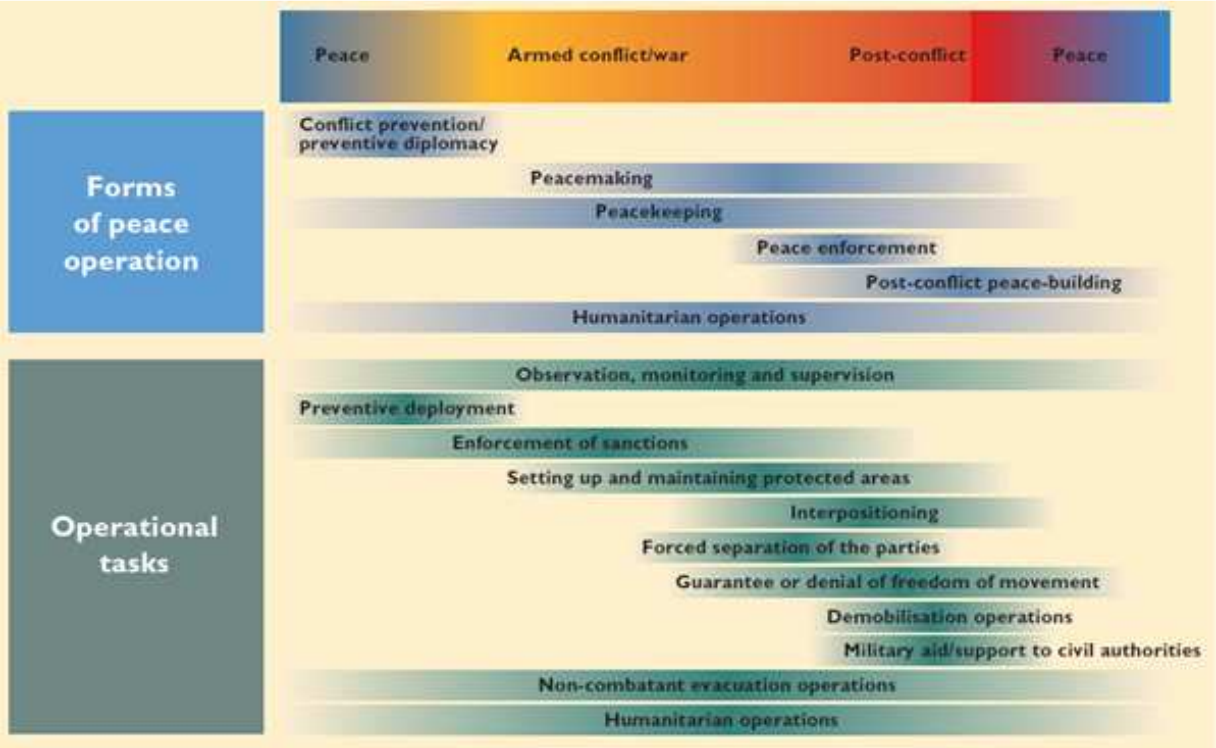


Figure G.3: Approaches within the Crisis Management Operations phases (Royal Netherlands Army, 2003).

Within each of these approaches, the role of international diplomacy is of significant importance for creating long-lasting peace by helping the fragile state[20] to fight poverty and assist its transformation towards a stable and self-sustainable country with appropriate functioning political, social and economic structures. In figure G.4, the level of violence is displayed in combination with the different Crisis Management Operations phases. Crisis Management Operations, also referred to as peace operations, include the prevention, intervention, stabilisation, and normalisation phases. A Stabilisation Operation starts within the intervention phase and continues by the stabilisation- and normalisation phases within the Crisis Management Operations spectrum (Royal Netherlands Army, 2003; Ministry of Defence, 2013).

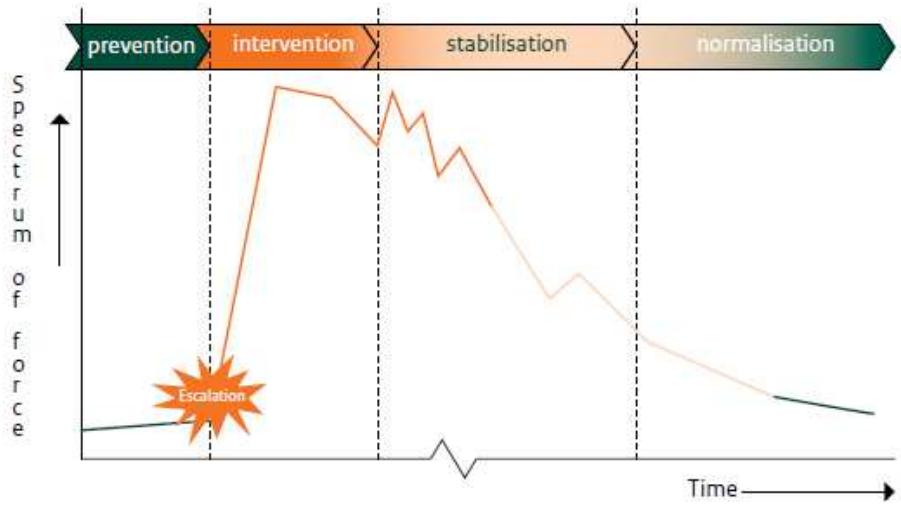


Figure G.4: Levels of violence accompanied within the Crisis Management Operations spectrum (Ministry of Defence, 2013).

Stabilisation Operations are aimed at stabilising the area through the use of military capabilities including kinetic offensive and -defensive actions. These actions are executed in order to create, maintain, and increase a safe environment that provides freedom of movement for the military, civil humanitarian organisations and the local population. This freedom of movement allows non-governmental- and international organisation to start reconstruction acts and assist the local-, regional-, and national authorities, as well as the inhabitants, in returning to peacetime day-to-day routine. Safety and security are vital preconditions to such reconstruction acts and long-term orientated sustainable development activities. Stabilisation and normalisation only can be accomplished by long-term oriented development acts supported by short-term reconstruction activities. Integrating the diplomacy, development, and defence domains is essential to success. By close interaction between the political-, civil-, and military actors throughout the intervention, stabilisation and normalisation phases, the balance can be swayed towards establishing a self-reliant nation once again. International and humanitarian laws restrict coalition nations, governmental organisations (GOs), non-governmental organisations (NGOs), and international organisations (IOs) to involvement in stabilisation operations (Royal Netherlands Army, 2003; Gabriëlse, 2007; AIV, 2009; Ministry of Defence, 2013; Koninklijke Landmacht, 2014b). Within stabilisation operations the following three overlaying phases are distinguished (Gabriëlse, 2007; AIV, 2009; Maier, 2010; Ministry of Defence, 2013; Koninklijke Landmacht, 2014b):

- **Intervention Phase:** The emphasis in this phase is on military actions, since the stabilisation force is the only actors who can operate in a high-violence-intensity environment. The aim of the intervention is to de-escalate the conflict by military means, ultimately reducing the level of violence and thereby shaping the preconditions for the subsequent stabilisation phase. The local population is often the main victim of violent armed conflict, whether intentionally or not.

[20] Fragile states are countries where the central government (if any) is unable or unwilling in fighting poverty, stimulating socioeconomic development and protecting their citizens and fulfilling human rights (AIV, 2009).

Frequently, military forces provide humanitarian aid because it is too dangerous for civil aid organisations to operate during this phase. This means that military capacity will be required to provide emergency relief. The boundaries between the intervention- and stabilisation phases are difficult to define. It is usually a matter of a gradual transition. Therefore, it is vital that the planning of an intervention takes into account the conditions required for the stabilisation phase.

- **Stabilisation Phase:** In this phase, the accent shifts gradually from the deployment of military assets and actions to the deployment of civil means and activities with the political aim to decrease the level of violence substantially. Initially, the stability and safety circumstances are often fragile. Also, the level of violence can suddenly rise during this phase.

  Over time, the level of violence will decrease during the stabilisation phase. Regular offensive and defensive kinetic military actions will be needed to enforce the peace by the coalition forces, in particular during the early stages. Thereby fulfilling the conditions for a safe and secure environment towards the normalisation phase. When the coalition forces are unable to contain the escalating level of violence, stabilisation operations are doomed to fail.

  To prevent violent escalations, improve the security situation, and shape the conditions for long lasting socioeconomic development and peace, civil capabilities are essential in this phase. Targets include the establishment of the rule of law, strengthening of the security sector, setting up good governance, providing economic assistance, restoration of infrastructures and governmental services (like education, health), etc. All these activities are a concerted effort to support reconstruction and prevent post-conflict countries from sliding back into war or insurgency. In countries emerging out of violent armed conflicts, reconstruction activities are often hampered by the opposing military force, non-state insurgency groups, or criminal organisations that resist the stabilisation efforts. Hence, counterinsurgency has increasingly become a significant component of stabilisation operations.

  Operations in the stabilisation phase are complicated due to the wide diversity of tasks, changing levels of force and the large number of actors with different interests. Moreover, reconstruction efforts and counterinsurgency operations in post-conflict areas are intertwined and cannot be approached separately. The use of military means and its effect must therefore be constantly synchronised with diplomacy and development-related activities. Past experiences and insights have resulted in a growing consensus for increased synergy between the defence, diplomacy, and development domains, as well as between actors and donor nations or -organisations. This has resulted in the 3D and Integrated Approaches that are elaborated in chapter 4.
- **Normalisation Phase:** In this phase, the emphasis is on sustainable development for a self-reliant nation. Improving the capacity the host-nation's security sector and reinforcement of the local governmental organisations have the highest priority. Military operations by the coalition forces are reduced further, eventually resulting in a full withdrawal when the host-nation security forces are able to provide the needed safety. A long-time political and civil commitment of host-nation assistance provided by the international community will be essential to prevent future violent escalations.

The three elaborated stabilisation operations phases can be preceded by a preventive phase. The emphasis in this phase is on settling the conflicting interests without a violent confrontation. It is crucial that the situation does not escalate into a crisis or violent conflict. This applies particularly when the level of damage caused by an escalation may be disproportionately high or irreversible. When vital interests are at stake, much emphasis must be placed on prevention and protection. If preventive activities are unsuccessful, a conflict could escalate rapidly. The preventive intervention ideally takes place during the earliest possible phase of escalation. In section G.1.1, a generic example is provided how to prevent armed escalation (Royal Netherlands Army, 2003; AIV, 2009; Ministry of Defence, 2013; Koninklijke Landmacht, 2014b).

Unlike regular kinetic offensive and -defensive military operations, stabilisation operations do not focus on undermining the physical and/or mental component of the opponent forces. Stabilisation operations are aimed at strengthening the physical, mental and even conceptual component of the internationally recognised government and its society. When it comes to convincing the local population that the presence of international coalition forces are useful and necessary, the theory of winning "hearts and minds" is often applied (AIV, 2009; M. Grandia, 2009; Koninklijke Landmacht, 2014b). Here, the main strategy is to undermine the opponent's aspirations by creating a secure environment in which socioeconomic activities can be developed. Within this development zone, trust-building, consensus-building, and reconstruction works can be executed, creating long-term focussed stability and sustainable development. Activities within stabilisation operations can be grouped in the following four clusters:

- Security and Control: enforce and maintain a safe environment.
- Security Sector Reform (SSR): support to (re)formation of national and local security organisation controlled by the government, such as the police- and military assets of the host-nation.
- Reconstruction Activities: aid to basic rehabilitation of infrastructure and utilities;
- Establishment of good Governance: a functional political system, economic development and free expression of culture and religion.

Multiple stabilisation operations phases can occur simultaneously in the same battlespace. For example, intervention activities might be conducted in one region, while activities characterised by the stabilisation phase are conducted in another. In addition, both types of activity might even take place in the same region at the same time. The phases often overlap in practice, resulting in transition periods leaving phases hard to distinguish from one another (Royal Netherlands Army, 2003; Gabriëlse, 2007; AIV, 2009; Ministry of Defence, 2013; Koninklijke Landmacht, 2014b).

As concluded in chapter 1, most contemporary crisis do not have a military root-cause. Therefore traditional military tools to defeat the enemy and suppress violence are no longer adequate. In addition, the military actors alone are not equipped or prepared for carrying out civilian tasks. Modern crisis management operations are more likely to be successful if they address all aspects of the problem and include all concerned actors and parties. In this approach, the military is just one part. By means of figure G.5, the complexity and link areas are visualised (CCOE, 2012; Vogelaar, 2013).

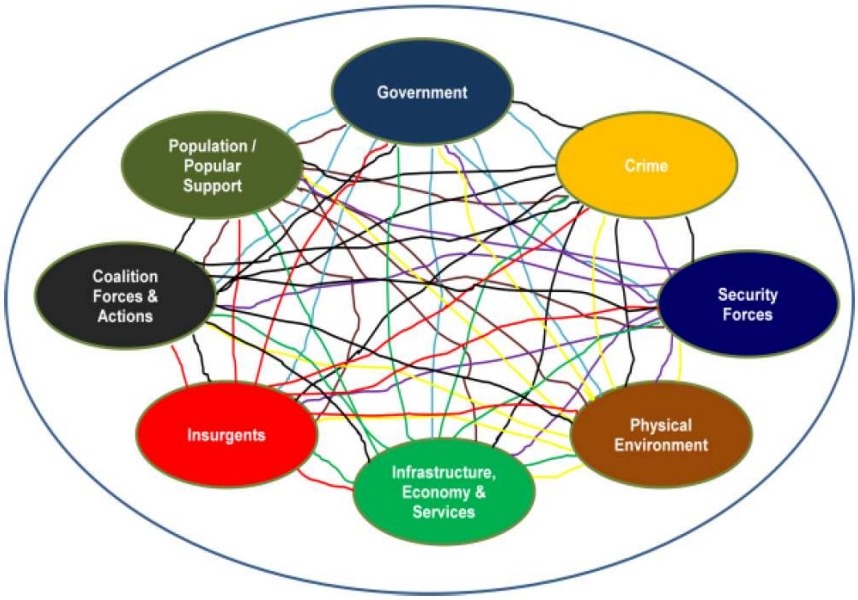


Figure G.5: Complexity and interlinks of contemporary crisis management operations (CCOE, 2012).

Diplomatic-, information-, military-, and economic activities are thus crucial requirements in all phases. The types and intensities of these accents will differ between phases and areas. The activities and capacities must be embedded in comprehensive civil-military planning. Due to the scarcity of military and civilian resources, the "ink blots" strategy is a commonly applied practice. These and other strategies, methodologies, frameworks and crisis management tools applicable in stabilisation operations are explained in the next paragraph.

G.2 Stabilisation Operations Methodologies

A variety of strategies, methodologies, frameworks, and tools are applied towards the planning and execution of stabilisation operations. The ones that are included within the new developed *Integrated Water Management Development Framework for Stabilisation Operations* are elaborated in the paragraph. First, the DIME strategy is explained in section G.2.1. The Tactical Planning Design methodology applied by the Royal Netherland Army is discussed in section G.2.2. Subsequently, the "ink blot" strategy and the USECT framework are elaborated in the sections G.2.3 and G.2.4. Finally, the Toolbox Crisis Management Operations is presented in section 3.2.5.

G.2.1 DIME Strategy

Actors use a range of instruments to realise their objectives or safeguard their interests. Their power means are designed to influence another party with the aim that the induced party takes the course of action that is favoured by the actor. Power instruments are always used in combination. It is not always necessary to deploy all instruments at the same time. Depending on the prevailing situation, the interests to be protected or the objectives to be realised one instrument will be more suitable than another. The range of power means are divided into Diplomatic, Information, Military and Economic instruments, also known as the DIME strategy (Ministry of Defence, 2013; Koninklijke Landmacht, 2014b):

- **Diplomatic Instrument (Political).** This political instrument is commonly used by a nation or an international organisation to establish and maintain a long-term relationships with foreign powers as well as other actors in the international arena. Thereby, a nation can influence other actors with the ultimate aim of protecting its own interests or for realising its own objectives. International forums are an important stage where political leaders and ambassadors use their diplomatic capabilities. The diplomatic power instrument includes the use of special envoys, negotiations, participation in alliances and coalitions, boycotts and treaties. Diplomatic pressure can also be accompanied with the threat of using military capabilities or another DIME power instrument.
- **Information Instrument (Social).** Nations can apply information as an instrument to develop their own strategies and to influence the perception of other actors as well as their esteem in the eye of the public. A controlled release of correct, misleading, or false information is a commonly found example. Apart from publishing information, the information instrument is also designed to influence an opponent's information domain by targeting his information systems. For reasons of national security and privacy, the nation's own information systems need to be protected.
- **Military Instrument (Security).** By the use of force or by the threat thereof, an actor can compel or persuade other party to take a particular course of action or to refrain from one. Consequently, the military instrument distinguishes itself significantly from the other instruments through the threat or use of kinetic military capabilities. Since no crisis or conflict can be resolved by military means alone, the military instrument is most effective when focussed on short-term interventions in combination with the other DIME instruments. This requires a coherent approach whereby the use of military force contributes to creating the required preconditions for applying the diplomatic-, economic- and information instruments. Accordingly, security issues have to be considered in their entirety. Within this framework the military instrument provides support and creates the required preconditions for lasting solution such as a safe environment. The use of the military instrument is not limited to conflict situations and crisis. It can also be used in the event of natural disasters. Offensive kinetic actions are usually executed within a coalition of countries or under the umbrella of an international organisation, like the UN, NATO, or the EU.
- **Economic instrument.** This instrument provides a range of long- and short-term options to improve, support, disrupt, or combat an actor's wellbeing. In general, the economic instrument includes particular trade-, monetary / fiscal policies, including supportive measures like economic development aid on the one hand and punitive measures such as embargoes and boycotts on the other.

Economic instruments usually affect the target's long-term interests. In practice, the economic instrument is not always used consistently and the desired effects are then not fully achieved. For example, changes in government may result in changing policies and crucial parties in multilateral efforts may not abide by the agreed measures. Moreover, no government or international organisation has absolute control over the economic instrument. Multinational corporations in particular will look to adapt in ways that circumvent local legislation.

Other civil capacities exist within the national-, regional-, and local context alongside the diplomatic- and economic instruments. A nation controls various civil capacities like legal power; the judicial system; its police force; administrative organisations; education; healthcare; and the media. In addition, there are other organisations with a religious, political, cultural or scientific background, including international and non-governmental organisations that can contribute to the realisation of strategic objectives. These civil organisations are not government-controlled, yet they can exert influence. The control and coordinated deployment of civil capacities is complex since many organisations, particularly NGOs, have an independent position in respect to the government. Despite the often different interests and specific objectives of these civil organisations, all political, diplomatic, economic, socio-cultural, humanitarian and military activities and efforts need to be synchronised as much as possible to achieve the desired end state (Ministry of Defence, 2013; Koninklijke Landmacht, 2014b).

Generally speaking, small organisations have a limited choice of instruments or lack the capabilities to use them successfully. This does not mean that these actors are powerless, like terrorist groups and criminal organisations are demonstrating. The ability to use power means is in any event not confined exclusively to nations, international organisations or multinationals (Ministry of Defence, 2013; Koninklijke Landmacht, 2014b).

G.2.2 Military Campaign Planning Methodology

Applied by the Royal Netherland Army, the Military Campaign Planning Methodology, or Tactical Planning Design Methodology, forms part of the foundation of the newly developed framework. The planning methodology is a holistic approach that describes and visualises the problems within the battlespace area (Koninklijke Landmacht, 2011; Koninklijke Landmacht, 2014b). Its elements, and how they are related, are visualised in figure G.6.

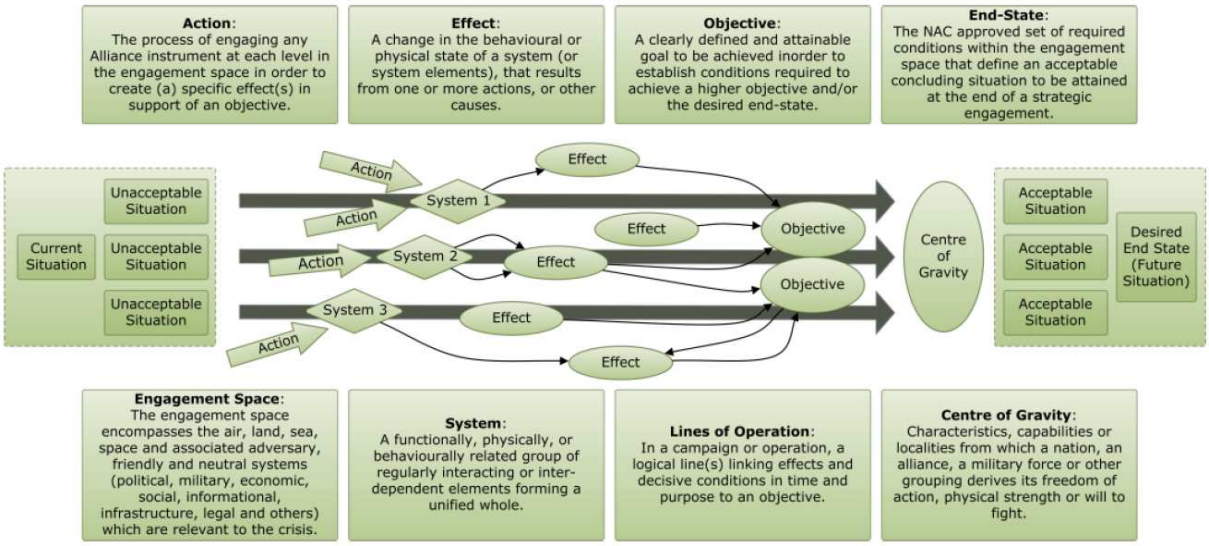


Figure G.6: Elements of a Campaign Plan including its interrelations (Koninklijke Landmacht, 2011).

The first step is to gain an understanding in the nature of the conflict, the operational environment, and the consequences of the operation. When the military commander understands the battlespace area, he or she can plan and prepare the stabilisation operation through the development of a campaign plan. For stabilisation operations, a long-term approach focussed on achieving objectives and end states is crucial. This demands a broad focus and a consistently high level of situational awareness. In order to gain the situational awareness needed for the stabilisation operation, all items and issues displayed on the flowchart of figure G.7 should be analysed thoroughly (Royal Netherlands Army, 2003; Koninklijke Landmacht, 2011; Koninklijke Landmacht, 2014b).

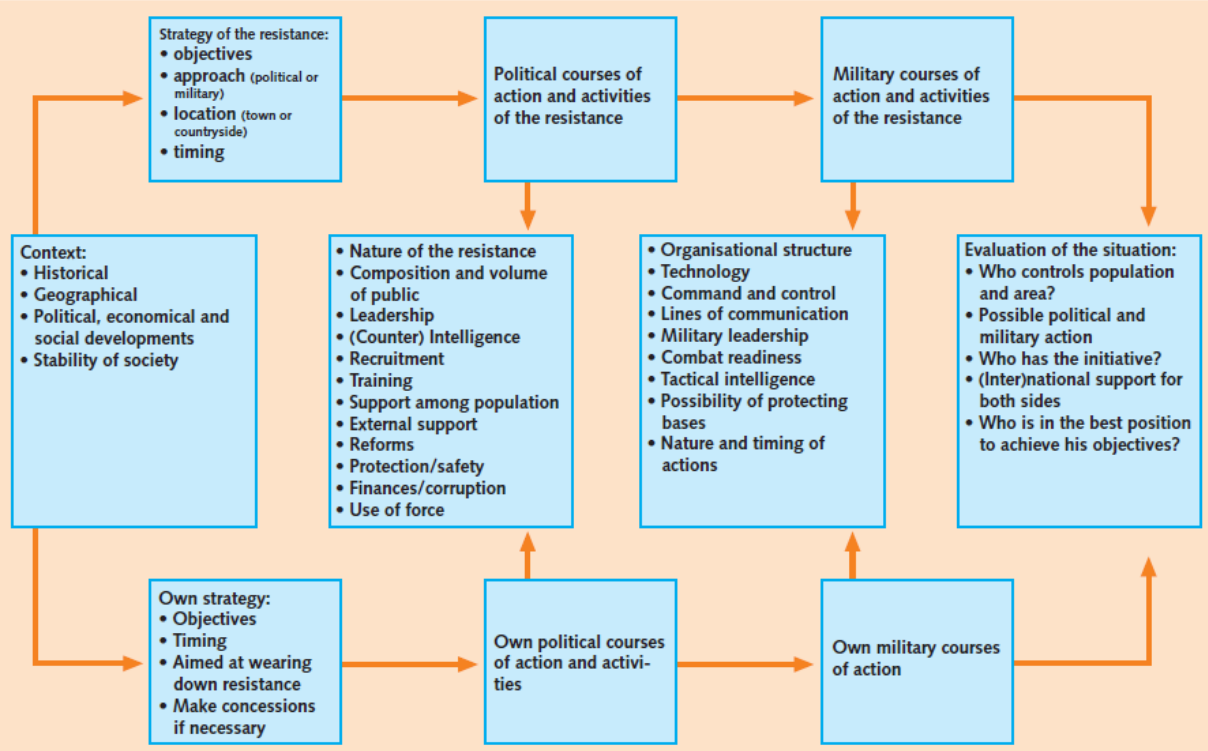


Figure G.7: Analysis process of stabilisation operations (Royal Netherlands Army, 2003).

As explained in section G.2.1, all DIME power instruments must be included. The holistic design process starts with the formulation of the long-term political desired strategic end states. In order to accomplish these, medium-term military operational end states are formulated, including the lines of operations. For the planning of operations and activities, short-term tactical objective and supporting effects are formulated including the needed activities and supporting effects. Often, multiple short-term tactical operations are necessary to create the desired operational objectives. Eventually the combination of all these efforts should result in the accomplishment of the long-term strategic end states. With figure G.8, a generic example is provided of a holistically designed campaign plan (Koninklijke Landmacht, 2011; Koninklijke Landmacht, 2014b).

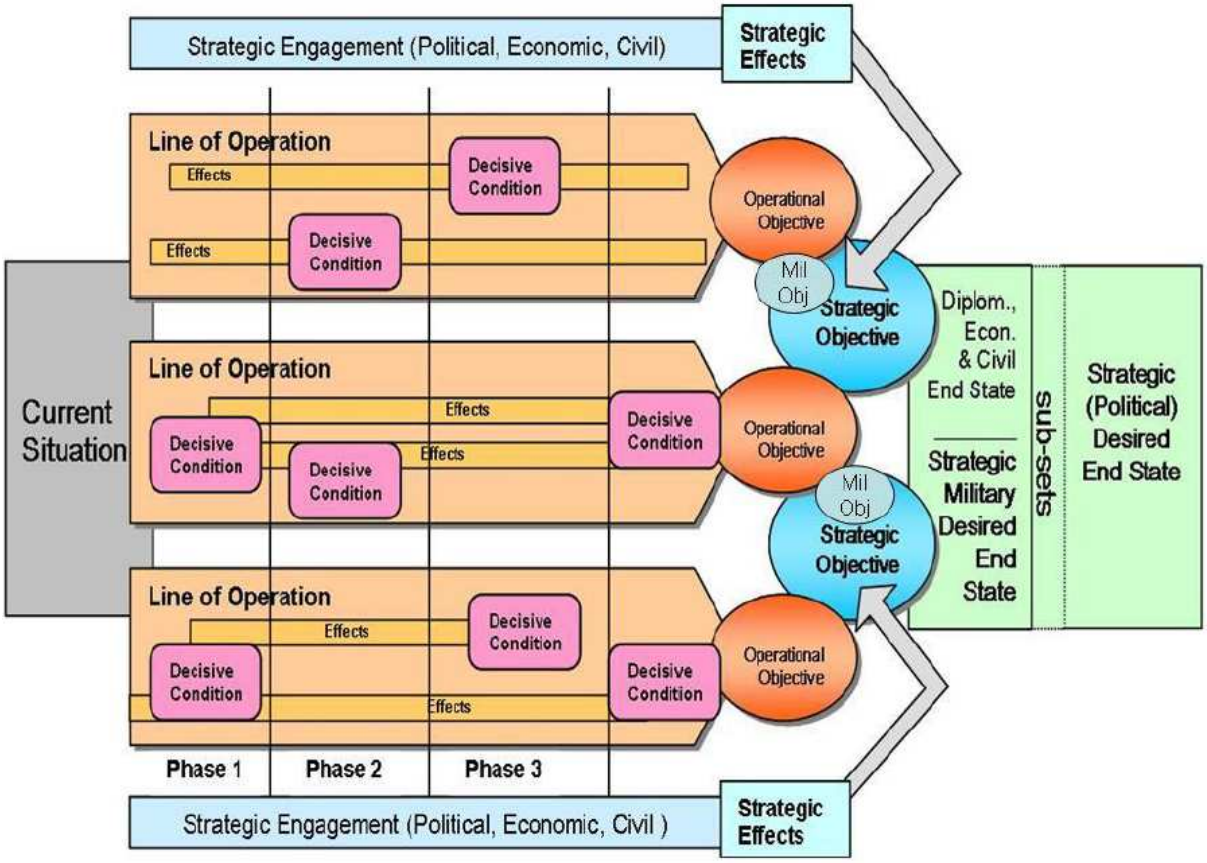


Figure G.8: Generic example of a holistic Stabilisation Operations Campaign Plan (Koninklijke Landmacht, 2011).

During the execution of the stabilisation operation, the commander can assess the performed actions and adjust the planned activities when they do not generate the desired effects. (Koninklijke Landmacht, 2011; Koninklijke Landmacht, 2014b). The corresponding building blocks of the Tactical Planning Design Methodology for a holistic campaign plan, their interrelations as displayed in the figures G.6 and G.8, and additional military definitions are elaborated, by subject, in table G.2.

Objectives. An objective is a clearly defined and attainable goal. Objectives exist both in the physical and the psychological domains. Objectives may relate to disabling an enemy unit, to convince a hostile population to accept their own military presence or the termination of local support for an insurgency. *Decisive Conditions* and/or *Supporting Effects* can be designated by a commander as an objective.
End State. An end state is a situation that must be achieved at the end of an operation. End states have different definitions regarding the subsequent levels. The *strategic end state* is the situation a high political authority wants to achieve when all operations have been completed. An *operational end state* is the desired military situation derived from the strategic end state, taking into account the multiple objectives of the DIME strategy. A *tactical end state* is the situation that must be reached after an operation or activity. The objectives of a tactical end state serve the operational end state. And the objectives of the operational end state serve strategic end state.
Decisive Conditions & Supporting Effects. A *decisive conditions* is a specific combination of conditions that is necessary to achieve an objective. *Supporting effects* are the result of operations or activities that contribute to the achievement of the strategic- and operational end states. Achieving the supporting effects is crucial for creating or maintaining the decisive condition. Both the decisive condition and supporting effects have physical and psychological domains and include the dimensions time, space, and information.

Centre of Gravity. The centre of gravity (COG) is a feature, capacity or location which an organisation, military unit or group obtains its freedom of action, physical strength, cohesion or its will to fight from. A COG is an important power source the actor applies to achieve its objectives. By removing or blocking a COG, it becomes difficult for the opponent to achieve its goal. The opponents COG's must be eliminated and the own COG's must be protected. COG's are likely to change over time. The Centre of Gravity Analysis Matrix presented in figure G.9 is an important tool to understand the strength, weaknesses, opportunities and threats of the opponent and own forces.

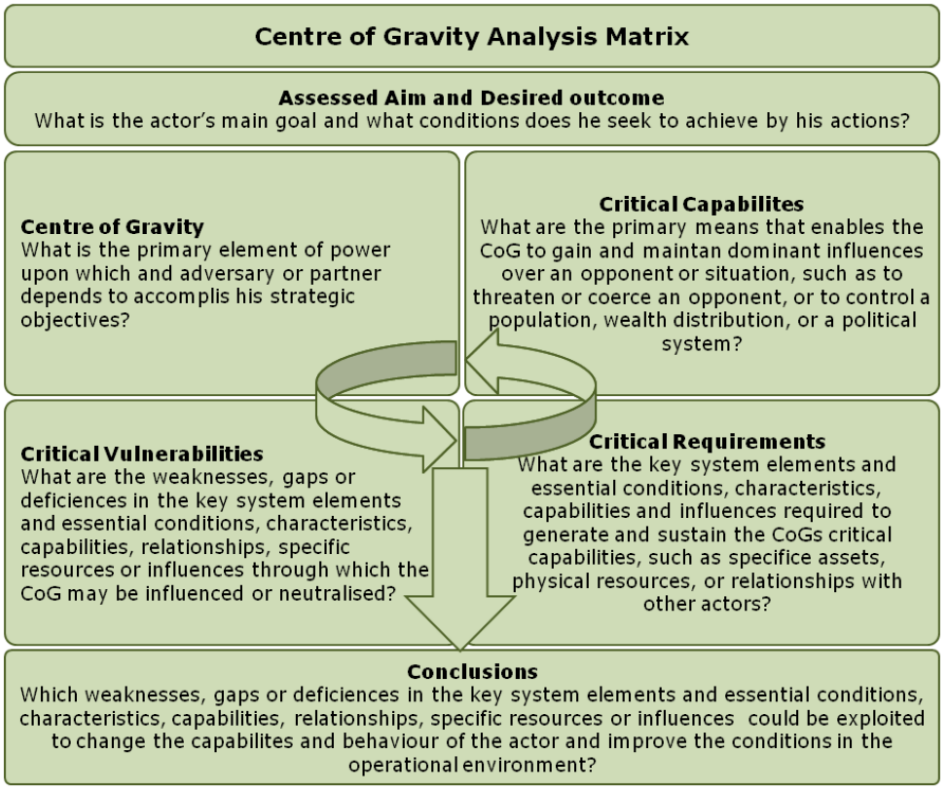


Figure G.9: Centre of Gravity Analysis Matrix (Koninklijke Landmacht, 2011).

Lines of operations. In the figures G.6 and G.8 the lines of operations are displayed. The lines of operations visualise interrelationships and explains the mission approach: how the strategic end state is to be achieved through the execution of specific decisive- and supporting activities. During the stabilisation operation its progress is monitored by presenting the achieved objectives, decisive conditions, tactical and operational end states on the lines of operations. These lines may be grouped thematically, functionally or environmentally.

Planning Horizons (Short-, Medium-, Long-term). The planning horizon prior to the preparation and execution of an operation is often a dilemma. Making plans far ahead can result in irrelevant plans at the time of their execution, due to the dynamics within the battlespace. Not planning far enough ahead can lead to losing the initiative and unprepared units. In a security campaign plan, timelines stretching months or years are no exception. A useful method is the use of planning timelines associated by long-, medium- and short-term objective. A constant level of situational awareness and flexibility is crucial in every planning process.

Long-term Planning. The long-term planning is primarily intended to give direction and generate options for decision-making. Long-term plans are usually not focussed on a specific activity or a mix of these, but shape the context how the tactical activities should contribute to achieving the operational end state. It also provided the decision-making framework regarding new developments, issues and concerns in the area of operations.

Medium-term Planning. The medium-term planning is focussed on the execution of the next decisive condition and the associated supporting effects. Also, plans for operations with a limited scope, but with a large size and/or a long duration, which were not foreseen in the long-term plan are delivered within the medium-term planning process. Furthermore, *Branch Plans* regarding current operations are developed for medium-term operations. These are often separate but clear operations with their own mission statement, timeframe and end state. **Short-term Planning.** Short-term planning is based on changing situations in the battlespace or progress assessments of current operations. Thereby, they are focussed on the near future, a period of hours or days, with the aim of pursuing the objectives and the decisive conditions.
Sequencing and Synchronisation. Sequencing is the process of classifying impacts and activities based on their interdependency. By means of synchronisation time and spatial aspects are added to the ordered activities, making the feasibility assessment easier.
Phase. A phase is a time period characterised by a certain kind of military activity, an operation or a combination of decisive conditions.
Contingency Planning. The manner in which an operation develops can never be predicted fully. Based on the expected evolution of the current situation, a follow-up operation is planned. Within a long-term plan, flexibility should be included in order to be able to anticipate on favourable opportunities, setbacks or other needed freedoms of movement. Contingency planning is based on unexpected situations that arise in an operation, but will take a certain amount of preparation to generate a suitable reaction. These activities are planned through *branches* and *sequels*. *Branches* are contingency options derived from the existing plan with specific adaptations or alternatives. *Sequels* are follow-up operations based on possible outcomes of the current operation. In a sequel, the latest developments have been taken into consideration including the progress of the campaign plan, possible changes in the campaign theme and the changing balance between offensive, defensive and stabilising operations. Both types of plans (branch and sequel) support the individual lines of operation in the long-term plan.
Simultaneous & Sequential Operations. Generally, operational objectives are not achievable by a single tactical operation. The commander will plan the entire operation upon a number of interrelated decisive conditions and their supporting effects in order achieve the operational objectives. Therefore, he or she must have a clear understanding regarding the relationship between the events in time and space including the required capacities. Without this understanding, the commander cannot determine which events could and/or should take place simultaneously or sequentially or in which order. Capacity shortages often force the commander to sequential operations. For sequential operations, the commanders should synchronise the activities of their subordinate commanders in time, space and effects by connecting the end states, objectives and decisive conditions with tactical operations. Without these connections, incoherent operations and activities will not shape the decisive conditions for achieving the desired objectives or end states.
Culminating Point. At the culminating point, the current situation can be maintained, but development towards a better situation will be impossible. Attempts for further developments without a pause or reinforcement will risk exhaustion of the available resources. Thereby, their own vulnerability will increase. Also, responding appropriately to new or unforeseen developments is not possible. Culminating points can exist both in the physical and psychological domains.

Operational Reach & Pause. In order to achieve the desired objectives without compromising the available combat power too much, a good campaign plan must strike a balance between operational reach and operational pause. *Operational Reach* is the physical and psychological distance in which activities and effects can be achieved. This depends strongly on the local situation because combat power, support and the geographical environment have their independent influences. These limitations decrease the opportunities to influence the environment and the situation. An *Operational Pause* is a rest, pause, or interruption in operations. An operational pause will slow the pace of the operation on the short-term. On the long term however, it can accelerate the pace. An operational pause is used to avoid culmination, to restore its own power, to maintain the initiative, and to increase the momentum. Based on the physical and psychological states of the various target groups, commanders should provide culminating points and when necessary plan operational pauses. Eventually, a commander will have to find the right balance between increasing its operational reach, avoiding culminating points, and limiting the necessary operational pauses.
Linear Operations. Linear operations are conventional operations against a conventional opponent. There are clear fronts and the units move in a contiguous area of operations. Each unit generates combat power and supports adjacent units against the opponent. The density of the units in the operational area often leads to a continuous forward line of own troops.
Non-Linear Operations. Non-linear operations are operations in which units operate in non-contiguous areas. The units focus on achieving their objectives without geographically adjacent units. This is typical of stabilisation operations based on the "ink blot" strategy that is elaborated in section G.2.3.

Table 3.2: The building blocks of the Tactical Planning Design methodology (Koninklijke Landmacht, 2011; Koninklijke Landmacht, 2014b).

G.2.3 "Ink blot" Strategy

To create the conditions for a safe environment and to gain trust from the local population and authorities, the physical and mental component of the opponent forces need to be tackled on a local and temporarily scale by means of offensive- and subsequently defensive military operations. Thus, the main strategy is to undermine the opponent's appeal to the population by creating a secure environment in which regular socioeconomic activities can be developed. Trust-building, consensus-building, and reconstruction works can be executed within this development zone, creating long-term focussed stability and sustainable development. This approach is called the "ink blots" approach.

The battlespace of a stabilisation operation can be divided by means of the following four areas (Koninklijke Landmacht, 2014b):

- **Area of Operations** (orange): this is the operational area in which the commander has the authority to perform tactical operations to achieve its mission.
- **Area of Influence** (blue): the area of influence is the geographical area in which the commander is able to influence the environment directly by means of operations to create physical and psychological effects.
- **Area of Interest** (green): the area of interest includes the area of operations, area of influence and the adjacent unassigned areas. Therefore, this area is important for the commander because it is related to the objectives of present and future operations. In both the orange, blue and green areas, opposing military forces, violent opponents or interested non-combatants are present which can affect the mission.
- **Area Unassigned** (white): In non-contiguous battlespace areas, unassigned areas are present. Here no subordinate units are present. The commander remains responsible for these areas including the operations conducted in this area. He also determines which resources and capabilities are assigned to this areas for monitoring and, if necessary, to increase its influence.

A fictitious stabilisation operations battlespace is illustrated in figure G.10. Activities and their effects are not limited to the geographic size of the area of operations or the area of influence. Activities executed within an area may cause strategic effects beyond this area toward the entire battlespace (Koninklijke Landmacht, 2014b).

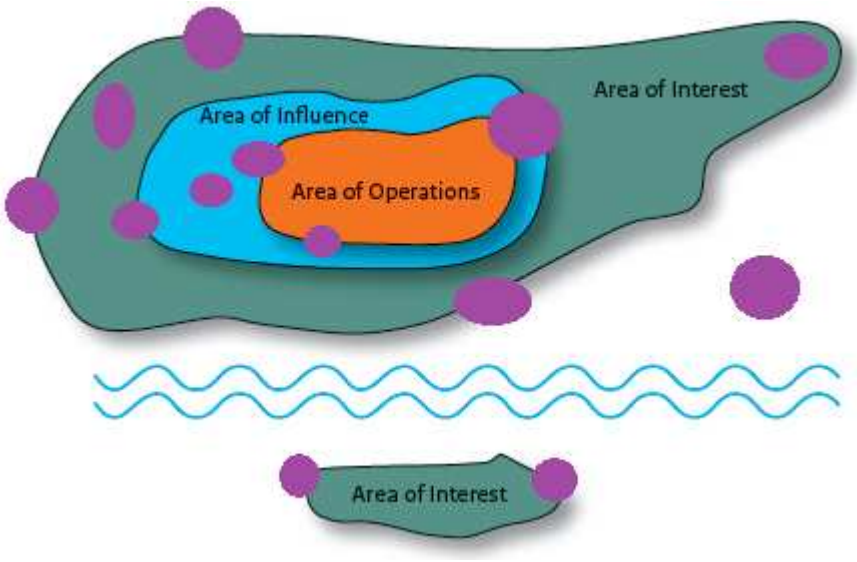


Figure G.10: "Ink blot" Strategy within a fictitious stabilisation operations battlespace (Koninklijke Landmacht, 2014b; adapted and supplemented by the author).

The available capacities and resources - materials, equipments, financial means, time and personnel - limit the ability to control the entire battlespace area. The multiple actor actions and their effects makes stabilisation operations a difficult process. Therefore, a commander will prioritise his resources and dedicate them within the main area of interest (Koninklijke Landmacht, 2014b). The commander can do this by means of creating "ink blots" or "oil spots" throughout the battlespace area. By means of purple spots, these ink blots are displayed in figure G.10. Frequently, the majority of the local population is living in these areas, thereby making the purple zones also socioeconomic development zones. Within these socioeconomic development zones, the military and/or police actors must first establish peace, security, and stability in the short run. Long-term stability can only be established by a functional and effective governance system as well as socioeconomic growth. Thus at the same time, also development and diplomacy activities should be performed within these "ink blots". (Gabriëlse, 2007; Lijn, 2011; Rientjes, 2015). The simultaneous execution of Defence, Development & Diplomacy activities is called the 3D Approach. In chapter 4, the 3D approach is emphasised in more detail.

Once an area is secured and socioeconomic development kicks in, the authority over the socioeconomic development zone can be transferred to the local authorities. Assistance from the civil-military coalition forces will still be needed after they have transferred their authority. But civil-military resources are now made available to increase the area of influence by means of creating ink blots in another area of interest. Since winning the hearts and minds is the core strategy within stabilisation operations, the focus will probably be on another crucial settlements of the local population. By repeating this process over and over, the commander's area of operations and influence, displayed orange and blue in figure 3.10, is gradually increased. Ultimately this process will be responsible for transforming the post-conflict area to a secure, prosperous, and free region.

The ink blots strategy can be operationalised by means of the USECT (Understand, Shape, Engage, Consolidate & Transfer) framework (NATO, 2003). This framework will be explained in the next section.

G.2.3 USECT Framework

The ink blot strategy described in section G.2.3 can be put into action by means of the USECT (Understand, Shape, Engage, Consolidate & Transfer) framework. The relationship of each phase of the USECT framework is visualised by means of figure G.11. Per phase the USECT framework is explained in this section.

Understand

It is crucial to create and maintain an advantage in tempo within any operation. In addition, the needs to understand will continue throughout the operation. The stabilising forces need to ensure that, wherever possible, it has the diplomatic-, economic-, social-, and cultural means to understand and influence the situation. It is also essential to understand the battlespace. This includes evaluation of the physical terrain, buildings, cultural centres, and crucial infrastructures such as utilities, transportation systems, and hospitals. Moreover, a threat analysis extends beyond conventional enemy forces to criminal gangs, tribal vigilantes, or insurgents operating among- and indistinguishable from the local population. Furthermore, the situation may be complicated by the presence of non-military governmental departments. In addition, the important actors including their interests and power positions need to be known (NATO, 2003). By means of a stakeholder analysis, the PMESII domain analysis and Causal-Functional Relationship Diagram, the needed situational awareness can be created, maintained and increased. In Appendix M, these tools are explained in more detail.

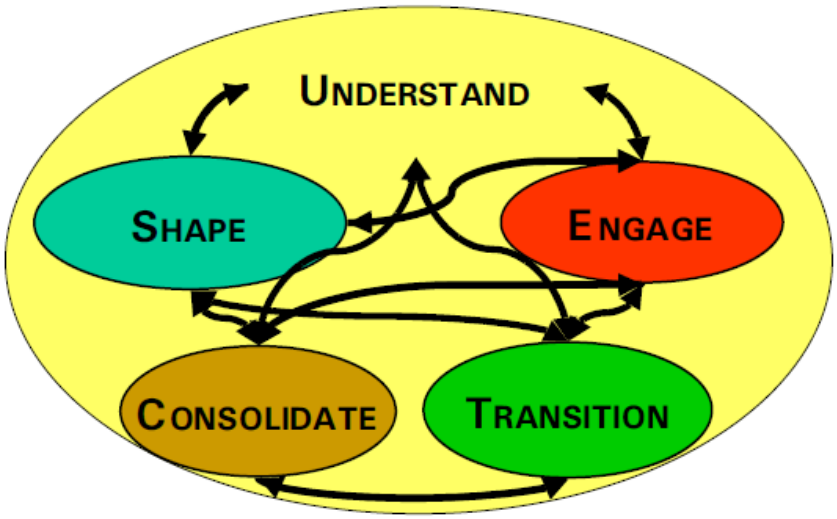


Figure G.11: Visualisation of the USECT parameters including their interrelations (NATO, 2003).

Shape

Shape includes all actions taken to set favourable conditions for the subsequent phases of Engagement, Consolidation and Transition activities. This includes (NATO, 2003):

- Shaping is the strategic movement of forces into theatre and positioning the forces for operations. Depending on the situation and objectives to be achieved, forcible entry may be required. This also includes combat support services.
- Shaping also includes actions to maximise mobility, force protection and establishing air- and maritime superiority.
- Establishing refugee camps or sanctuaries for non-combatants, providing a safe passage, and arranging emergency services are shaping activities which can be the main focus of military activities.
- Shaping will involve activities to isolate portions of the battle space. Isolation has both an external aspect (i.e. of cutting off outside support), and an internal aspect (i.e. of cutting off mutual support). Isolating the opponent may also preclude his withdrawal.
- Information operations are an essential contributor to shaping. A military commander should have the capability to achieve and sustain information superiority over the opponent. Information passing into- and out of the area may well be able to be managed in such a way that it cuts off the opponents communication including establishing influence over national-, regional-, and local radio, -television and other media sources. As with all military operations, the Information Operations aspect of a campaign is to be fully integrated with other lines of operations, such as civil affairs and psychological operations. Additionally, it has to be coordinated with national and perhaps international agencies to ensure that all actions remain consistent with the overall strategic aim.

- Shaping a campaign often requires seizing, disrupting, controlling or destructing critical nodes (power grids, communication centres, etc.). This may involve controlling crucial terrain, critical infrastructures including cultural centres, and cutting-off or controlling inter-city and intra-city mobility links and communications thereby disrupting an opponent's centre of gravity.

Engage

The Shaping activities described above set the conditions for the engagement of adversarial forces. For the commander, engagement activities are those that directly address decisive points on the line of operations aimed at the opponent's centre of gravity. These will be the specific actions taken by the commander against a hostile force, a political situation, or natural- or humanitarian predicament in order to accomplish his mission. At this point, the commander will apply all his available capabilities in order to accomplish its operational objectives. Engagement within stabilisation operations can range from large-scale combat operations to humanitarian assistance and disaster relief. In all cases where an enemy is confronted, understanding his centres of gravity and identification of the decisive points will be crucial to the success of one's own operations. Integration and synchronisation of forces coupled with a clear knowledge of the rules of engagement are critical in order to reduce the risk of injuring own- and coalition troops or non-combatants and causing collateral damage. Firepower thus has its limitations. The aim within stabilisation operations is not just to seize and hold positions, but also to apply strength against the enemy's weakness using tempo as a controlling mechanism in order to shatter his organisational cohesion. After the military engagement, civil orientated engagement by means of reconstruction activities, development projects and governance activities will be deployed (NATO, 2003).

Consolidate

The focus of consolidation is on protecting what has been gained and enhancing the initiative to continue disorganising the opponent. Consolidation thus requires an ongoing process of organising and strengthening an advantage in tempo (spatial, psychological, informational) over the opponent. Consolidation also requires activities geared at mopping up adversarial forces that have been bypassed and processing prisoners. Civil affairs, public affairs, and psychological operations and activities remain critical, since engineering efforts are executed including demolition, repairs, route clearing, bridge construction and water supply. During this stage of operations, an opponent faced by conventional defeat may resort to terrorist activities to frustrate the winning consolidation. A military commander will need to consider this possibility and make resources available to manage this possibility at an early stage. It is similarly important to expand the use of liaison and cooperation with local authorities as well as with NGOs and GOs, both nationally and internationally, because there will be major challenges associated with infrastructure collapse, humanitarian assistance, and the movement of non-combatants (NATO, 2003).

Transfer

The strategic objective for stabilisation operations is to transfer the control from the coalition helping force to the local civilian authorities or perhaps an international organisation. At this stage, military forces would gradually be redeployed while the work of the civilian administration continues. The resettlement of displaced civilians, reconstruction works regarding socioeconomic infrastructures, and the reconstitution of national military forces are fundamental to the transition process. Just as important is maintaining the rule of law. Local authorities need law enforcement units and a judicial presence in order to provide a relatively safe and secure environment. Success of the USECT (Understand, Shape, Engage, Consolidate & Transfer) framework is closely linked with the successes of non-military elements. The close interweaving of administrative, economic and social aspects of security makes the implementation complex due to the fact that many necessary activities are the responsibility of other non-military organisations. If the security situation is critical and/or other organisations are not (yet) present, the military organisation itself need to perform these activities. When this is the situation, first the tasks which provide the most optimal contribute to the achievement of the desired effects should be performed (NATO, 2003; Cremer, 2014; Berg, 2014 Lucius, 2015).

G.3.5 Tool for Crisis Management Operations Tools

'Crisis management operations are understood as the provision of civilian, police and military personnel, within a bi- or multilateral framework, using various instruments, with the aim to build peace and stability in crisis regions, by means of stabilisation of regional hot-spots, which contributes to international stability and collective security' (SWP & ZIF, 2013).

Traditional peacekeeping was focussed on containing military escalation. Today's crisis management activities span from hot stabilisation, post-conflict peace building to conflict prevention. Contemporary crisis management aims to deal with the security-, social-, political-, and economic dimensions including humanitarian aid and rule of law in order to reach a comprehensive and sustainable conflict transformation. This can take several years or even decades to accomplish. Due to the broad spectrum of tasks and its accompanied specific required instruments and expertise, multiple civilian, civil-military and military actors will be involved. Actors from the crisis region, such as the host-government or relevant forces from neighbouring regions, are even more crucial. Their ownership in conflict resolution is crucial to ensuring a sustainable transition (Goor et al., 2012, CCOE, 2012).

Crisis prevention is regarded as the best instrument for peace building. When prevention is taken into consideration as well, the spectrum of stabilisation operations is enlarged toward crisis management operations. Based on the complex origin of the conflict area or fragility of the falling, multiple components of the Crisis Management Cycle presented in figure G.12 should be applied simultaneously by the multiple involved actors. The set of appropriate tools is determined by the conflict phase. These instruments include measures for crisis prevention and resolution mechanisms regarding acute and long/lasting armed conflicts. The Crisis Management Toolbox presented in table G.3 provides an overview of all available instruments regarding civilian, civil-military and military crisis management and crisis prevention instruments.

The structures, principles, actors, and instruments in crisis management operations are subject to a continuous process of change through learning, adjustment, and further developments of actors and events. Consequently, crisis management is not a linear process. The toolbox should be regarded as an analytical tool that helps to understand the course of a crisis, illustrates the commonalities and by which appropriate goals can be developed including suitable instruments in each conflict phase. Thereby the toolbox reduces the complexity and assists the helping actors in selecting those elements which can contribute to de-escalation of a crisis (SWP & ZIF, 2013).

INSTRUMENTS:	**ACTORS:**	**CONFLICT PHASES:**
CIMIC (Civil-Military Cooperation): stands for the interaction of the military with governmental or non-govern- mental civilian actors in international military operations. It is a military doctrine for the operational and tactical level: it supports the cooperation of foreign troops with civilian forces and local actors to fulfil the military mission and to contribute to the protection of the troops.	- Nation states - UN - EU - NATO	- Fragile post conflict. - Armed conflict.
Conflict Resolution & Mediation: is a collective term for processes of diplomatic conflict settlement by third parties. It can take place pre-emptively, to avert the escalation of a crisis, but may also accompany the use of civilian and military means that can bring about the termination of a crisis and establish stable political conditions.	- Nation states (high and low power) - UN - EU - OSCE - AU - NGOs	- Escalation. - Fragile post conflict.

CSDP Operations: In the framework of the CSDP, the EU disposes of civilian and military means for conflict prevention and crisis management. Therefore, the EU can cover a wide range of tasks in CSDP operations, e. g. police training or election observation.	EU: - Nation states - Council - Commission - Parliament - CMPD	- Escalation. - Armed conflict. - Peace or no armed conflict.
Democracy Promotion: encompasses all non-military measures of external actors, who aim to establish, strengthen or restore a democratic political order.	- UN - EU - Nation states - NGOs	- Peace or no armed conflict. - Fragile post conflict.
Disarmament and Arms Control: both concepts describe a series of measures, agreements, and initiatives, which are targeted at limiting or reducing of military instruments and capacities. In broader terms, instruments of non-proliferation or export control are included.	- Nation states - UN - EU - OSCE	- Peace or no armed conflict.
DDR (Disarmament, Demobilisation and Reintegration): Disarmament, demobilisation, and reintegration of former combatants are central tasks in post-conflict situations. Accomplishing these is a crucial prerequisite for stabilisation and reconstruction. Local ownership should be the emphasised on.	- DPKO - World Bank - UN - DFID - GIZ - Local / national commissions	- Peace or no armed conflict.
Economic Recovery: measures aim at the creation of a constitutionally regulated and welfare state-oriented "Peace Economy" and fighting against economies of violence and shadow markets. International donors finance, coordinate, and implement these measures in cooperation with local actors.	- UN - UNDP - World Bank - IMF - Companies - international & local NGOs	- Peace or no armed conflict.
Election Observation: In the context of an election observation, a group of independent international and/or local observers monitor and assess the election process in a country. International standards and national legislation have to be taken into account. The aim is to guarantee free and fair elections and to improve the conditions for confidence in the democratic process.	-EU - OSCE - ODIHR - OAS - AU - ECOWAS - National & International NGOs	- Peace or no armed conflict. - Fragile post conflict.
Groups of Friends of the UN Secretary-General: Groups of friends are diplomatic instruments for negotiations. They are small, informal unions of UN member states that support the Secretary-General, his representatives on site, and the Security Council in finding a solution to a conflict or a content-related question of UN crisis management. Composition and size may vary. As a rule of thumb, a group of friends should represent a balanced combination of Security Council members, financially strong donor countries, neighbouring states to the conflict-ridden country, and representatives of the most important stakeholders. Last but not least, it needs to be impartial.	- UN member states	- Escalation. - Armed conflict. - Peace or no armed conflict.

Humanitarian Aid: is the immediate relief for people in acute humanitarian emergencies. It is provided by state and non-state actors and is bound by principles of impartiality, independence and neutrality. Humanitarian actions should alleviate the suffering of affected people. Yet, their aim is not to eliminate the causes of the emergency.	- Nation states - EU - UNHCR - UNICEF - WFP - Red Cross - NGOs - Local partners	- Armed conflict.
International Tribunals: The International Criminal Court (ICC), a tool in the fight against severe human rights violations, should strengthen the rule of law in local- and international relations. The jurisdiction of the ICC includes crimes of international concern (genocide, crimes against humanity, war crimes and aggression).	- The 121 states which ratified the Rome Statute	- Fragile post conflict.
Peace Enforcement: implies the application of sanctions up to the point of military force on the basis of a UN Security Council mandate. It can be carried out in case of a threat to peace and international security or in case of a breach of peace. It aims to re-establish peace and security. It is accompanied by humanitarian aid and diplomatic measures.	- UN Security Council - NATO - EU - AU - multinational coalitions - individual member states	- Escalation. - Armed conflict.
Police Missions: should support security forces in their efforts in crisis-ridden countries, stop state failure or achieve internal stability through the construction of statehood.	- UN - EU - OSCE - bilateral agreements	- Fragile post conflict.
Military Rapid Response Forces: are a distinct capability which enables a quick reaction in crisis scenarios. The underlying assumption is that a timely, rapid and decisive intervention of a few troops might allow to prevent the escalation of a crisis or suspend it until larger units are available, or until political solutions to resolve the conflict are found.	- EU: EUBG - NATO: NRF - AU: ASF	- Escalation. - Armed conflict.
Peacebuilding & consolidation: refers to a range of different civilian measures, which are to establish lasting peace in a post-conflict country. They are aimed at removing structural causes of violent conflicts, overcoming the consequences of conflict, and the creation of mechanisms for conflict transformation. Peacebuilding unites enable security and development policy approaches which provide politically strategic and financial contributions, supporting the implementation.	- States - International and regional organisations - Groups of friends. - Financial Institutions - NGOs - Local population, governments, Conflict parties	- Peace or no armed conflict. - Fragile post conflict.
Peacekeeping: peacekeeping missions help states, which are involved in armed conflicts, to create the requirements for a sustainable peace, for instance by accompanying the implementation of peace accords. Mandated by an UN Security Council resolution, the missions typically consist of international troops, police, and civilian personnel.	- UN Security Council. - DPKO - DFS - Country of operation - Troops, police, civilian personal of member states	- Fragile post conflict. - Escalation. - Armed conflict.

Political Missions: is a loose collective term for predominantly civilian operations, in which various multilateral actors work towards conflict resolution and peacekeeping. They vary greatly in number and composition of their personnel, their duration and mandate. What they have in common is that they seek to achieve their aims through political interaction with local partners.	- DPA - OSCE - EU - AU - OAS	- Peace or no armed conflict. - Fragile post conflict.
Pooled Funds / Common Financial Structures: are multilateral mechanisms to mobilise country- or issue-specific resources, and coordinate donors. The aim is greater coherence, flexibility and effectiveness in the application of contributions.	- Donor states - UN - World Bank - NGOs: local, international	- Peace or no armed conflict. - Fragile post conflict.
Sanctions: are political or economic aimed at inhibiting states, groupings or individuals from taking a specific policy or action. In the context of an overall strategy, international sanctions can weaken their addressees economically and militarily or put them under pressure politically.	- UN - EU - ASEAN - AU - individual states	- Peace or no armed conflict. - Escalation.
Reconciliation and Transitional Justice: are defined as processes in a post-conflict country, designated to lead from a state of hostility to a situation of cooperation. In this context, coming to terms with the past and the attempt to achieve justice are essential.	- Individual, societal (churches) and political actors (governments) - Victims & perpetrators - International states - NGOs - UN + UNDP	- Fragile post conflict.
Security Sector Reform (SSR): refers to a long-term transformation process. The aim is to transform institutions and organisations involved in internal security to make them more efficient, more transparent and more democratic. For this purpose, the government of a country willing to reform applies appropriate strategies and programs in collaboration with local, regional and international partners.	- National government - National States - NGOs - Regional organisations - Bilateral donors - Private Security Companies - OECD - UN - EU (UK & NL) - World Bank	- Peace or no armed conflict. - Fragile post conflict.
Small Arms Control: Included in small arms control are various measures on the national and international level: from UN-moderated state conferences and national action plans to local small arms control programs in post-conflict situations. All measures aim to prevent illegal access to small arms and to control the legal arms trade more strongly.	- UN - EU - OSCE - IANSA - Development organisations	- Peace or no armed conflict. - Fragile post conflict.
Special Representatives: are appointed by states or international organisations to take over responsibility for certain issues or regions. They can be located in the region itself or in the headquarters of an organisation.	- EUSR - UN Special Representatives	- Peace or no armed conflict. - Escalation. - Fragile post conflict.

Table G.3: Toolbox for Crisis Management Operations (SWP & ZOF, 2013).

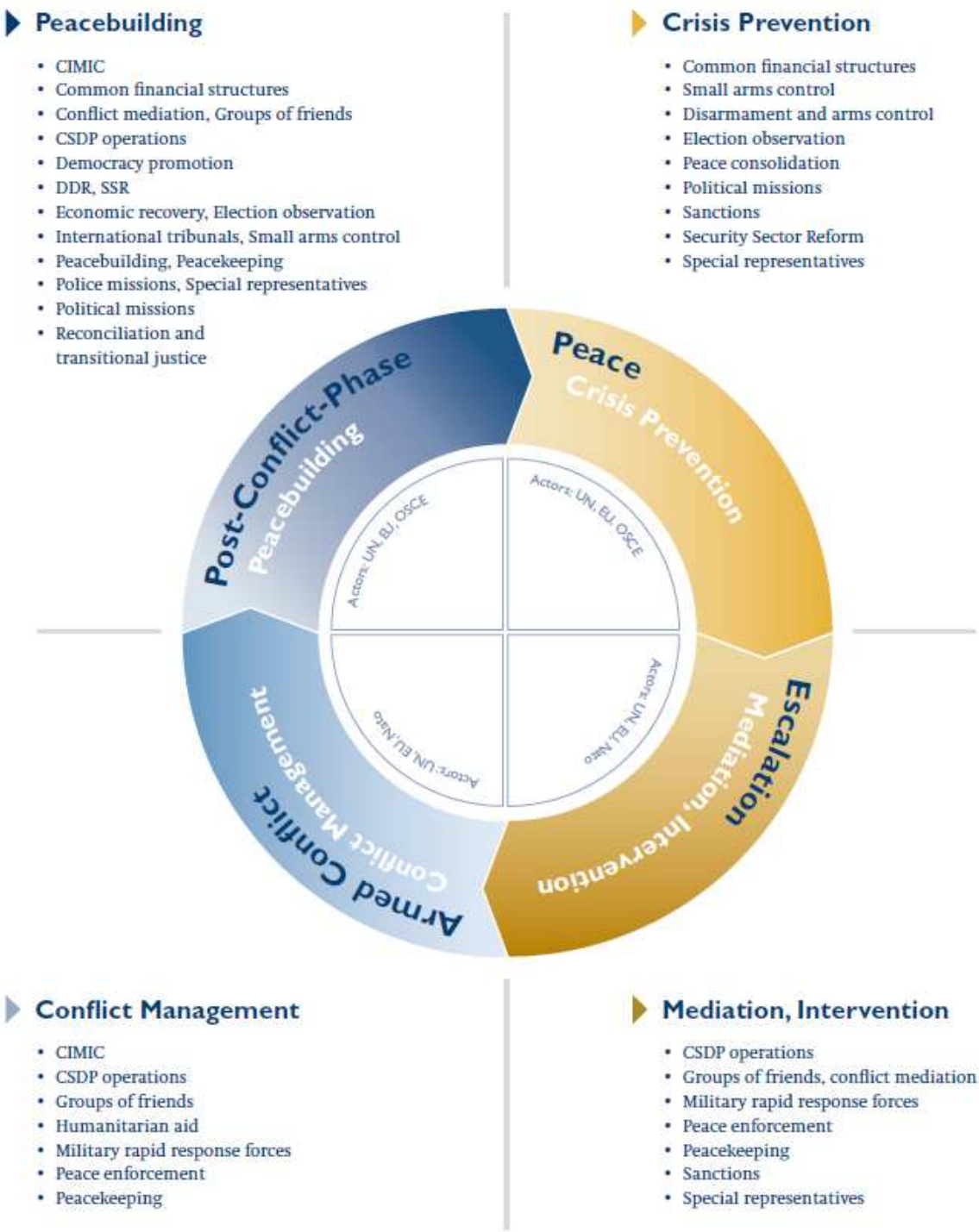


Figure G.12: The Crisis Management Cycle (SWP & ZOF, 2013).

H

Lessons Learned Uruzgan Mission

Numerous lessons learned from the Dutch involvement within the NATO-ISAF Uruzgan mission are included within the new developed framework. An overview of the Netherlands' involvement within in the Afghan province of Uruzgan, including general observations and recommendations, are presented in chapter 4. The identified lessons learned relevant for the development of the new framework are presented in this appendix.

A speech summary of Peter van Uhm (2012), chief Netherlands Armed forces from 2008 until 2012, gives an interesting insight in the problems the Dutch encountered and what solutions they applied*; 'Situational awareness is a military term describing the amount of knowledge you have with regards to the area you are operating in. This involves the terrain characteristics, strength of the enemy but also culture awareness regarding local values and habits. Before the deployment to Uruzgan, we thought we had a good understanding of the local culture. Although the initial mission plan was well constructed, there were some substantial defaults'* (Uhm, 2012):

- *'Making a good first impression with easy and fast success projects also known as 'low hanging fruits', turned out to have a small effect especially with regards to the long-term goals'* (Uhm, 2012).
- *'The formal leaders, the tribesman, with whom the negotiation meetings were performed and agreements made were strongly influenced by other informal leaders. The women turned out to be these "informal leaders". Due to local religion reasons, they were although not involved. This made a couple of made agreements at the end ineffective'* (Uhm, 2012).
- *'At the start of the mission local hospitality and a trustworthy relationship were misinterpreted due to the Dutch and Afghan culture differences. The Afghan culture is a culture based on pride and hospitality. Hospitality does not mean that you have initially a trustful relationship. To establish this, you need to invest in trustworthy long-term relationship where ego's and pride should be set aside. At the start of the mission hospitality and a trustworthy relationship were miss interpreted'* (Uhm, 2012).

'DO NO HARM' (Post, 2015; Lucius, 2015).

'Be flexible' (Lucius, 2015).

'What has no monetary value, has no value' *(Post, 2015).*

'By only acting as a mediator, small conflicts were resolved (talk, make suggestions, find solutions)' (Lucius, 2015). *'When actors feel safe, they will take part in the negotiations. At that moment you need to start working at the water management system'* (Kleijn, 2014).

'Winning the "Heart-and-Minds" by means of basic water provision and agriculture is crucial' (Kleijn 2014).

***'Common interest is the starting point for cooperation**. **The second is trust**. Find early in the process the local water managers in the area of operations and establish a good working relationship to create trust to enable cooperation. Sharing of hydrological data can be a first step in building trust' (Post, 2015).*

'Governance & Water are pillars of common interests and essential needs in every society. *Without water there is no live and without live there is no governance. Thus make water as a pillar for governance' (Post, 2015).*

A continues, coherent and flexible plan which integrates short-term activities and long-term stability and socioeconomic development objectives within a set of boundaries is key, but not easy in reality (Tak, 2015; Matthijssen, 2015; Lucius, 2015). *'While doing, always keep the political agendas in mind'* (Lucius, 2015). In addition, *'a shared political vision, makes cooperation easier. Also, be open with regards to you motives, objectives and activities. Make the cooperation explicit and plan the activities together'* (Berg, 2014).

'Apply development project to enlarge the ink blot / area of influence' (Lucius, 2015). *Liberating an area without the following-up of establishing and maintaining a permanent presence to* maintain a direct physical security *only results in delivering short-term results. Based on the "ink blot" strategy elaborated in Appendix G - section G.2.3, kinetic offensive or defensive operations should directly be followed by reconstruction activities as well as the training of native armed forces and/or policy personal (Graaf, 2010, LTO, 2012).*

'I would have liked ***more army engineering capacity*** *for the execution of more water management and other reconstruction related activities and thereby stimulate quick impacts and short-term wins in the unsafe areas. These are shaping condition for increasing the "ink both" including peace and development. After, civil actors could have continued these projects'* (Matthijssen, 2015).

'Investigate how you can contribute to the current development activities, respecting the knowledge and effort of the already involved actors and try to establish a good working relationship by ***synchronisation of activities'*** (Lucius, 2015).

'Pride is a barrier for cooperation. ***In order to enhance cooperation, difficult and delicate subject should be made negotiable.*** *This was primarily done, by explaining the benefits of cooperation and have open and honest discussions in order to create awareness and policy support'* (Uhm, 2012).

'Know the social network, structure, habits and the informal and formal leaders*. Therefore,* ***a good situational awareness is crucial.*** *In order to enhance this, the main basis is a* ***trustful relationships with the involved stakeholders.*** *In order to enhance this, you need to belief in what you tell, keep your promises and gif the right example. A Dutch proverb says; "trust comes by walking, but leaves per horse". Meaning that one wrong action, can result in a degradation of the heavily invested trust'* (Uhm, 2012). *'Uruzgan is a tribal society, where you need to own the trust of the local population. This was achieved by actually doing what you have promised to do (a deal is a deal)'. Also, 'if you damage a water system or farm land, apologize and compensate or reconstruct it'* (Post, 2015). This resulted in: '*there are close contacts with tribal leaders, informing them of our activities, consulting with them regarding development initiatives and to obtain information from them regarding opposing militant forces' (*Gabriëlse, 2007).

'If you damage a water system or farm land, apologize and compensate or reconstruct it.' (Post, 2015).

'The media is key in how the mission is framed, explained and thus supported' (Lucius, 2015).

'Discovering and validating the real important issues of the local population is difficult, especially in a conflict area. For example, people are being threatened and thereby forced by an actor to gif a certain answer. Also, like in western countries, people just give a social satisfying answer due to group pressure or to protect their social status and position in the society. Like: "the mosque is for me the most important thing in my village" and by saying this I am proving that I am a good Muslim'. ***'By having knowledge in the matter, you will earn respect.*** *By having knowledge in this situation about water, you can ask the right questions to discover the real problems. Like, Is the water for the hospital clean? or Do you face flooding problems? etc'* (Lucius, 2015).

'Don't focus too fast on solutions. First make a proper analysis and assessment of the situation and claimed problems' (Lucius, 2015).

'Sometimes you cannot prevent and is it even essential to do quick impact projects, without a proper assessment. *Hereby the projects are based on common sense and experience, because doing nothing is not an option especially in crisis situations'* (Lucius, 2015).

'Achieving visible and measurable positive effects can take a while' (Tak, 2015). *'The low absorption capacity and an underdeveloped administrative system make sustainable development a long-term process'* (Gabriëlse, 2007). '*The patience of Western democratic governments, including the Dutch one, was lacking at the beginning of the mission'* (Tak, 2015).

'Understanding the local economic situation and drivers is key*. Rapid change in this system like, from Poppy to Saffron cultivation will have large impacts. Therefore it is appropriate to* ***implement fundamental changes gradually over the long-term****'* (Tak, 2015).

'Leave your own value of judgment at home with regards to how the local population manages and execute their things' (Post, 2015). *'Respect and accept that the locals of the host-nation have another way of doing their things.* ***Know the local culture, use / apply and support it in order to stimulate self-reliance.*** *Don't perform the activities which can be performed by the local population themselves. Instead only support them by means of management advice, technical support, materials, tool, educations, etc. Focus on the right effects aimed at right target group. It is not going about us, but about them. The process is more important that the outcome'* (Lucius, 2015).

Start with local entrepreneurship, which includes local problem ownership and local capacity building, from the very start of the mission *(*Gabriëlse, 2007; *Koolhof, 2014; Matthijssen, 2015). 'Use the energy of the local population in order to make their society self-reliance'* (Lucius, 2015). *' "Where people work, the chances of an armed conflicts are small" is the credo of 1CMI-Co IDEA (Integrated Development of Entrepreneurial Activities). By means of business case formulated micro-finance programs executed by the local population, micro business development and private sector development can be established. This is the base for socioeconomic development. Moreover,* ***stagnation or a decrease of the local economy in the area of operations is a significant threat for stability'*** *(Koolhof, 2014). 'Stimulate the local economy by contracting the local population and local companies as much as possible for the execution of the development aspects. Furthermore, this approach will educate the local population in maintaining and optimising the development works. Also, it will enhance cultural understanding, stimulates a good working relationships and contributes to increasing the situational awareness'* (Matthijssen, 2015). *'With regards to water management, local contractors can be contracted for construction purposes. Moreover, maintenance contacts can be made with local entrepreneurs with regard to maintain water wells and irrigation systems' (Koolhof, 2014).* ***'This approach will be more costly and time consuming compared to the execution by a Western organisation, but are crucial and essential to invest in for the creation of a self-reliance community and country'*** (Matthijssen, 2015).

'Expectation management by means of explaining where you come from, what your boundaries are, what the expectations of your organisation are, etc. is crucial in gaining trust of your own staff and that of the local population including the host-nation governmental organisations' (Lucius, 2015).

*'**Developing the capacity of the local and national government to deliver basic services is crucial for the government's outreach to its population**. It is also a prerequisite for the tribal structures to improve the confidence in their elected leaders. In Uruzgan we are in constant dialogue with the governor and the provincial ministers. Assistance is given for the creation of a provincial development plan, regular meetings of the Provincial Development Council are attended and training is provided for those involved in basic management skills (such as agenda setting, how to conduct a meeting, etc.). **Afghan ownership is a prerequisite for the sustainability of the assistance.** Despite limited capacity of the Afghan government, in the long run Afghan leadership is the only solution. At the same time quick and visible results are required to give the population an interest in stability and confidence that the government will improve their living conditions'* (Gabriëlse, 2007).

*'**The current strategy of the Netherlands for reconstruction contains both a top-down and a bottom up approach**. Top down: we channel the larger part (two-thirds) of our yearly development aid through trust funds and multilateral programs that aim at creating preconditions for good governance. The aim is an effective roll out of national and local programs as well as the increase of legitimacy of the government. Bottom up: because of the poor implementation capacity in Uruzgan, we try to create the preconditions for national programs to be rolled out. We do this by actively involving local NGOs and by directly funding projects in the sectors of education, infrastructure, health and alternative livelihoods'* (Gabriëlse, 2007).

*'**Lighting is a key need for socioeconomic development.** Without it the economy just stops. By means of lighting, home industry and entrepreneurship is stimulated because the working day is increased. Also the local population can study longer. Furthermore, by means of lightning of homes and streets, the safety and security is improved. **By means of hydropower and storage basins, electricity supply for lighting can be established'** (Koolhof, 2014).*

*'**Infrastructure is another important key need for socioeconomic development**. Flooding can result in the destruction of bridges. During my NATO-ISAF deployment, I have experienced this events. Due to the flood, a vital bridge link was destroyed with great negative effects; a part of the local population could not reach the city resulting in the fact that they were not able to trade their products on the local market, get day-to-day live supplies including provisions and were cut off from healthcare. Because the Afghan and Dutch forces could not patrol in this area on a regular base, the area of influence of the Opposing Military Force (OMF) increased in the area which was cut-off' (Koolhof, 2014) Flooding events also cause a threat with regard to the agriculture sector, industrial activities and a safe living near rivers. **Mitigating or preventing floods is thus essential in order to have a constant positive loop of socioeconomic development.***

The time horizons differs between the involved organisation: Defence, Foreign Affairs, NGOs, IOs and the local / host-nation governmental organisations. To reconstruct a country toward stability the NGO Cordaid maintains the principle that the stabilisation and normalisation period is the same as the total conflict duration. Commonly Cordaid formulates its development policies and activities over a time horizon of 20 years. This differs compared with that of military deployments, which are shorter. Communication is thus crucial. Direct association although in the conflict areas is not wise. NGOs can be regarded as an 'extension' of the military force and thereby becoming a target for the OMF (Berg, 2014; Lucius, 2015). But, *'be aware of the conflicting issues and interest of all the involved actors and stakeholders'* (Lucius, 2015).

'Behind the sciences, information can be shared with regards to the safety situation *(IED locations, road block) which are live saving. But also the kind and scale of the development projects, with which local stakeholder do I or can I collaborate and 'open source' date (internet sites) of projects. This need to be a double-side, giving-getting and open based. Also explain what you are going to do with the information to increase trust in each other and show that the shared information is not abused for PSYOPS or combat operation. Especially if the safety of the NGOs activities, personnel and local contacts will be threatened due to the fact that they have shared their information'* (Berg, 2014). In the field, the -coordination between the PRT and NGOs went well during PRT-8. *'From the NGOs, AUSAID and USAID I always got full assistance with regards to data sharing and vice versa. But we did not see any projects of each other, because we were acting in different areas within Uruzgan. USAID and AUSAID worked in permissible areas and we, the Dutch forces worked in non-permissible areas. Due to the fact that I was a functional specialist and thereby a civilian expert with a military uniform, the communication between the NGOs and Netherlands Ministry of Foreign Affairs went well because we speak/spoke the same language. Also the fact that a civil representative of the Ministry of Foreign Affairs was leading the PRT, did contribute to a well coordination of the development activities and cooperation with the involved actors'* (Post, 2015).

'Staying aligned with the key stakeholders is important. *When you want to implement a plan, consult all the stakeholders internal and external (army, foreign affairs, NGOs local population and the local government) from the bottom toward to top organisational levels. By consulting them and include their input, it becomes also their idea. By this approach you will develop support for the implementation of your plans.' (Koolhof, 2014).*

'Success is a mutual interest*. Keep the initiative by yourself but don't impose solutions. Important is to involve the local population within the entire process and share expertise (locals know the area, social network and informal leaders). Also share the credits of successes in order to enhance the trust in the local authorities'* (Uhm, 2012).

'Need a well 'hand-over-take-over' and continuity in staffing *(same persons in the teams)'* (Berg, 2015). *'Sharing of information with the host-nation of local projects was not always common practice. While this is essential for a good hand-over'* (Lucius, 2015). Also, *'reporting should be better in order to establish a continuously development progress'* (Post, 2015).

'Constructing water wells *including the related knowledge regarding the effects of its usage on draining the aquifer,* ***is present within the 105 Netherlands Army Engineering Battalion****. Within the Uruzgan mission, knowledge regarding its possibilities and constraints for Quick Impact Projects was gained and extended'* (Tak, 2015)

'The media is key in how the mission is framed, explained and thus supported' (Lucius, 2015).

I

IWRM Dimensions

The natural and human systems within the Integrated Water Resources Management (IWRM) framework are characterised by the following four dimension (Savenije et al., 2008):

1. **Water Resources:** the entire hydrological cycle, including water quantity and water quality.
2. **Water Users:** all human economic-, industrial-, and social interests, including the natural dimensions.
3. **Temporal Scale:** the temporal variation in water availability and -demand, including the physical structures for water management and control.
4. **Spatial Scale:** spatial water distribution (upstream watersheds and arid areas downstream) and the various spatial scales at which the water is managed (individual, groups, watershed, catchment, basins), including the institutional arrangements to manage water (individual users, water boards, governments, international transboundary commissions).

In figure I.1 the relationships between the four dimensions is visualised. Each dimension has multiple issues related to governance policies and water management systems. Within IWRM, it is recommended to integrate these issues within the solutions. Due to the different perceptions and conflicting stakeholder interests, integration of these issues will be a challenge. Some even argue that this is simply impossible with the current state of knowledge (Biswas, 2008). In the following paragraphs each dimension is discussed in more detail.

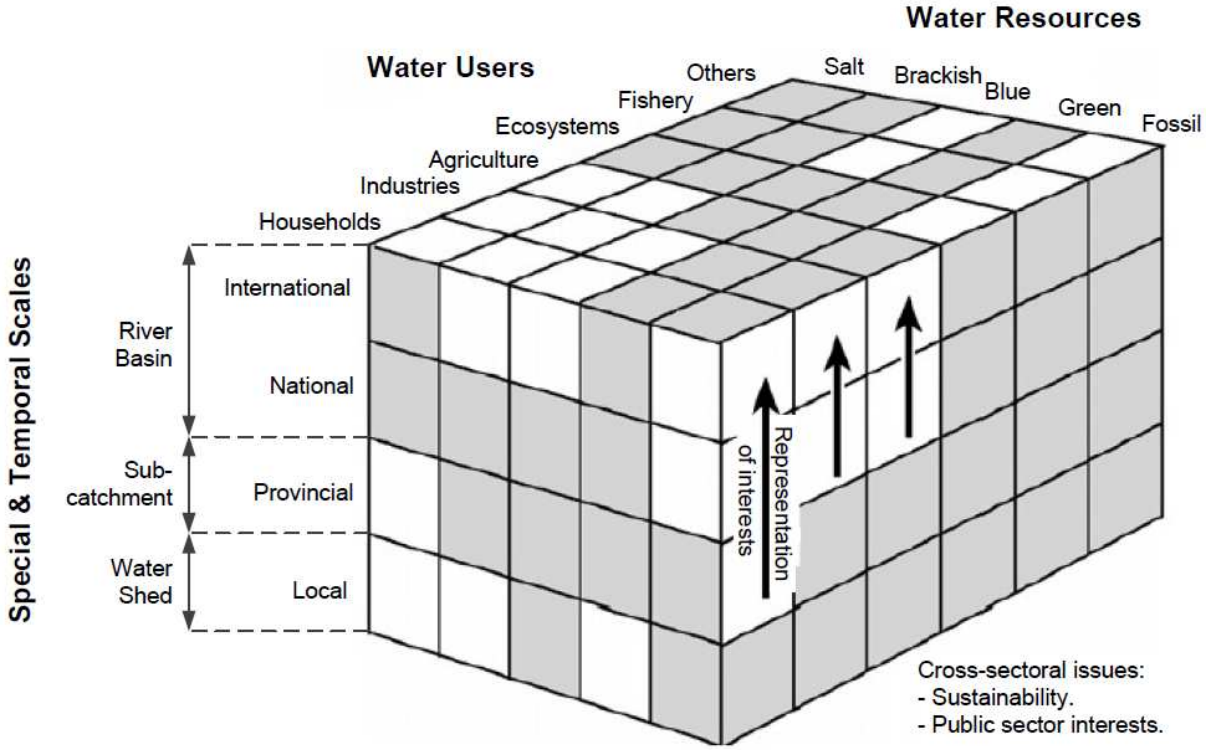


Figure I.1: Three of the four IWRM dimensions (Savenije et al., 2008; supplemented by the author).

I.1 Dimension 1 - Water Resources

Water resources include all forms of water occurrence including:

- Salt water.
- Fossil groundwater: non-renewable water.
- Blue water: the water in rivers, lakes and shallow aquifers.
- Green water: the water in the unsaturated zone of the soil.

Green water is responsible for 60% of the world's food production and all of the biomass produced in forests and pasture. Moreover, this water resource is most sensitive to land degradation. Fossil water, the deep aquifers that contain non-renewable water, should be considered a mineral resource that can only be used once at the cost of foregoing future use (JØnch-Clausen et al., 2001; Savenije et al., 2008).

Successful IWRM implementation requires a coordinated management of issues and sustainable development regarding: water supply and water demand; land- and water use; surface water and groundwater; water quantity and -quality; upstream and downstream use including freshwater from rivers and aquifers and salty waters from estuaries and coastal zone issues (GWP, 2000; JØnch-Clausen et al., 2001; Savenije et al., 2008; JØnch-Clausen, 2004, Biswas, 2008). For example, high irrigation demands and polluted waterways from agriculture result in less freshwater for drinking- and industrial use. Contaminated municipal- and industrial wastewater pollutes rivers and threatens ecosystems, resulting in less water available for crop growth (Brears, 2014). When water stress becomes severe due to these conflicting interests, it will result in conflicts (Wolf, 2007).

Another important but oft-neglected interrelation is the integration of surface and groundwater systems. The widespread use of agrochemicals and pollution from non-point sources already pose significant threats to groundwater quality. Groundwater pollution is frequently irreversible over a human timescale, given the present technologies and the remediation costs. Similarly, there are multiple feedback effects of groundwater withdrawal and use on the surface and freshwater in coastal zones (JØnch-Clausen et al., 2001).

Thus, water is a crucial determinant for the health of all ecosystems including public health and -living standards. Water quantity and quality requirements therefore have to be taken into account in the overall allocation of available water resources between upstream and downstream interests (JØnch-Clausen et al., 2001).

I.2 Dimension 2 - Water Users

An important aspect of IWRM is the participation of individuals and communities in all aspects of water management and decision-making. This ensures that all members of society benefit from the sustainable and equitable use of water. An important management approach forming the basis for sustainable development is the establishment of multi-disciplinary teams at all levels (governmental and non-governmental local, regional, national and international actors) between all water users. By means of applying the bottom-up- and top-down approaches, communication regarding the different multiple water usage perspectives will be enhanced. This will probably contribute to effective consensus-building between the stakeholders. It also ensures that local community experiences and views will be integrated into the development and management plans. (Radif, 1999; Brears, 2014).

In addition, IWRM involves modifying human systems to encourage people to use water resources sustainably. This can be achieved by a variety of present- and future technologies, legal programmes, and policies. These policies including water resources assessments, demand management and conflict resolution mechanisms (Radif, 1999; Brears, 2014).

There are multiple different water use functions. These functions can be split into:

- Production functions (for economic production activities).
- Regulation functions (for maintaining a dynamic equilibrium in natural processes).
- Carrier functions (to sustain life forms and transportation).
- Transfer functions (as a contribution to culture, religion and landscape).

An important issue for sustainable development is maintaining a healthy and functioning water ecosystem. This needs to be in balance with human water usage. Typical urban- and rural water users within the public- and private sectors are: households; industries; agriculture; fishery; ecosystems; hydropower; nuclear, coal and gas powered electricity plants; navigation and shipping; recreation. (GWP, 2000; JØnch-Clausen et al., 2001; Savenije et al., 2008; JØnch-Clausen, 2004, Biswas, 2008). Besides water quantity, the users also depend largely on the quality of the resource. Since water is a renewable and reusable resource, the Reduce, Reuse, Recycle principles (see chapter 9) should be incorporated to ensure a sustainable water systems. Incentives need to be provided to individual users, but to be effective this philosophy needs to be incorporated into national and international water policies (Ven, 2011; JØnch-Clausen et al., 2001).

I.3 Dimension 3 - Temporal Sales

The hydrological systems within national and international rivers and -basin systems as well as water users, have a distinct diverging temporal patterns, like: floods; droughts; base flows; flooding patterns; peak demands; constant requirements; cropping patterns; etc. To prevent water conflicts, integration of upstream- and downstream interests regarding macro-, meso-, and micro water distribution- and -governance levels is crucial (see figure I.2 for a schematic overview of these levels). Since consumptive losses upstream will reduce river flows downstream, identification of conflicting interests between upstream- and downstream stakeholders is essential. Also, pollution discharged upstream will degrade river water quality downstream. Land use changes upstream may alter groundwater recharge and river flow seasonality. Flood control measures upstream may threaten flood-dependent livelihoods downstream. Such conflicting interests must be considered within IWRM with full acknowledgement of the physical- and social linkages that exist. Recognition of downstream vulnerability to upstream activities is imperative. Once again, management involves both natural- and human systems (JØnch-Clausen et al., 2001; Savenije et al., 2008). The Retain, Store, Discharge principle (see chapter 9) is regarded as an appropriate philosophy to cope with these challenges (Ven, 2011).

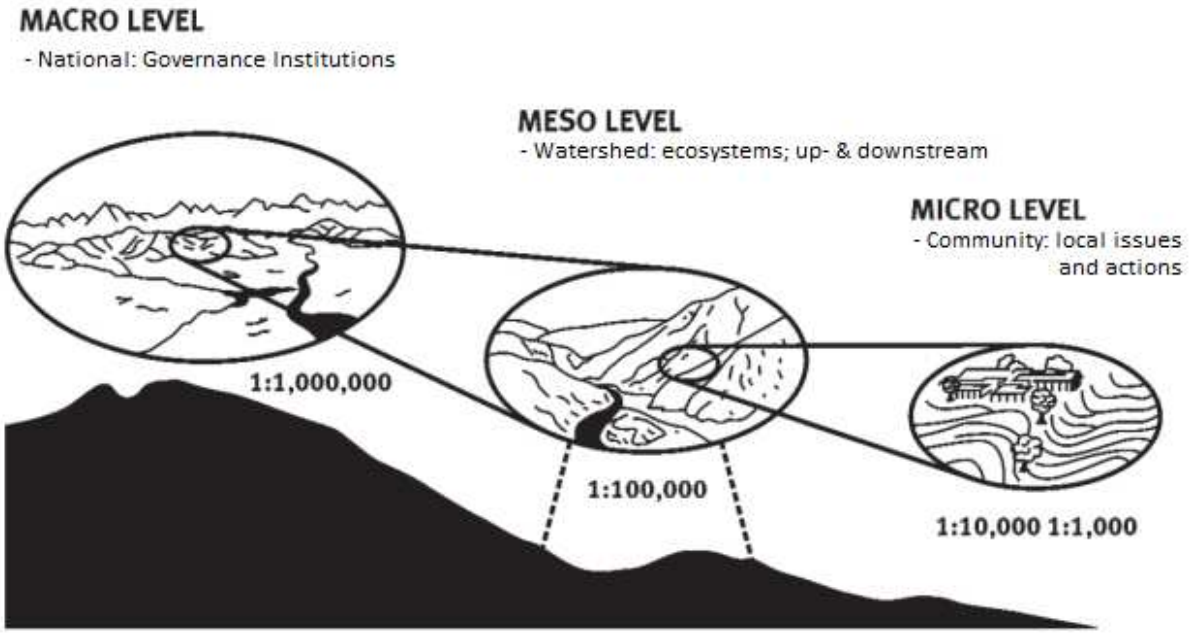


Figure I.2: Schematization of macro-, meso-, and micro-level within IWRM (GWP, 2009; UNEP, 2012).

I.4 Dimension 4 - Spatial Scales

Water resource issues are dispersed over the international-, national-, regional- and local levels. Due to the wide range of human activities interrelating with the water system, water politics and water economy requires integrated policy making within all these management levels. Moreover, administrative boundaries seldom share the hydrological boundaries of river basins, sub-catchments and watersheds. This calls for an inter-basin approach of problem solving. Participation of all relevant stakeholders at all levels within the planning- and decision-making processes is regarded as a crucial IWRM element for ensuring sustainable process development, both for present- and future generations (JØnch-Clausen et al., 2001; Savenije et al., 2008).

Due to the difference in geographical scales, including the multiple social, economical and administrative levels, water resources decisions are made - and belong at - different management levels. The concept of subsidiarity, decision-making at the lowest appropriate level, is a guiding principle in the development of IWRM. Interests and decisions at lower levels need to be made in cooperation with the higher levels, particularly to the national- and international levels (GWP, 2000; Savenije et al., 2008). Accordingly, the decision-making involves integration of different objectives that are not contradictory and trade-off by priority setting like: economic efficiency, regional income redistribution, environmental quality, and social welfare (GWP, 2000; JØnch-Clausen et al., 2001; Savenije et al., 2008; JØnch-Clausen, 2004, Biswas, 2008). The priorities need to be communicated in a transparent manner, according to the local societal objectives and constraints (R. Brears, 2014). Within this process, one should mobilise and involve the relevant and concerned stakeholders, especially at the implementation level within the management and planning of water resources. This is universally recognised as a crucial element in obtaining a balanced and sustainable utilisation of water. Stakeholder interests and -objectives probably differ substantially and consequently cause conflicts. This needs to be managed in a sustainable manner (JØnch-Clausen et al., 2001; Savenije et al., 2008).

In order to achieve these societal objectives, the following principles should be considered in the technical, governance and policy designs:

- **Water Economics.** Water must be integrated into the local-, regional-, and national economic planning process. Policies and financial priorities take into account the implications for water resources development, water-related risks and water use. Within this process it is essential that all economic sectors, both public and private, are incorporated (JØnch-Clausen et al., 2001).
- **Integrating water resources planning with poverty alleviation.** Water is interlinked with five of the eight Millennium Development Goals. Water management activities are thus closely linked with poverty alleviation, especially in most developing countries where freshwater supply and sanitation are often not present at the household level. Moreover, the rural and urban poor regions, in particular, depend on agriculture, fisheries and other natural resources for their livelihoods. Thus, as a result of water scarcity and -pollution, the poor will suffer the largest and most direct impact since mitigation measures are not within their set of options. Therefore, it is essential that the specific linkages between poverty and water are analysed, understood, and taken into account in the overall management of water resources, development policies, and management instruments (JØnch-Clausen et al., 2001; Savenije et al., 2008).
- **Cross-sector integration in public- and private policy development.** Private- and public economic- and social actors significantly influence the impact on water demand, water-related risks and the its availability and quality. National food, energy and industrial policies will impact water resources, including the natural system and vice versa. Therefore, water-related procedures for cross-sector information exchange and -coordination as well as techniques for evaluating the implications of individual projects for water resources, should be included within IWRM practices (JØnch-Clausen et al., 2001).

- **Link water resources planning with national security and trade policies.** Roughly 50% of all countries are situated within river basins. Within a basin system, downstream riparians are vulnerable since the origin of the water resource on which they depend is not within their national territory. This issue has created and continues to create substantial political tensions and -conflicts at a regional level. Moreover, water resource management is interlinked with international trade in food and other products that require significant amounts of water in their production. Furthermore, navigation channels are essential for the transportation of goods. On a broader international scale, water resource management is thus directly linked with international trade regimes and national security issues, making it an ideal tool to stimulate bilateral- or multilateral cooperation mechanisms (JØnch-Clausen et al., 2001).

J

IWRM Constrains & Optimisations

Based on actual implementations of the Integrated Water Resources Management (IWRM) framework, its Strengths, Weaknesses, Opportunities & Threats are discussed through a SWOT-analysis in paragraph J.1. The recommended optimisations to overcome the limitations of the IWRM framework are also discussed this section. But beforehand, the lessons learned are summarised in paragraph J.2.

J.2 Lessons Learned

The implementation of multiple IRWM practices has provided important information. These lessons learned and best practices are summarised below (JØnch-Clausen, 2004):

- The hydrological system should be understood at the macro-, meso-, and micro-level.
- The highest political levels should demonstrate commitment at an early stage.
- The process should be firmly anchored in the responsible ministerial organisation and financial institution.
- The planning and implementation processes should be supported by a communication strategy for active involvement of stakeholders as well as technical- and financial partners.
- Reforms to policy, governance, and institutions should be possible during the process.
- The IWRM process needs to be adapted to the local context and –content, including prioritisation of crucial water issues.
- Form stakeholder groups, including the decision-makers representing the different levels, to participate in the discussion-, decision-, planning-, and implementation processes. Sufficient time must be made available to include all comments and endorsements.
- In basins where economic-, social-, and environmental stakes are high, proposals and approaches need to be tested through pilot programmes before implementation.
- Crucial players who can act as catalyst for change should be included from the beginning. Local stakeholders, NGOs, and private industry can be such crucial players.
- Have patience in the implementation phase and be consistent in pursuing the IWRM objectives.
- The three crucial IWRM implementation principles should be applied from the early beginning.
- In democratic societies, public awareness and multi-stakeholder participation are fundamental to creating and ensuring acceptance of the local population and at the various governmental levels.
- The process of reaching consensus is difficult, but it forms the most significant step towards sustainable, long-term orientated development.
- An agreed set of coordinated- and prioritised actions provides a firm basis for cooperation with stakeholders and funding agencies.
- Using cost-benefit sharing and water trading arrangements between community organisations, private sector organisations, and governments turns out to be very effective in stimulating efficient water use. Specifying who pays for what, including an equitable cost-sharing arrangement and enforcement, is identified as a complex challenge.
- A high-level international and inter-ministerial water resources committee is required to deal with cross-sector and cross-border water resources issues and situations of competition.

- Decentralisation of certain water resources management responsibilities will increase local ownership and will reduce logistic pressures.

J.2 Discussion & Recommended Optimisations

The Global Water Partnership (GWP) considers the Integrated Water Resources Management (IWRM) framework as the strategic approach to coordinate, develop, and manage water, land, and other related resources along interstate basins, including trans-boundary-, national-, and local water systems. It is focussed on the entire water cycle and takes into account the interests and values of all water users. By definition, IWRM appears to be a holistic approach but in reality, it vagueness is its main weakness. Since the performance of the IWRM road map is difficult to measure, its level of effectiveness and efficiency at the operational level regarding the implementation on the macro- and meso-scale are disappointing. Its vagueness has nevertheless contributed to its popularity in recent years (Biswas, 2008). By means of the in table J.1 presented SWOT-analysis, the crucial IWRM characteristic are summarised.

Strengths:	**Opportunities:**
• IWRM is a multi-country, inter-sector approach. Thereby it stimulates integration and cooperation with all interested actors. • IWRM provides governance, institutional structures, and processes to provide permanent mechanisms for constructive dialogue, planning and development among riparian stakeholders, focussed on sharing water benefits. • IWRM aims at building confidence, trust and a collaborative relationship among the actors. • Includes sustainable development, the maintenance of environmental- and water quality, plus sound socioeconomic development that safeguards the resource base for future generation through: - Financial sustainability through cost recovery. - Good governance through effective management and control mechanisms including legal frameworks. - Good institutional capacity through capacity building and human resources. - Equity. - Alleviation of poverty and gender inequality. - Water security, food security, and health.	• Translate the water strategy into an operational, explicit, tailored action plan, including measurable development goals and -criteria. • Hydrological and socioeconomic data collection is the first step in building commitment, trust, and cooperation. • IWRM needs to be linked with other resources management issues such as food and energy security. • Make use of the local "enabling champions" or crucial stakeholders as the drivers for processes. • Establish continuous financial support from donors and lenders, like the World Bank. • Create institutional strength / permanent water management organisation with the aim of providing a united vision and policy framework for accelerating economic cooperation and -integration among the stakeholders, riparian states, and other public- and private actors. • A multi-disciplinary monitoring- and evaluation team must assess and guide the projects. • Perform livelihood analysis, especially in communities where the development is low and poverty high. • To increase the water quality, educate communities on how to use less agriculture inputs, particularly nitrogen- and phosphate fertilisers that cause water pollution. • Hydropower installations for energy production including flood protection and water security by its strategic water reservoir.

Weaknesses:	**Threats:**
• In theory, IWRM is a bottom-up approach yet in practice, it is a top-down approach. • Decision-making at the lowest possible level (subsidiarity) forms a conceptual strength, but is not put into practice. • Consensus-making is a critical factor since this results in local ownership of the water strategy. Incorporating sufficient time for allowing robust stakeholder consultation is essential. Most politicians nevertheless fail to embrace this. • The IWRM Toolbox is too complex and thus ineffective.	• Its vague definition can result in the practice that clear water management goals are not made explicit. • A lack of coordination and linkages between the stakeholders. • The differences in interests, policies and procedures among the involved stakeholders, sectors and institutions. • Individually minded stakeholders exploiting as much as possible for their own purpose. • An inadequate regional database to analyse water resource information. • Previously concluded water treaties that limit present effective and equal water utilisation. • Historic tensions, including those over water and/or those that cause current regional instability. • Corruption. • Climate change and water stress. • Hydropower installations and their devastating impact on the environment, nearby societies, and water security for downstream stakeholders.

Table J.1: IWRM SWOT-analysis (JØnch-Clausen, 2004; GWP, 2004; Savenije et al., 2008; A. Biswas, 2008).

For a successful implementation of IWRM, complex issues must be addressed explicitly. For successful application on the operational level, water strategy action plans have to be tailored to local habits, cultures and socioeconomic needs. Where the water activities are explicitly made on a micro scale, IWRM has proven to be an effective approach. On the macro- and meso scale, the IWRM activities are formulated vaguely, driven by political motivations. These motivations are based on having a constant, wide, and multi-issue playing field in which trade-offs are possible. By making the strategic plans explicit, possible trade-offs are no longer possible. Thereby politicians lose their power and also their interests in the matter (Bruijn et al., 2008; Biswas, 2008). Furthermore, different governmental authorities are related to water management. These authorities have their own values, issues and interests. When for example only land and agricultural resources are considered, the institutions responsible for water management have seldom any say or authority over them. When the boundaries of integration are further expanded with environmental- and ecosystem-related issues, the outcomes are complexly formulated, with multiple interpretations possible and without explicitly formulated strategies (A. Biswas, 2008). To be more effective, a more local and -specific approach is needed. By combining the Negotiated Approach with IWRM, this can be established.

Other water-related systems, like energy, agriculture, the environment, and rural developments are becoming increasingly related and interdependent. Accordingly, integrated management between these systems is needed, but this will be accompanied by technical-, institutional-, and managerial challenges. For example, water is used to generate energy by means of hydropower yet the water sector simultaneously is an energy user, too. Moreover, the global agricultural sector is the largest user of water. Therefore, neither agriculture nor water can be managed in an integrated way without considering the other. This means that, in a conceptual, technical, and managerial sense, it is not possible to consider parallel efforts focussing exclusively on integrated management of water as a single resource. Due to their common factors in terms of planning, operation, and management, integrated water resource management should contribute to integration between the energy-, agriculture-, environmental-, and rural development systems. This means that the use of these resources must be planned in a cooperative and coherent manner. Yet, this is not included within the IWRM framework (Biswas, 2008).

The world is heterogeneous. As a consequence governance systems, legal frameworks, decision-making processes, and the effectiveness of institutions mostly differ from one country to another. (Biswas, 2008). Therefore, one single IWRM framework cannot encompass all differences in geographic-, economic-, social-, cultural-, religious-, and legal conditions (Biswas, 2008).

n addition, due to the diverging perspectives and -issues of the involved stakeholders, trade-offs need to be made. As a result, not the 'best', but a 'good' solution, one that is acceptable for all the involved actors, is preferred. Trade-offs, positive and negative ones, for the management approaches will be inevitable. As long as the sum of these trade-offs for society will be higher than the sum of the separate sectors, an integrated approach based on collaboration is recommended (Pahl-Wastl, 2006).

To keep the top-down process suited and manageable, collaboration policies need to be developed as simply and small as possible. Furthermore, IWRM is based on active stakeholder participation, decentralisation, and decision-making at the lowest possible level. These development objectives are based on a bottom-up participation approach. In practice, most of the performed IWRM projects have had little interaction with all the relevant stakeholders. Only decision-makers and water management authorities were included as the only end-users (Pahl-Wastl, 2006; Biswas, 2008; Savenije et al., 2008). To overcome the limitations of IWRM, the higher levels need to be integrated with the lower levels. Consequently, a combination of bottom-up and top-down approaches need to be combined. Thereby, actor- and area-specific tailored governance policies as well as water management systems are the ultimate result. To accomplish these aims, several parts of the Negotiated Approach need to be added into the IWRM framework.

Based on the discussed IWRM limitations and elaborated lessons learned in this appendix, the author has developed a new implementation cycle. This new implementation cycle combines aspects of the Integrated Water Resources Management process cycle and building blocks of the Negotiated Approach (NA). In chapter 5 and in Appendix L, the "New Integrated IWRM Implementation Cycle" is presented. Beforehand, the Negotiated Approach is elaborated in Appendix K.

K

Negotiated Approach

The Negotiated Approach (NA) is derived from the Integrated Water Resources Management (IWRM) framework. The Negotiated Approach does not replace IWRM but supports it by adding a more locally oriented approach. It aims to close the gap between the locally oriented bottom-up and top-down managerial policy approaches. Since IWRM is supply-driven, fragmented, lacking integration with and between the multiple user needs and struggles with integrating the collective interests of water, the NA aims to support the operationalisation of IWRM by giving autonomy to the local population as initiators and owners of the process. Community participation within the NA is crucial in proactively developing and implementing water strategies. Hereby, the goal is not to negotiate about how to split the 'pie', but to enhance collective learning and communication improvement between the stakeholders. Therefore, the Negotiated Approach also includes context analysis and capacity building (Both ENDS et al., 2011).

In paragraph K.1, the ten characteristics including their interrelations will be discussed. In the paragraphs K.2 until K.7, specific IWRM and NA principles will be explained in more detail.

K.1 NA Characteristics & Interrelations

The Negotiated Approach (NA) is based on the IWRM principle of subsidiarity. This principle of decentralisation states that water systems need to be managed at the lowest appropriate level. For water systems, this is often the village- or community level. Within the Negotiated Approach, the local level is the starting point of the process and empowers communities to participate in each part of the decision-making process. This is enabled by providing local communities with the knowledge and training necessary to manage water resources (Both ENDS et al., 2011). Now, they are able to protect their own rights, manage their own ecosystems, and design and operate water systems, including strategic water policies.

Community participation cannot replace institutions that operate top-down. Bottom-up governance is necessary to ensure policies are valued locally, while top-down coordination is necessary to prevent a loss-loss situation and to ensure a collective sustainable integration of local actions into national or international basin system. In this manner, the Negotiated Approach aims to bridge the gap by connecting both layers. In addition, by applying the NA, the IWRM framework becomes more need-driven and better suited to implementation. As a result, the NA distinguishes itself from other bottom-up management approaches through its broadness. This allows local stakeholders to design their own solutions for what they perceive as their own problems in different situations (Both ENDS et al., 2011).

The NA is also flexible and adaptive to different dynamic contexts. Thereby, the local actors are provided with the autonomy and room to negotiate necessary to shape the process. Its flexibility is a strength but also a weakness, because it complicates the formalisation of policies and activities. Moreover, the overlap between the principles makes the process more difficult. Therefore, the NA "building blocks" presented in figure K.1 are essential. The sequence of these building blocks are although context and content dependent. The Negotiated Approach is thus a set of principles, not a fixed script (Both ENDS et al., 2011; Both ENDS, 2013; Vavier, 2014).

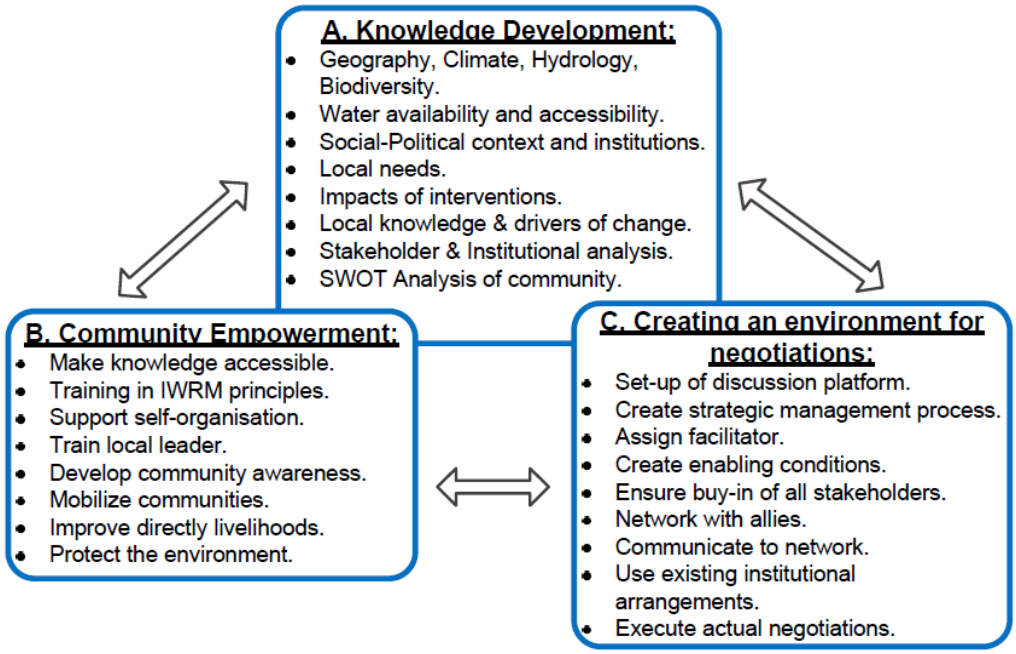


Figure K.1: Negotiated Approach "Building Blocks" (Both ENDS, 2013; Vavier, 2014).

Ten principles form the basis for the Negotiated Approach. In figure K.2 the interrelation and coherence between these principles is displayed. The first three are specific Negotiated Approach principles. The remaining principles four until ten are general recognised IWRM principles. These principles are listed below (Both ENDS et al., 2011):

1. Prioritising self-motivated local action for initiating the Negotiated Approach.
2. Empowering local communities to assert their basic rights to water.
3. Maintaining flexibility to negotiate at different levels simultaneously.
4. Optimising the use of water resources by integration.
5. Taking decisions by consensus at the lowest appropriate level.
6. Up-scaling water management initiatives through iterative negotiations.
7. Maintaining the integrity and resilience of ecosystems.
8. Working to achieve and maintain a gender balance.
9. Using appropriate science and technology.
10. Promoting transparency and accountability.

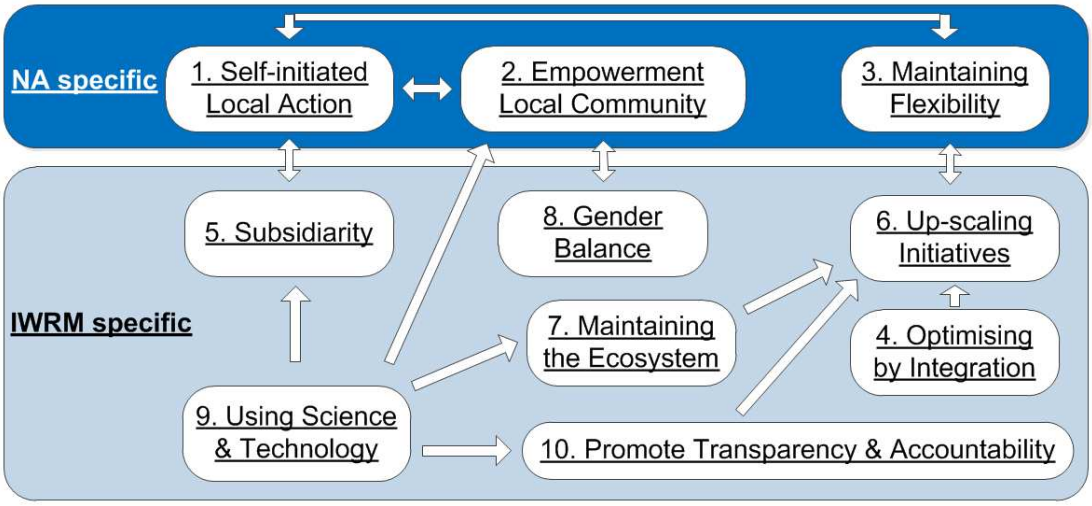


Figure K.2: Integrated Approach Principles and there interrelation (Based on: Both ENDS et al., 2011; Vavier, 2014; adapted and supplemented by the author).

The interconnections between the principles makes the process complex, but also robust. The Negotiated Approach starts with Self-motivated Local Action (principle 1) that is based on Subsidiarity (principle 5). Principles 1 and 2 are inseparable, because without the empowerment of the local community (principle 2), participation cannot take place. Empowerment Local Community is also focussed on restoring a Gender Balance (principle 8). This principle prioritises the support of women, because they fulfil a central role in water distribution. Shifting autonomy (by means of principle 1) and power (by means of principle 2) to users and Up-scaling Initiatives (principle 6) are strongly related with Maintaining Flexibility (principle 3). Optimising by Integration (principle 4) is based on the IWRM principles, which state that optimal usage of a scarce resource requires integration. IWRM planning and activities are preferably optimised and increase by means of a iterative, cyclical and adaptive up-scaling process within the catchment or basin system (principle 6) (GWP, 2000, Both ENDS et al., 2011, Vavier, 2014).

By means of horizontally up-scaling other villages and communities are included. The political players are included through vertically up-scaling Since up-scaling need to be done in a sustainable manner and preferably based on cooperation, Maintaining the Ecosystem (principle 7) and Promote Transparency & Accountability (principle 10) function as important inputs for principle 6. In order to establish working relationships and cooperation, Transparency & Accountability (principle 10) is essential. Unbiased scientific information and the use of technology (principle 9) is a crucial principle to establish and maintain transparency and accountability (principle 6), Maintaining the Ecosystem (principle 7), Subsidiarity (principle 5) and Empowerment Local Community (principle 2) (GWP, 2000, Both ENDS et al., 2011, Vavier, 2014).

In the following sections, the principles one to three will be explained in more detail. Because the IWRM principles 5 (Subsidiarity) and 10 (Promote Transparency & Accountability) are strongly related with to the first three NA principles, they will be explained in more detail as well. Since the remaining principles are discussed in chapter 5 and Appendix I, they will not be elaborated in this paragraph.

K.2 Principle 1 – Self-Initiated Local Action

With regards to water issues, stakeholders often common act independent while cooperation is essential to prevent strategic behaviour. Participation, or in other words, involvement of all stakeholders into the decision-making process is also an important IWRM design principle (GWP, 2000). In most situations, the IWRM policy-maker encourages participation but only in a few situations did participation influence the decision-making process. Unwillingness to redistribute power and a lack of knowledge of the participants are commonly heard criticisms. The last argument is however frequently misinterpreted by policy-makers, because without actually shifting influence in the decision-making power, participation will frustrate and demoralise the participants due to the emphasis on their inability (Vavier, 2014)

In order to close the gap, principle 1 stimulates a locally oriented bottom-up approach in which the community is the initiator and co-manager of water systems. By shifting the initiative of the planning process to the local community level, IWRM becomes more locally problem-solving driven. Furthermore, power is redistributed in such a way that communities can negotiate trade-offs with other power-holders (Both ENDS et al., 2011).

The government represents the overall interests of the nation and acts accordingly. These can be conflicting with local needs. Trade-offs thus have to be made. Moreover, within common-pool resources (CPR) management, governance will become more effective if the users of the resource support rule enforcement and participate in the monitoring of compliance and enforcement (Dietz et al., 2003).

Hence, the local community should not only be involved in the decision-making process, but also in the operation and maintenance of the water management system. Consequently, the communities are also involved in all the steps of the PRIMO-Chain.

K.3 Principle 2 - Empowerment Local Community

The principle of empowering local communities to assert their basic rights to water is based on the IWRM principle of social equity: that access to water in sufficient quantity and of acceptable quality is a social right and -good. Successful empowerment depends on the ability for self-organisation as well as effective accountability mechanisms. Participation is thus an important principle within empowerment. Enhancing the community's ability to negotiate and make well-argued decisions based on inherited knowledge and scientific data is a crucial factor in the capacity-building process (Both ENDS et al., 2011). In addition, reallocating power implies shifting control over financial- and production resources, improving information symmetry and skills. Without capacity building, power redistribution will not take place. Knowledge development is critical in participation, since it increases the production power of the local community. In order to gain a full participatory process, communities also need to have blocking power (Bruijn et al., 2008). With regards to involving the powerless groups, this implementation is supported by their involvement into practical projects that improve their livelihoods. Also, IWRM and the NA aim to improve gender equality by including women in the process. Therefore, principle 2 is interrelated with principle 8 (Both ENDS et al., 2011).

K.4 Principle 3 - Flexibility

Within every process and stakeholder engagement, flexibility is the crucial ingredient. Due to the dynamics and future uncertainties within social environments and water systems, flexibility is imperative for implementing the Negotiated Approach (NA) and IWRM frameworks, because (Both ENDS et al., 2011; Vavier 2014):

- They have to be applicable in different contexts and situations.
- Civil Society Organisations (CSOs) need to have the freedom to shape the process themselves.
- The power position and interests of stakeholders will change over time, resulting in a constant needed for flexibility.
- Flexibility is required to provide greater room for negotiation.
- Discontinuity in supply of water requires flexible and pragmatic handling to fulfil the long-term goals of IWRM and the NA.

Flexibility also can result in non-specific and non-explicit tailored governance policies and -water management systems. These are exactly the points that require improvement within the IWRM framework. Therefore, the implementation phases need to be made explicit without suggesting a fixed roadmap (Both ENDS, 2012).

K.5 Principle 5 - Subsidiarity

IWRM ostensibly supports decision-making at the lowest appropriate level. Implementation of subsidiarity is difficult, however, because it is accompanied with decentralisation conflicts in combination with the protection of the collective interest (Biswas, 2008).

Due to their daily needs, water users have a substantial knowledge level of the common-pool resource and are consequently quite capable of developing sustainable and effective solutions that correspond accordingly with their needs (Ostrom, 1996). It is likely that local communities pursue local self-interest above the regional-, national-, and international collective interest. Coordinated cooperation between the local communities and the central government is thus a necessity for enabling integration and preventing a loss-loss or tragedy-of-the-commons situation. In order to ensure that the collective interest is served, the Negotiated Approach recognises that both local- and central governance are required. By means of balancing central, top-down- and local, bottom-up governance, the Negotiate Approach bridges the gap between local initiatives and central institutions (Both ENDS et al., 2011).

K.7 Principle 10 - Promote Transparency & Accountability

To enable cooperation by means of IWRM, transparency and accountability are essential guiding principles and conditions. Due to the dynamic political economy of water issues, the problems and solutions are often complex. Improving transparency is often the first step within the problem solving process. To transform from unstructured- towards structured problems, consensus on knowledge and values must be obtained (Enserink et all., 2010). Without a form of transparency, this transition process will be impossible. In order to maintain long-term cooperation and stability, accountability is essential. Thereby, credibility of monitoring- and sanctioning systems are crucial. Consequently, this principle depends on principle 9; Using Science & Technology, since decentralisation requires the establishment of accountability mechanisms (Both ENDS et al., 2011; Vavier, 2014).

L

New IWRM Implementation Cycle

To overcome the Integrated Water Resources Management (IWRM) limitations discussed in Appendix J, a new water recourses management implementation cycle is developed by the author. This new implementation cycle combines aspects of the IWRM process cycle, the Negotiated Approach (NA), and the elaborated lessons learned derived from IWRM practices. In paragraph L.1, the "New Integrated Water Resources Management Implementation Cycle" is presented. Also, its main characteristics are discussed in this paragraph. In the paragraphs L.2 to L.9, additional information is provided regarding the seven implementation phases and three blocks.

L.1 Characteristics of the "New IWRM Implementation Cycle"

The "New Integrated Water Resources Management Implementation Cycle" is presented in figure L.1. The local community, including its public and private actors, should always function as the starting point of the "New IWRM Implementation Cycle", this due to the subsidiarity principle - and the fact that water management should serve the population. Since a constant level of situational understanding is crucial, Block A (Knowledge Development & Analysis) is the starting point of every phase. Therefore, it has a central and phase independent position within the implementation cycle. Blocks A, B and C are derived from the Negotiate Approach and the phases 1 to 7 from the IWRM framework. Active stakeholder involvement is crucial in providing essential feedback on implementing the cycle. To ensure active stakeholder involvement, Blocks B and C are an integral component of the phases 1, 2, 4 & 5. In addition, bottom-up and top-down approaches tailored to local circumstances are created by this integration.

In practice, the new implementation cycle is guided by completing the following seven phases:

1. Process Goal Definition.
2. Commitment Building.
3. Gap Analysis.
4. Negotiated Process & Strategy Formulation.
5. Action Plan Definition.
6. Action Plan Implementation.
7. Monitoring & Evaluation.

Balancing and making trade-offs between the ecological-, social-, and economic goals and interests in a practical, scientifically sound way is common practice. Therefore, the three IWRM implementation principles as explained in chapter 5 are crucial in every phase. Due to the many actors involved and the change over time in hydrological conditions, including water usage, flexibility is the second crucial implementation principle. In order to ensure a continuous optimisation process with active stakeholder participation, the new implementation cycle is a closed loop. After phase 5, new parties can be invited through horizontal and vertical up-scaling. Probably, no region will ever complete the entire New IWRM Implementation Cycle, since the design is an evolving process. This is caused by a continuation of substantial exogenous changes in the natural and/or human water systems or because needed reforms for optimisation are identified.

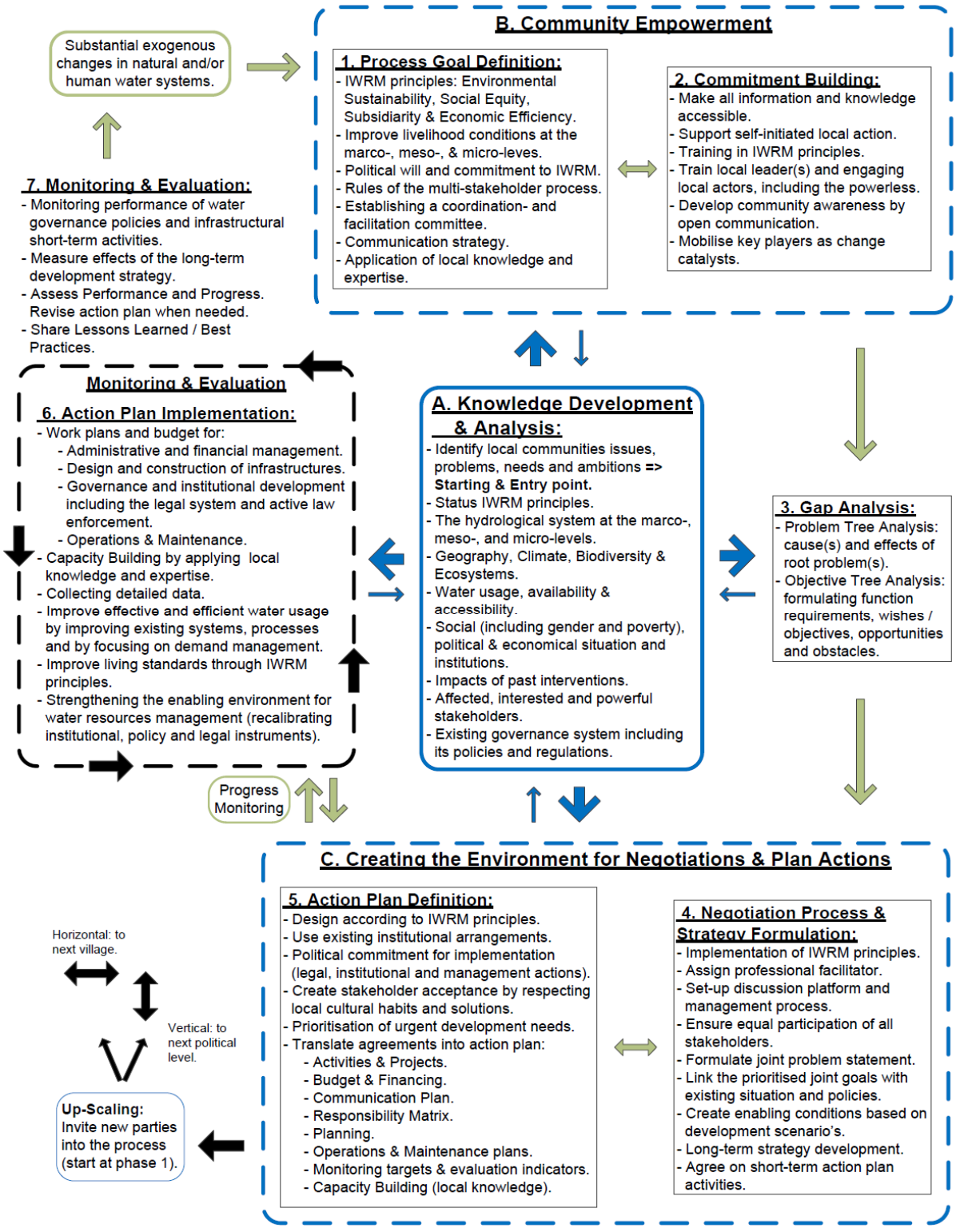


Figure L.1: The "New Integrated Water Resources Management Implementation Cycle" (Developed by the author, based on: JØnch-Clausen, 2004; GWP, 2004; Both ENDS et al., 2011; UNEP, 2012; Both ENDS, 2013).

As a consequence, the implementation cycle as described in figure L.1 must be repeated at regular intervals. When substantial changes are involved, it is advised to repeat the process starting at phase 1, including block A. This is necessary in order to deal with new or additional social-, economical-, management-, and infrastructural needs and priorities.

The depth intensity regarding each phase depends on the present stage at the project location and the set goals. Some of the components may already be in an advanced stage, while others may have developed hardly yet. It is logical, but not always necessary, to start with the creation of a policy and instrumental frameworks, followed by the specific management instruments. Yet in fragile states and development countries, it is often better to start somewhere, working as far as possible within the existing arrangements, rather than waiting for the more-wide ranging reform measures to be completed. Experience shows that the implementation processes are facilitated by (T. JØnch-Clausen, 2004; GWP, 2009; UNEP, 2012):

- Political determination, often motivated by a need to address urgent- and high-profile issues.
- A clear distribution of roles and responsibilities among the stakeholders.
- Highly motivated "champions" or crucial drivers maintaining commitment throughout the entire implementation cycle.
- Exchange of knowledge and experience between all actors at various stages of the process.
- Setting clear milestones for the agreed upon development strategies and strategic activities.
- Monitoring and evaluation of the progress and optimising those activities when they do not perform accordingly to the set achievements.

L.2 Block A - Knowledge Development & Analysis

Within the New IWRM Implementation Cycle, a local-, regional-, national-, or international issue will always function as the starting point. Therefore, the water issues, -problems, -needs, and -ambitions also function as the entry point to the New IWRM Implementation Cycle.
These issues and -problems will be actor-, area-, and time-dependent. A continuous knowledge development and analysis of the following items is thus crucial for the successful implementation of the New IWRM Implementation Cycle (Ønch-Clausen, 2004; GWP, 2004; Enserink et all, 2010; Both ENDS et al., 2011; UNEP, 2012; Both ENDS, 2013):

- Identification of local communities' issues, problems, needs and ambitions => Starting & Entry point.
- Understanding of the hydrological system at the macro-, meso-, and micro-levels.
- Geography, Climate, Biodiversity & Ecosystems.
- Water usage, availability & accessibility.
- Social (including gender and poverty), political & economical situations and institutions.
- Impacts of past interventions.
- Affected, interested and powerful stakeholders.
- The existing governance system including its policies and regulations.

Every phase requires another type of knowledge. Therefore, Block A is a phase independent and continuous process providing the required information for the execution of each phase. Also, every phase produces knowledge. Due to the feedback loops, this knowledge is made available for every phase and for all anticipating actors. Regarding water management related analysis and assessments methodologies, more information is provided in Appendix M.

L.3 Phase 1 - Process Goal Definition

Implementing the seven phases of the New IWRM Implementation Cycle starts with defining the process goals. This includes creating consensus and commitment between all participating stakeholders over the following issues (JØnch-Clausen, 2004; GWP, 2004; Both ENDS et al., 2011; UNEP, 2012):

- IWRM principles: Environmental Sustainability, Social Equity, Economic Efficiency & Subsidiarity.
- Improving livelihood conditions at the macro-, meso-, and micro-levels.
- Political commitment to IWRM.
- Rules of the multi-stakeholder process.
- Establishing a coordination- and facilitation committee.

- Communication strategy.
- Application of local knowledge and expertise.

In order to establish consensus and commitment, an active stakeholder dialogue is used to create the necessary awareness among all actors regarding the importance of change, including its positive effects. Since awareness raising and active multi-stakeholder involvement are critical success factors, it will be necessary to have a communication strategy. This strategy will also stimulate political interest, since the citizens will demand the needed change when they are aware of its positive effects (JØnch-Clausen, 2004; GWP, 2004; Both ENDS et al., 2011; UNEP, 2012).

L.4 Phase 2 - Commitment Building

Within phase 2, communities are prepared for participation in the negotiation process. By sharing all information and knowledge available, the awareness level is enhanced including their citizenship rights. In combination with facilitating negotiation trainings and by preparing local leaders to facilitate the problem-solving processes, communities are prepared for participation in the negotiation process.

Especially when the central governance is weak, there is a need as well as room for local participation and self-initiated actions. When a functional legal system enforced by the government is in place, the focus should be on supporting communities in asserting their legal rights (Both ENDS et al., 2011; Both ENDS, 2012; Both ENDS, 2013).

Coherent actions to build commitment at all political and social levels are also essential. Moreover, the development of awareness and knowledge among the local decision-makers, water managers and other stakeholders is essential to creating and maintaining local problem-solving ownership. In order to enhance this process, there is a need for national or local “champions” who can act as catalysts for the needed change. These crucial stakeholders should be engaged at the earliest possible opportunity in capacity building and development within existing institutional- and social structures. These champions should be sufficiently motivated and influential enough to take responsibility for the planning process and in securing adequate human- and financial resources by means of developing an interactive, multi-stakeholder environment. Once the process is well underway, capacity building and the training of local actors in IWRM practices for supporting self-motivated local action should be the main priority (JØnch-Clausen, 2004; GWP, 2004; Both ENDS et al., 2011; UNEP, 2012; Both ENDS, 2013).

L.5 Phase 3 - Gap Analysis

Several elements of a water resources management framework will already be in place in all likelihood. It is advised to use the foundations of the existing framework and optimise it. Due to the conflicting actor interests, the issues gabs are often framed as wicked problems (see chapter 6 for more information). Consequently, the issues at stake can be framed in different ways, since the values and perspectives of the involved actors are different. For sustainable development, it is important to identify the gaps, identify the points of conflict and develop acceptable solutions to achieve the following objectives (JØnch-Clausen, 2004; Bruijn et al., 2008). Elements to consider are (JØnch-Clausen, 2004; GWP, 2004; UNEP, 2012):

- *The enabling environment* national / local water resources and water services policies, laws and regulations, as well as financing- and incentive structures.
- *The institutional framework* in terms of trans-boundary organisations, national agencies, basin organisations, regulatory bodies, local authorities, private sector-, and civil society groups.
- *Management instruments* in terms of water resources and demand assessments plus economic instruments including water resources information and monitoring.
- *National plans* such as relevant Sector Reform Plans, Infrastructure Plans, National Environmental Action Plans and Water Action Plans.

- *Endorsed international* agreements and processes.
- *Forum for cross-sectoral and multi-stakeholder dialogues*, such as partnerships at national and/or local levels, active NGOs or other civil society organisations through which dialogues take place.
- *Capacity building and empowerment* activities to enable stakeholders at all levels, both men and women, in relevant structures (public, private, civil society) to play their role.

Elements as mentioned above need to be merged to form a basis for further progress. The following functions are required to deal with prioritising water resource management and development issues in order understand the existing gap (T. JØnch-Clausen, 2004; GWP, 2009; UNEP, 2012):

- *Resource management functions* such as formulation of policies for international co-operation on transboundary waters, water allocation and wastewater discharge permits, water resources assessments, monitoring, enforcement, mediation, training, and information.
- *Water services and infrastructure management functions* including items like frameworks for water services with the associated policies, laws, regulations and enforcement plus outlines of infrastructural requirements with the associated social and environmental impacts, as well as water use efficiency standards.
- *Financing functions and mechanisms* including items such as national- and local capital markets and -mechanisms like grants and internal sources, user payments, subsidies, loans and equity capital.

The identification process of opportunities, risks, and constraints should take place at all levels, including: international; national; local; and community levels, based on the functions required to handle the main water resources management and development issues.

L.6 Phase 4 - Negotiated Process & Strategy Formulation

The identified gabs for improvements and the corresponding targets milestones need to be agreed upon by all affected actors. The short-term orientated, action-plan will be formulated based upon a long-term development strategy. In table L.1, the characteristics of a development strategy and a strategic action plan are compared. The development strategy includes guidelines for balancing public/private sector involvement, improving regulatory policies, and identification of financing and tariff options. To bridge the gaps, the strategic action plan aims to prioritise the needed optimisation or recalibration of: institutional roles and their policies; the infrastructural systems; legislation; financing frameworks; and daily water management practices (JØnch-Clausen, 2004; GWP, 2004; UNEP, 2012). It is advised to link and synchronise the local strategic actions plans with existing local-, regional-, national-, and/or international development strategies.

Development Strategy:	**Strategic Action Plan:**
• Defines direction. • Encourages innovation. • Governed by vision and goals. • Long-term. • Synthesis. • Attention to strengths and opportunities. • Based on future possibilities.	• Direction is given. • Relies on existing ideas. • Governed by objectives. • Short-term. • Analysis. • Attention to problem-solving. • Based on present trends.

Table L.1: Differences between a Development Strategy and a Strategic Actions Plan (GWP, 2004).

In order to guarantee a successful end result, a strategic action plan based on a long-term oriented development strategy must be agreed upon. This is crucial to achieving equal stakeholder participation, linking the prioritised goals with the existing situation and to formulate a joint problem statement. Establishing a platform for dialogue and negotiations is thus essential.

Since the various stakeholders' interests will be conflicting, it is advised to have a professional facilitator to guide the negotiation process (Both ENDS et al., 2011; Both ENDS, 2012; Both ENDS, 2013). In Appendix M, more information is provided regarding water management negotiation processes.

L.7 Phase 5 - Action Plan Definition

In order to have commitment for implementing the action plan, the development strategy should be adopted at the appropriate inter-ministerial levels where coordination takes place. Since water management goes beyond the responsibility of a single ministry or -department, the development strategy should be adapted in national water legislation. Additionally, to have a sustainable and continued implementation of the action plan, institutionalisation is important in order to be included in the annual budget and policy formulation cycles (T. JØnch-Clausen, 2004; GWP, 2004; UNEP, 2012).

Dialogue and acceptance among the involved stakeholders within the entire process is crucial. Social acceptance is mostly generated through the acceptance of local differences and the fact that actions are perceived to be leading to real improvements for the local population, both men and women, wealthy and poor. Important for its acceptance is that political feasibility, ideology, and cultural aspects have been incorporated into the action plan. (JØnch-Clausen, 2004; Both ENDS et al., 2011).

The planning process has to be accompanied by a clearly defined action plan. The so-called "hot spots", or high-priority actions, need to be implemented at the earliest possible stage. The water management priority issues in relation to urgent development needs identified in phase 4 can be divided into (T. JØnch-Clausen, 2004; GWP, 2009; UNEP, 2012):

- **Livelihood demand issues:** prioritising and meeting the increasing and often conflicting demands of different stakeholders and in different economic sectors, including challenges like:
  - Securing access to safe drinking water and basic sanitation for the presently un-served, rapidly growing urban water demands and wastewater discharges.
  - Securing water for increased food production.
  - Reducing vulnerability to floods and droughts (including considerations of possible impact of climate change).
  - Reducing risks to public health, such as diseases and hazards.
  - Meeting increased demands from irrigated agriculture, industry, and other economic activities.
  - Protecting vital ecosystems.
  - Meeting the livelihood demands, providing equal opportunity for men and women, of all ages.
- **Resource-impact issues**: impacts of climate change and shifts in human demand need to be understood, well balanced and implemented by means of land management with regard to:
  - Deforestation.
  - Erosion and siltation.
  - Pollution and ecosystem deterioration.
  - Reduction of wetland areas.
  - Declining groundwater tables and salt water intrusion.
  - Climate variability.
  - Desertification.
  - Floods and droughts.

In parallel with the planning process, actors should start reforming institutional structures, creating ownership, building capacity, improving local knowledge, and boosting the capability to use the appropriate management instruments. Proposals and project documents ready for consideration by funding agencies and donor organisations can be presented including the portfolio of activities and projects (JØnch-Clausen, 2004; GWP, 2004; Both ENDS et al., 2011; UNEP, 2012). Below, the foundations of a successful action plan are summarised (GWP, 2004; Both ENDS et al., 2011):

- Agreeing on detailed goals and targets.
- Establishing a framework for ongoing basis decision-making.
- Linking the water development strategy with national development planning processes.
- Planning adequate investments in human and institutional capacity building.
- Securing the support and involvement of stakeholders by means of the responsibility matrix and through a communication plan.
- Allocating sufficient financial resources.
- Defining a plan with clear milestones and targets.
- Defining monitoring- and evaluation mechanisms to guide the implementation process.

After Block C; Creating the Environment for Negotiations & Plan Actions, new parties can be invited into the process by horizontal (to the next village) and / or vertical (to the next organisational / political level) up-scaling (Both ENDS, 2013). Depending on the amount and the type of new actors involved, it may be required to start at phase 1. In addition, between phase 5 en 6, the actions implemented need to be monitored constantly and adjusted when they do not meet expectations.

L.8 Phase 6 - Action Plan Implementation

Like the IWRM framework, the New IWRM Implementation Cycle is developed to manage water resources in such manner that economic and social welfare are improved. Crucially, the development of governance and institutions (including the legal system with active law enforcement) must focus on prioritising water for domestic supply and regulating water usage in a manner that reduces pollution. Promoting and improving water efficiency should be one of the main strategies. Throughout the world, large amounts of freshwater are wasted due to poorly constructed, -operated and -maintained irrigation systems, leaking urban water systems, and wasteful industrial practices. Significant positive impacts can be created when the currently available water is managed in an appropriate manner. Effective and efficient water usage must be addressed at all levels of water management, through both technical means and by improved management practices. An equally important aspect of water efficiency relates to the amounts of water extracted, treated, and provided for wasteful or unnecessary uses. Before simply providing more water and constructing any new and expensive infrastructure, the first emphasis should be on addressing the demand side and shifting from supply management towards demand management (T. JØnch-Clausen, 2004; GWP, 2004; UNEP, 2012).

Reform to established structures and roles is often accompanied by friction and conflict, especially when power positions shift. Individuals who experience the change as a threat will inevitably resist the implementation of new strategies for reallocating water in a way that maximises the benefits to society based on the subsidiarity principle. Therefore, constant gathering of detailed data and a well-functioning administrative and financial management system are crucial (T. JØnch-Clausen, 2004; GWP, 2004; Both ENDS et al., 2011; UNEP, 2012).

L.9 Phase 7 - Monitoring & Evaluation

Indicators that are appropriate and practical to apply form an essential part of measuring the effects of the implemented activities during phase 6. They are also very useful in identifying future challenges and changes in the natural- and human water systems. Their function is therefore crucial in the optimisation process of the short-term strategic action plans and the long-term development strategies. Hence, phase 7 (Monitoring & Evaluation) is displayed as a continuous and independent evaluation process of the Action Plan Implementation phase 6.

The process Indicators should be appropriate to illustrate positive and negative improvements in the water and sanitation situation for people (impact indicators), the progress towards a more holistic IWRM process (process indicators) and the function of the New IWRM Process Cycle (performance indicators). During the entire implementation process, the indicator system should be applied, reviewed, and adapted when found ineffective. Moreover, the indicator system should be tailored to the situation in a specific area, while at the same time allow comparative assessments. Important indicators to apply are (JØnch-Clausen, 2004; GWP, 2004; Both ENDS et al., 2011; UNEP, 2012):

- ***Impact indicators on water resource availability and trends:***
  - Demand- and development trends for major water usage.
  - Demand-livelihood challenges.
  - Public- and private prioritisation of water resource management issues.
  - Threats to water resources from pollution.
  - Climate change challenges for water resource management.
  - User conflicts and competition over water.
- ***Process indicators regarding the stage of the IWRM process:***
  - Awareness about IWRM and the political will to support the process;
  - Amount of active stakeholder participation.
  - Actors' roles and responsibilities within water resources management.
  - Management potentials and -constraints identified.
  - Development stage of the IWRM framework.
- ***Performance indicators on how the New IWRM Implementation Cycle works:***
  - National policies regarding water goals, -use, -protection, and -conservation.
  - Integration of water concerns into public- and private sector policies.
  - Legislative framework for policies and goals.
  - Financing- and incentive structures.
  - Organisational structures and functions.
  - Management capacity.

M

Water Diplomacy in a Nutshell

In order to create an acceptable agreement, the requirements of the single actor standpoints of each actor need to be fulfilled and combined based on the requirements of the multi-actor standpoint perspectives (Bruin et al., 2008). Within the water diplomacy problem-solving practices, the flowing six crucial principles are essential (Islam et al., 2013):

1. Stakeholder Representation.
2. Joint Fact-Finding & Scenario Planning.
3. Value Creation.
4. Communication.
5. Collaborative Adaptive Management.
6. Societal Learning.

In the paragraphs M.1 until M.6 each of the above principles will be discussed in more detail. In addition, this paragraph will be finished by means of paragraph M.7 explaining the role of a neutral facilitator including it possible functions and responsibilities.

M.1 Stakeholder Representation

When actors are excluded from the negotiations process, it is very likely that they will try to block or delay the implementation of the negotiated results. When every affected actor has had the chance to make their interests known and is (partially) satisfied with the outcome, implementation of the agreed upon agreements will be a lot easier (Enserink et al., 2010; Bruijn et al., 2008).

In order to ensure credibility, all stakeholders and network interests need to be identified and adequately represented in the problem-solving process. This includes individuals and groups who are directly affected or are expected to be affected in the future by the new or changing water governance and policy decisions. In addition, by including all relevant actors the full range of perspectives and all available local knowledge can be used in order to create better acceptable solutions (Enserink et al., 2010; Ven, 2011; Islam, 2013; Kleijn, 2014). In multi-actor policy analysis practice, the following principles are essential (Enserink et al., 2010):

- **Trustworthy:** by involving trusted analysts, giving all stakeholders a voice and making the analysis accessible for all.
- **Bridging:** broad scope when exploring the options, identify irreconcilable differences, maximise benefits and prevent losses.
- **Multi-perspective research focus:** covering all relevant features for anyone involved and provide insight in the distribution of the gains and losses.

To ensure adequate and credible stakeholder representation, a stakeholder assessment including a problem analysis should be made by a neutral professional. This assessment includes the following items (Bruijn, 2008; Enserink et al., 2010; Hofstede et al., 2010; CCOE, 2012; EU, 2013; Ven, 2014; Onancan, 2014; Kleijn, 2014; Post, 2015):

- **Problem Formulation,** including:
  - Mapping of the existing problem.

- Mapping of the historical events, since these determines why the area and problem issues are as they are.
- Mapping of the existing human situation.
- Mapping of the geographical factors: physical geography of the terrain and the soil characteristics.
- Mapping of water management factors: the hydrological system at basin level and water usage including water quality and water quantity issues at the local level.
- Mapping of the previous applied resolution techniques, their outcomes and process. Knowing the lessons learned regarding the previous applied water conflict resolution techniques and there water management outcomes will be very helpful in making the current problem-solving process more effective and efficient.

- **Inventory of the Actors involved,** including:
  - Inventory of individuals and/or organisation who have a legitimate interest and/or a production[21] power, blocking[22] power or a diffuse[23] power position.
  - Mapping the actor values, perception, interests, his/here (framed) problem perception, goals / objectives, expectations, alternatives solutions including the consequences, preferences of the alternatives, resources[24], strategic behaviour and its network.

At this stage, each actor will be defined including their perceived desired condition. Since now "the gab" is identified, possible solution or actions proposed by the actors are important to map. Table M.1 provides an example how this can be mapped and presented. Also, a causal-relationship diagrams is a useful tool in identifying and explaining the real problems and distinguish them from the problem symptoms including possible contradiction. In chapter 3 an example is provided through figure 3.5

Actors	**Values, Perceptions & Interests.**	**Power position, Resources & Networks.**	**Perception of the existing situation.**	**Desired situation / objectives.**	**Expected situation, the "gab" and its causes.**	**Possible alternative solutions.**	**Interdependency, shared interests / cooperation enablers.**
Problem owner							
Actor 1							
.....							
Actor N							

Table M.1: Example actor inventory (Enserink et al., 2010).

The PMESII over ASCOPE model is regarded as a useful and proven tool to conduct stakeholder analysis within a (post)conflict areas. The CMI[25]-branch of the Netherlands Armed Forces has applied the PMESSI over ASCOPE model during their NATO-ISAF Uruzgan deployments. In box M.1, this methodology is explained in more detail.

[21] Production power position: having the power to realise something (Bruijn et al., 2008).

[22] Blocking power position: having the power to stop something from happening (Bruijn et al., 2008).

[23] Diffuse power position: unclear power position of the actor, position might change or unclear how the actor will use its resources and relations (Bruijn et al., 2008).

[24] Recourses includes: information, knowledge, skills, manpower, financial resources / money, authority (formal and informal), laws and regulation, position in the network, access to other actors, its level of organisation, their ability to mobilise and use resources effectively and efficiently (Enserink et al., 2010).

[25] CMI: Civil Military Interaction (CMI) is the general term for the overarching process of military and civilian actors engaging at various levels (strategic, operational, tactical), covering the whole spectrum of interactions in today's challenges, complex emergencies, and operations (CCOE, 2012).

- **Network Analysis,** including:
  - Analysis and assessment of the local, regional and national culture including its values, religions, governance, political, safety, economic and social systems. Culture is although a difficult parameter to capture and understand. Hofstede's (2010) "*Cultural Dimensions*" method is an established framework for assessing and understanding the expansive concept of culture. Therefore, it is a useful tool to apply. In box M.2, this methodology is explained in more detail.
  - Mapping the formal and informal actor relations and their interdependencies including their tasks and responsibilities by means of a causal-relationship diagram.
  - Mapping the power-interests positions of the actors including their positions regarding the problem issues (supporters, opponents or neutral). Table M.2 provides an example how to map the power-interests including the levels of appropriated engagement.
  - Mapping the actors degree of replaceability and resources dependency.
  - Mapping of the critical actors, by means of table M.3.

Through a causal-relationship diagram, the individual actors are visually linked based on their social interactions. Thereby the power dynamics and possible weaknesses are made clear. A short description of the most important laws, legislation, procedures and authorities is advised.

	Dedicated / Interested Actors.		**Non-dedicated / Non-Interested Actors.**	
	Critical or High power.	Non-critical or Low power.	Critical or High power.	Non-critical or Low power.
Similar and supportive interests and objectives.	**INVOLVE** Actors will probably participate and are potential **strong allies.**	**KEEP INFORMED** Actors will probably participate and are potential **weak allies.**	**KEEP SATISFIED, INFORM AND ENGAGE** Indispensable allies that are hard to activate.	**MINUMUM EFFORT, INFORM** Actors who do not have to be involved initially. **Never ignore**.
Conflicting interests and objectives.	**LISTEN TO, TAKE CARE, ENGAGE** **Strong opponents** / potential blockers of certain changes.	**WATCH THEIR MOVES** **Potential critics** of certain changes.	**WATCH THEIR MOVES & SMOOTH THEM** Potential blockers that will not act immediately: **Potential strong opponents.**	**MINUMUM EFFORT, INFORM** Actors that need little attention initially. **Never ignore**.

Table M.2: Example mapping Power-Interests relations including the level of engagement (Enserink et al., 2010).

Actors	**Important resources.**	**Replaceable?**	**Dependency: high, average, limited.**	**Critical actors? YES / NO**
Actor 1				
.....				
Actor N				

Table M.3: Example of an overview-table for determining critical and non-critical actors (Enserink et al., 2010).

- **Scenario Development:**
  Based on the above made analysis and assessments, a SWOT matrix can be developed. Thereby the potential supportive and non-supportive actors including their specific interests, objectives, perceptions and possible implications regarding the alternative solutions can be assessed rapidly and systemically compared. Scenario's also provide an answer in what the consequences; Why's, What's, How's, When's and Where's of the proposed alternatives are for the multiple involved actors regarding possible future situations including the risks of action or non-action.

PMESII over ASCOPE Methodology

The PMESII model analysis the factors and actors in an environment through the Political, Military, Economy, Social, Infrastructure and Information subsystems. Through ASCOPE, crucial areas, structures, capabilities, organisations, people and events of each subsystem in the PMESII model are identified. By applying the PMESII over ASCOPE methodology, a multi-layered overview is created. (CCOE, 2012) By means of table M.4, an example of the a PMESII over ASCOPE assessment is provided.

	Political	**Military**	**Economy**
Area	District, Municipality, Province, Area with high support base.	Area of Operations, Barracks, Safe haven, Training camp.	Industrial area, Business centre, (Black) Market, Resident zone, Mine, Cropland, Trade route, Smuggling route, Natural resource zone.
Structure	Ministry Office, District Council Hall, Courthouse.	Headquarter, Jail, Checkpoint.	Financial institutions, Shops.
Capabilities	Presence of public administration, Parliament, Court, Fire department, Ambulance service, Other government departments.	Troops, Weapons, Materials.	Agriculture, Food, Water, Materials, Support / Aid, Natural resources, Workforce.
Organisation	Political parties.	Police, Army, Paramilitary.	Business, Labour union, Criminal groups.
People	Governor, Parliamentarian, Decision-maker, Spokespersons, Opposition member.	Soldiers, Police-agent.	Business leaders, Criminals.
Events	Election, Assemble, Protest, Riot.	Fighting's, Explosions, Terrorist attacks.	Harvest, Market day, Theft, Robbery, Bribing.

	Social	Infrastructure	Information
Area	Urban / Rural, Historical or sacred sites, Enclave, Neighbourhood, Refugee camp.	Connected or disconnected area.	Connected or disconnected area.
Structure	House, Shelter, Hut, Farm, Church, Mosque.	Road, Railway, Waterway, Port, Airport, Bridge, Dam, Energy line and centre, School, Hospital.	Radio tower, TV station, Cell tower, Newspaper office, Printing press, Internet, Regulation.
Capabilities	Building, Land, Agricultural area, Cattle.	Truck, Car, Bicycle, Public Transport.	Radio, Mobile phone, TV, Computer with internet connection.
Organisation	Community, Religious group, Tribe, Clan, Family, Informal network, Community organisation, NGOs, Diaspora groups.	Business, NGO.	Business, Media agency, University, Government.
People	Leader, Follower, Dissident, Influential, Religion, Refugee.	Leader of checkpoint, Government, Private companies, NGOs.	Journalist.
Events	National holiday, Wedding, Gathering, Rituals, Rivalry, Drugs use, Refugee flow.	Attack, Flooding.	Press conference, Censorship.

Table M.4: Example of a PMESII over ASCOPE assessment (CCOE, 2012).

Box M.1: PMESII over ASCOPE Methodology.

Hofstede's Cultural Dimensions Method

Culture has important implications regarding policy implementations. In additions, culture is difficult to capture and understand. Hofstede's *"Cultural Dimensions"* method is an established framework for assessing and understanding the expansive concept of culture. Through Hofstede's methodology a country's culture can be represented by its scores on six universal dimensions. Extensive studies have published cultural scores for many countries. Thereby, countries can easily be characterised and compared (Hofstede et al., 2010). But, only on a basic level although. A short definition and description of Hofstede's six cultural dimensions are outlined below (Hofstede et al., 2010):

- **High vs. Low Power Distance**: is the extent to which people view inequality as normal and acceptable.
- **Individualism vs. Collectivism**: is whether people value most of their views, needs and goals as individuals (individualist) or as a group (collectivist).
- **High vs. Low Uncertainty Avoidance:** is the extent to which people are able to tolerate ambiguous, unclear or unpredictable situations.

- **Masculinity vs. Femininity:** is the degree to which a culture values 'masculine' qualities, such as assertiveness, achievement and acquisition of wealth, or 'feminine' qualities, such as equality, caring for others, social support and quality of life. Strongly defined (masculine) or ambiguous (feminine) gender roles are a second aspect to this dimension.
- **Short vs. Long Term Orientation**: deals with societies' search for virtue; traditional and normative societies tend to be short-term oriented, while those that use context and situation dependent truth, with greater tendency to adapt are deemed long-term.
- **Restraint vs. Indulgence:** indulgence is a measure of free gratification of basic and natural human drives, while restrained societies are societies suppress gratification and regulate this by means of strict social norms.

Box M.2: Hofstede's Cultural Dimensions method.

A wide range of assessment approaches are possible. In order to get an first idea, a desk research by consulting websites, news articles, annual reports, scientific publications and existing policies is common practise. After this "quick and dirty" assessment, the facts need to be checked. Although confidential interviews are time consuming, they are the most appropriate because unclear issues can be questioned (Enserink et al., 2010). Also, it shapes the conditions for an essential regarded need; a trustful working relationship (Post, 2014).

After the performed stakeholder assessment, the initial results should be communicated with all interested actors. Based on their feedback, an alternative problem formulation and actor / network analysis can be created. In addition, the made assessments should perhaps already be updated, due to the dynamics of the societal, political and natural domains. Now, also knowledge present regarding the most appropriate stakeholder engagement within the problem-solving process.

Since exclusion, favouring or belittle actors is a root cause of conflict, equal actor treatment is essential (Kleijn, 2014). This can be accomplished by open communication. In order to do so, the neutral assessor needs to summarise all the raised concerns and priorities, with or without naming the specific actors and communicate these findings appropriately. After the relevant stakeholder groups have been identified, they need to have the opportunity to review the proposed agenda, timetable, ground rules and budget. When a lot of actors are participating, it is advised to group them by stakeholders interests including one representative who speaks on behalf of the group, like; environmental interest. Some groups may require technical assistance before the negotiations begin. Getting their representative up-to-speed on technical matters and thinking through their priorities, will result in more equal outcome. The facilitator can assist in this process as long as every group has the option of making use of a similar kind of assistance (Islam, 2013).

Due to the long duration of negotiation processes, the initial findings will change over time. A constant update regarding the made assessments is thus needed.

M.2 Joint Fact-Finding and Scenario Planning

Due to divergent consensus on values and knowledge, multiple interpretations regarding the scientific, technical and local information is common practice. To result in the most desirable policy or management options, the stakeholder(s) first need to transform the problem from an unstructured, ill- or moderately structured problem towards a structured problem. When a problem is structured, consensus on values and knowledge is established among the parties. In order to create a structured problem, first understanding of each other's problem perspectives including an agreed upon knowledge how the crucial variables interact in their particular settings is needed.

Factual disagreements, particularly those caused by uncertainty and complexity, need to be discussed, but not necessarily resolved Blending local knowledge with scientific expertise, is the most challenging aspect in joint fact-finding. At the same time, it is also the most essential one because the right level of knowledge increases the effectiveness and efficiency of the decision-making process, increases stakeholders satisfaction by facilitating negotiated knowledge and avoids negotiated nonsense. Having a constant level of up-to-date knowledge is crucial. Therefore research should be a continues process. Also, these fact-findings are likely to be sensitive to a wide range of non-objective judgments, like valuing the role of the ecosystem or water safety and security. Computer assisted modelling, serious gaming and group decision are applicable tools to understand each problem perspective and in developing a set of satisfying possible solutions (Bruijn et al., 2008; Enserink et al., 2010; Islam et all., 2013).

The complexity of water networks makes forecasting difficult. Therefore, applying scenario planning is recommended since it enables the parties to deal with uncertainty and complexity in a constant changing a societal, political and natural environment (Ven, 2011; Islam et all, 2013). When realistic and decided upon forecasts have been generated, the parties will have to decide how data gaps and different interpretations of the outcomes are managed (Islam et all, 2013).

Joint fact-finding does not eliminate disagreement. It only makes clear what the stakeholders are accept as a common source of information, where they disagree about the resulting interpretations and why. The neutral facilitator should make the disagreements explicit in order to help the parties to proceed (Islam et all, 2013).

M.3 Value Creation

In order to meet multiple and often conflicting interests, value creation for all stakeholders is the central task in water diplomacy (Islam et al., 2013; Kleijn, 2014). Often this involves optimising efficient water usage through new techniques, technologies and policies in order to expand the useable quantity of the available water resource. (Ven, 2011; Islam et al., 2013). Understanding each stakeholder's core concerns and interests regarding water as a flexible resource, a creative mindset and introducing new or locally proven development practises are crucial in value creation (Ven, 2011; Islam et al., 2013; Kleijn, 2014). More significantly, value creation will be more successful when efforts are made to build trust among the parties, encourage the generation of alternatives and aiming for conversations that are respectful for cultural, educational and political differences (Islam et al., 2013; Kleijn, 2014; Onancan, 2014; Post, 2015).

A zero-sum view presumes that water can only be used to serve the interests of one actor (Islam et all., 2013). This is not the fact, since the same water resource can be used multiple times, depending on the water quality and the functions it need to fulfil (Ven, 2011). The best result from a zero-sum perspective is a compromise: a deal guaranteeing that most of the stakeholders receive enough in order to prevent that they keep pushing for more. Frequently, this means that a winning majority gets most of the benefits, while weaker parties get less. In the aftermath of a signed and agreed upon asymmetric negotiation, one or more stakeholders will look for opportunities to reopen the negotiations in order to get even. Delaying or disrupting implementation, is one of the techniques. Also, forming a new coalition with a powerful actor to defeat the winning coalition is regularly applied. In addition, a media-campaign to undermine public acceptance and create public sympathy of an unfair agreement by appealing to the principle of fairness, has been applied (Islam et al., 2013; Bruijn et al., 2008).

In order to prevent a constant conflict over water, fair, efficient and wise agreements for all stakeholders are needed. A non-zero-sum approach in which mutual gains are created, is the best approach. Value creation is most likely to be successful when a mutual gains approach to negotiation is used and a professional mediator or facilitator organises the meetings. In addition, the parties must have a non-zero-sum negotiation mindset. In other words, the parties need to consider ways of meeting their own interests while simultaneously meeting the interests of others through trade-offs of various kinds. The goal is not an agreement in which everyone wins everything they want, but an agreement that meets all parties interests better than if there would be no agreement at all (Bruijn et al., 2008; Islam et al., 2013). *'If B's support is the key to A getting something it wants very much, and B would gladly give that support as long as A promises something that is equally valuable to B, then neither side is being asked to compromise'* (Islam et al., 2013). Without an extended list of tradable values and issues, value creation by mutual gains will be difficult. Therefore, splitting issues into pieces and deal with them ones at a time is undesirable. Instead, brainstorming sessions with a creative mindsets without barriers for possible solution need to enrich the issue agenda (Bruijn et al., 2008; Islam et al., 2013).

M.4 Communication

Successful problem solving is most likely when all mutually beneficial proposals are clearly linked. Also, during the problem-solving process all decision-makers at the appropriate political levels of each participating organisation should be informed. This will enhance the actual decision-making process, it implementation into legally bounded policies and reserving the needed financial resources (Bruijn et al., 2008; Islam et al., 2013).

A higher authority is sometimes needed to enforce a fair decision, since the distribution of gains and losses tends to favour those with the most bargaining power. Therefore informing these authorities regularly, is an essential need in order to result in agreements who are viewed as fair by those affected, efficient by those who have to pay for them, and wise by those with the expertise to judge them (Islam et al., 2013).

M.5 Collaborative Adaptive Management

Collaborative Adaptive Management (CAM) assumes that water professionals never get everything right because the societal, political and natural domains are constantly changing. Periodical recalibration of the agreed upon policies, programs and plans is thus needed. The same is applicable for the long-term set goals and objectives. In order to adjust successfully, monitoring is needed. Since water users are in the best position to gather data on whether intended efforts are working, active stakeholder participation is crucial. In order to be successful in the follow-up optimisations, water professionals need to inform the stakeholders already in the problem-solving process what they think needs to be measured and how. This will significantly increase the chance that the optimisations will be successful. In addition, CAM offers the opportunity for stakeholders to participate and thereby influence, with limitations, the implementation of the agreed upon optimisations. (Islam et al., 2013). Moreover, CAM can result in legally binding cooperation mechanism (Wolf, 1998; Mostert, 2003). Since legally binding cooperation mechanisms are a solid base for peace and socioeconomic development, water diplomacy can make a significant contribution to safety, prosperity and freedom (Post, 2015).

M.6 Societal Learning

Water diplomacy is not just about solving specific water conflicts. The ultimate goal of water diplomacy is to prevent potential (violent) conflicts by establishing and maintaining well-working water governance systems through local capacity building and societal learning. Improving water management networks implies constant enhancement of the knowledge level and capabilities of individuals, organisations and networks. When water management networks succeeds in generating a way to resolve a particular conflict, or even if it fails in its efforts to do so, reflection on their experience should be used to strengthen the underlying capacity of the involved organisations, parties and actors. Even a modest effort can make it easier to handle similar problems more effectively in the future. Therefore, lessons learned should be made explicit and shared with water and non-water management related stakeholders, agencies and organisations in order to enhance further water capacity building at all levels (Islam et al., 2013; Kleijn, 2014; Post, 2015).

M.7 The role of a Neutral Facilitator or Mediator

Water use and water allocation are usually political sensitive item. Therefore, the facilitator or mediator should not take a position, but stay neutral (Islam et al., 2013; Kleijn, 2014). A neutral facilitator is a person who has no personals stake in the outcome, is acceptable for all the actors and is committed to build consensus by collaborative problem-solving for a successful outcome (Islam et al., 2013).

Mediation is an intensive involvement, due to the confidential interactions among the stakeholders. One of the most important functions of a mediator is communicating private messages between the stakeholders who do not communicate directly. A sufficient background in water management disputes, is regarded as a crucial need for the function of a facilitator or mediator. Also, a well working relationship with the stakeholders is desirable (Islam et al., 2013).

Most significantly, all the stakeholders need to trust the facilitator or mediator. But how can they be sure this person is unbiased and will stay neutral? Veto power is a common applied practice to overcome this issue. Any participating stakeholder who feels that the facilitator has violated the neutrality principle, can ask the other parties to disqualify that individual. After the facilitator had the possibility to defend hem/here self against the accusations, the parties as a whole can dismiss that individual at any point during the problem-solving process. (Islam et al., 2013).

Besides preparing assessments, a professional facilitator can also fulfil the following seven crucial function within the problem-solving process. These functions are briefly be explained below.

Identifying stakeholders and generating a commitment to informal problem-solving (Islam et al., 2013):

- Meeting with potential stakeholders to hear their concerns and convince them that a non-zero-sum problem-solving approach can work. Explaining by the use of clear examples of similar situations where this approach has produced better outcomes, is a strong tool.
- Explaining and seeking support to set ground-rules.
- Since common knowledge is essential, the facilitator can stimulate a constant level of research and new knowledge development during the problem-solving process.
- Support the stakeholders in the efforts to coordinate issues and stimulate cooperation.
- Linking the media with all the participants and speak on behalf of the process.

Clarifying responsibilities (Islam et al., 2013):

- Develop discussion protocols, agendas, a working plan, budget, and joint fact-finding procedures, writing meeting summaries and stimulate an internet page / web presence.
- Keep parties on track and steer the discussions when they tend to become off-track.
- Help stakeholders to shift from hard bargaining to value creation.

- Propose and revise the agendas for each meeting.
- Enforce the ground-rules. Especially when parties attend unprepared or lose track of their stakeholder group objectives.
- Making sure that the stakeholders themselves are responsible and "own" the problem-solving process.
- Assist in capacity building for those stakeholders who have limited negotiation experience.
- Reminding the parties of the commitments they have made.

Sharing information and revealing interests (Islam et al., 2013):

- Guiding the problem-solving process from being opponents towards becoming collaborative problem-solvers. This requires close attention to the needs and interests of all stakeholders. "Inventing without committing" is regarded as an appropriate method.
- Checking the facts is a crucial need in complex situation and political sensitive issues. A mechanism for collecting and sharing scientific or technical information is required. Together, by means of coordination but preferably in cooperation, all the stakeholder representatives should decide what types of data they need, how data should be collected, what kinds of expert advisors including local knowledge from people living in the area would be helpful and what possible interpretations of the data are plausible regarding the development of forecast scenario's. If not done by the participating stakeholders, the facilitator should guide this process.
- Using full-group discussions, the facilitator prepares the document for the joint fact-finding review. Also, the facilitator can created the plan to examine claims, explore trade-offs and search for mutually acceptable alternatives. Since open communication is essential, web-based tools helps the stakeholders keeping their supporters informed.
- Like-minded stakeholders are likely to form coalitions, especially when a coalition will give them a stronger leverage in the negotiation process. The facilitator can assist in this process, in order to make it fair regarding the multidimensional setting.

Deliberating (Islam et al., 2013):

- Persuade the parties to share information regarding their interests and brainstorm possible ways of meeting the interests of all the participants.
- Help to organise joint fact-finding.
- Preventing "group think" by open communication of each stakeholders views, even if they are unpopular.
- Suggest possible trade-offs.
- Draft preliminary agreements of various trade-offs.

Helping the parties in reaching agreements (Islam et al., 2013):

- Decision-making in complex water negotiations will take months, perhaps even years. The stakeholders involved set long-term agendas and a timetable for regular meetings in order to work towards a final meeting at which they can sign an agreed upon conceptual agreement. The facilitator can assist in incorporating a variety of trade-offs. Also, due to the long-time span, flexible agreements should be possible regarding commitments and interests changes.
- When it is time to make decisions, it is important that the package deal maximises joint gains thereby ensuring that no party is worse-off than they would have been without an agreement. This also includes agreements how to deal with uncertainty or disagreements regarding future issues. The facilitator should guard that this occurs.
- The objective is to design a nearly self-enforcing agreement. In order to manage political and scientific uncertainty, the stakeholders need to specify what will happen if various future events occur. Also, future dispute resolution commitments and approaches should be included in the final agreement. In this stage, the facilitator needs to guard that parties follow the set ground-rules.

- Once the stakeholders have produced the draft agreement, each is asked to check back with their supporters if they can agree upon the proposed agreements. When all agree, the agreements can be ratified. If one of them does not agree, this stakeholder or stakeholders are asked to suggest improvements that will make a package acceptable to them without leaving others worse off.

Deciding (Islam et al., 2013):

- The facilitator should produce a single written summary of crucial points of the made agreement. When each stakeholder writes their own, confusing regarding the interpretations will be likely.
- Clarifying the steps toward implementation.
- Making sure that the participating stakeholder(s) sign the agreements and are linked to actions needed for implementing the negotiated agreements.

Holding the parties to their commitments (Islam et al., 2013):

- The facilitator should ratify agreements by making sure that each stakeholder presents them to their officials who have the power to act and stimulate that monitoring systems are implemented.
- Suggest an adaptive management approach, because the societal, political and natural environments are dynamic and constantly changing. Therefore, periodical meetings regarding the implementation should be planned. Periodic reviews also stimulates in increasing the level of confidence in each of the participants, since they can "check" if the agreed upon obligations and responsibilities regarding the implementation are performed.
- Guiding the development of institutional capacities required to monitor implementation. A permanent management and monitoring organisation can be proposed in order to guarantee ongoing communication, cooperation and coordination. Also, this organisation can be empowered to implement small, fast or seasonal needed changes like; changing water utilisation when drought, flooding or water surpluses events occurs.
- Making sure that dispute resolution procedures are in place.
- Encourage the participants to produce and share the lessons learned.

N

Validation Interviews

By means of consulting experts the framework is validated. The conceptual *Integrated Water Management Development Framework for Stabilisation Operations* is validated based on the judgment of twelve experts in order to check:

- Its completeness;
- If it can effectively and efficiently be applied within stabilisation operations;
- Its usability and relevance for the Netherlands ministry of Defence and it partners.

In addition, the framework is optimised based on the tips and recommendation from the consulted experts. Twelve experts within the domains of Defence, Development and Diplomacy are consulted ranging from the Netherlands ministries of Defence and Foreign Affairs, NATO, the NGOs; Cordaid and Viafrica and the Dutch knowledge institutes; TU-Delft and Deltares. In table N.1 a detailed overview is provided regarding the consulted experts and their profession. More information with regard to their expertise in relation with the master thesis research is provided in each specific validation interview. The results of the validation interviews are summarised by means of a SWOT-analysis.

Expert:	**Profession & Organisation:**
C. J. Matthijssen, Brigadier General	- Commander 11 Air Assault Brigade, Royal Netherlands Army.
N. Tak, Brigadier General	- Director Comprehensive Crisis and Operations Management Centre (DCCOMC), North Atlantic Treaty Organization - Supreme Headquarters Allied Powers Europe (NATO - SHAPE).
G. van Cooten, Colonel	- Commander Army Corps of Engineers, Royal Netherlands Army.
L. Chubbs, Lieutenant-Colonel	- Staff Officer Environmental Management - Joint Engineer Division (JENG), North Atlantic Treaty Organization - Supreme Headquarters Allied Powers Europe (NATO SHAPE).
P. Cremers, Major	- Staff Officer Land Warfare Centre (LWC) department Integrated Deployments and Future Concepts, Royal Netherlands Army.
J. Kleijn	- Focal Point for Water Productivity and Water Affairs Middle East, Netherlands Ministry of Foreign Affairs.
G. J. Lucius	- Netherlands Diplomat, Netherlands ministry of Foreign Affairs. - Functional Specialist (Captain) 1CMI-Co[26], Network Politics.
P. van den Berg	- Political Advisor in: peace, security and development, human rights, gender, sustainable development & emergency aid, Cordaid (NGO).
F. van de Ven	- Team leader Urban Land & Water Management, Deltares. - Associate professor Urban Water Management, Delft University of Technology.

[26] 1CMI-Co**:** 1 Civil Military Interaction Command is a unit within the Royal Netherlands Army. By means of the CIMIC platoon, 1CMI-Co enhances the civil - military interaction, communications and cooperation in the area of operation. Moreover 1CMI-Co has a pool of reserve officers specialized in the disciples Politics, Military, Economy, Social, infrastructure and Information which can be deployed for the achievement of the Campaign Plan Development Themes. Normally these reserve officers have a job in the private or public sector and are deployed on a voluntary bases.

H. Post	- Director Water Management and Manager Water Systems Department, Waterboard Reest & Wieden. - Functional Specialist (Major) 1CMI-Co network Infrastructure.
F. Koolhof	- Board Member ViAfrica (NGO). - Owner Ontdekkingsreiziger BV. - Lecturer at the Civil-Military Cooperation Centre of Excellence. - Functional Specialist (Major) 1CMI-Co network Economic.
A. Onencan	- PhD researcher: Water governance and water diplomacy issues within the Nile basin, Delft University of Technology.

Table N1: Consulted experts validation interviews including their profession.

In this appendix, the validation interviews are presented. First, the results of the validation interviews are summarised presented through a SWOT-analysis in paragraph N.1. After, the validation process is described in paragraph N2. Subsequently, the twelve validation interviews are included. These paragraphs are ordered similar to table N.1. It starts with the validation interview of Brigadier General C. J. Matthijssen in paragraph N.3 and ends with A. Onencan in paragraph N.14.

The included validation reports are checked by the interviewed experts. There feedback, corrections and additions are included in the presented validation interviews. From all the interviewed experts, their permission is received to publish the included validation interviews as a part of this master thesis report.

N.1 Summary Validation Results by SWOT-analysis

The results of the validation interviews are summarised and presented in this paragraph by means of a SWOT-analysis. The Strengths will be elaborated in section N.1.1. After its Weaknesses and Opportunities will be discussed in the sections N.1.2 and N.1.3. Last, the identified Threats are presented in section N.1.4.

N.1.1 Strengths

All the items that should be in the scope, are in the framework (Tak, 2015; Matthijssen, 2015). By one visual illustration, the entire framework is professional formulated, easy to understand, complete, well arranged, systematic and clarifying (Koolhof, 2014; Berg, 2014; Post, 2015; Cooten 2015; Matthijssen, 2015; Chubbs, 2015). Especially for a person who is acquainted with the substance. When needed, the details of the framework are well described in the report (Koolhof, 2014;; Matthijssen, 2015). Also, the framework is well connected with the current Netherlands Integrated Approach and NATO's Comprehensive Approach (Koolhof, 2014; Post, 2015; Lucius, 2015; Matthijssen, 2015; Chubbs, 2015). Consequently, the framework will be easy to communicate at all military planning and implementation levels: Strategic, Operational, Tactical and Technical (Koolhof, 2014). Also, this integration is well formulated according to the knowledge institute Deltares and the NGO Cordaid (Ven, 2014; Berg, 2014). Thereby, It provides the desired "line to follow" within the peace-building process. (Onencan, 2014; Post, 2015). Also, the framework prevents the "loss'' of water management as a development team and creates awareness (Tak, 2015; Matthijssen, 2015; Cooten, 2015). Most significantly, the framework shapes the conditions to establish continuity and coherence because it starts with the long-term orientated development objectives. After, the short-term quick impact projects and long-term water management activities are connected and synchronised according to a flexible action plan with set boundaries (Onencan, 2014; Post, 2015; Berg, 2014; Tak, 2015; Matthijssen, 2015).

The framework provides the professional answer how water conflicts can be resolved (Cooten, 2015). Through the new framework, water management is made specific and structured coherently for application in stabilisation or crisis management operations (Koolhof, 2014; Post, 2015; Kleijn, 2014; Cremers, 2014; Lucius, 2015). Because water related problems and possible solutions can be detected in an early stage, future harm resulting in conflicts can be prevented (Cooten, 2015; Matthijssen, 2015). More significantly, water is a useful subject and good opening to start the discussion about local problems and needs (Lucius, 2015; Post, 2015).

The potential water management possesses as an enabling peace mechanism is well included (Onencan, 2014; Kleijn, 2014; Tak, 2015; Chubbs, 2015). As a consequence, the framework is very relevant for application within stabilisation operations (Matthijssen, 2015). *For example, it would have been very useful to apply this framework in the Syria example*[27] *(Tak, 2015).*

The frameworks provides structure and cohesion how water management can be applied by peace builders, from the top decision-making level until what water management actions army units and NGOs in the fields can conduct in the mission area (Onencan, 2014; Post, 2015; Cooten, 2015). The detailed Water Management Portfolio will be very useful (Lucius, 2015). Since all water functions including possible short-, medium- and long-term activities are described, fast wins can be made in the initial planning stages and in the actual deployment (Onencan, 2014; Chubbs, 2015).

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[27] *'When the crisis in Syria developed in 2011, the Netherlands ministry of Foreign Affairs engaged in the working group for reconstruction in 2012. Due to the dry landscape, water management was one of the first issues identified. Deltares and another Dutch company had extensive knowledge regarding water management in Syria, because there employees had worked for decades with the local population and government on water management activities based on local needs. A substantial amount of the water supply was used to cultivate cotton, a very water demanding crop. In a dry landscape, this is of course not smart. Change was almost impossible because the cotton cultivation was part of the 5 year national strategic-economic plan which had communist roots' (Tak, 2015).*

Stimulates Responsibility. By participating, the framework makes all involved actors, accountable for their actions. This stimulates cooperation and efficient use of the available resources (Onencan, 2014). Also, Local Ownership as the exit strategy is well included in the framework (Koolhof, 2014).

The framework is a solid base to establishing the desired good working relationship and cooperation between the involved military and civilian actors The framework uses "the same language". Also, the right connection between the activities and actors are made. Consequently, it functions as the "bridge" between the Ministries of Defence, Foreign Affairs, NGOs, IFIs, GOs, IOs and private sector enterprises. Thereby the framework stimulates cooperation, functions as base for trust establishment and gives room to discuss the different objectives. As a result, synchronisation agreements between all involved actors are better formulated (Cremers, 2014; Berg, 2014; Ven, 2014; Lucius, 2015; Post, 2015; Cooten, 2015; Tak, 2015; Matthijssen, 2015).

N.1.2 Weaknesses

For the average audience, the framework is regarded as overwhelming. Especially as a first impression by a person who is not acquainted with the matter (Kleijn, 2014; Post, 2015; Chubbs, 2015; Matthijssen, 2015).

Political willingness and those of the involved actors for implementation. Also, some actors and organisations should hand in their autonomy, thereby becoming less powerful (Berg, 2014).

Everyday reality and routine is too complex to be described or planned by one framework (Cremers, 2014; Kleijn, 2014).

The framework is focussed only on water, while the application of water management in stabilisation operations needs to be seen in relation with all the other Campaign Plan Development Themes. (Matthijssen, 2015).

N.1.3 Opportunities

The new framework can fulfill an important role within the international water- and crisis management domains. When the Netherlands ministries of Defence, Foreign Affairs, Infrastructure & Environment and Economic Affairs link the framework with the "top sector water", a Dutch niche expertise and export product is enlarged. As a result, all available know how regarding water management in *relation with security* and development issues can be used (Kleijn, 2014, Ven, 2014).

'Start with Water, the rest will follow' (Ven, 2014). *Water is an useful item for winning the "Hearts & Minds" of the local population (Tak, 2015). Also, the link with socioeconomic development and water management is strong (Koolhof, 2014).* Thereby, development and security successes can be made by means of a relative innocent subject: water. Especially when *win-win effects are created and the negative effects mitigated (Ven, 2014; Koolhof, 2014).*

The framework can be applied at many levels. It covers the entire spectrum from the top decision-making level to the practices of water management in the field. Thereby peace can be established through fostering cross-sectoral cooperation in water (Onencan, 2014).

Unique NATO capability. *The 1CMI-Co functional water specialists and Military Engineers of the Netherlands Armed Forces, possess a unique capability within the NATO alliance. In combination with the new framework, the Netherlands can play a key role in enhancing future NATO, UN and EU stabilisation and crisis management operations (Chubbs, 2015; Cooten, 2015).*

Integration in the Integrated Approach. *This framework will be useful as an underlying and in-depth specific document how to apply and implement the Integrated Approach with regards to water related issues. Therefore, the framework should be added or included within existing policies of the* Ministries of Defence and Foreign Affairs *(Matthijssen, 2015; Lucius, 2015)*.

***Implemented in the education programs**. 'This frameworks is must haves in the DNA mindset of every functional specialist' (Post, 2015). This framework can be used to train and educate the civilian and military mission teams (Post, 2015; Lucius, 2015). Therefore, it is advised to explore the possibilities to include the new framework in the of CCOE trainings and education programs of the HDV of the NLDA[28], Netherlands Army Corps of Engineers, 1CMI-Co and "Klasje Clingendael" of the Netherlands Ministry of Foreign Affairs (Post, 2015; Lucius, 2015; Cooten, 2015; Mathijssen, 2015). In addition, it is a good training tool for CIMIC or Military Engineering lectures at the NATO School (Chubbs, 2015).*

***Verification in Civil-Military Exercise.** It will be very interesting to verify and optimise the new framework by implementation within one of the exercises of the 1 German/Netherlands Corps (Cooten, 2015).*

Mission Implementation. Due to the Afghanistan - Uruzgan mission, the timing for implementing the framework is right (Berg, 2014). Within the army and NGOs, there is the right mindset for follow-up ideas based upon past experiences (Koolhof, 2014). The Netherlands deployment for NATO Resolute Support mission in the Afghanistan, can be interesting. In this area the NGO Cordaid already supports water management projects because water scarcity and quality is an expected root0cause of conflict between up- and downstream actors in the agriculture based economy (Berg, 2014). Furthermore, the current contribution of the Netherlands Armed Forces regarding the stabilisation mission in Mali is an interesting implementation opportunity *(Cooten, 2015).*

N.1.4 Threats

Limited power position of the Netherlands. The power position of the Netherlands on the international playing-field is limited. Usually, the Netherlands jointly participates in stabilisation operation with coalition partners, NATO, UN or the EU. As a consequence, the chance of developing a totally own campaign plan is small. In most situations a campaign plan is formulated and decided upon within the mandate of the international community and host-nation. Within this limited window of opportunity, the new framework needs to be implemented (Lucius, 2015).

Until today, the "DO NO HARM" implementation principles is not firmly set in the military mindset (Cooten, 2015). In un-safe areas, military priorities will come first (Tak, 2015). This will jeopardize the "DO NO HARM" implementation principle. Due to the hostile environment and safety provision for the own force, it is likely that water infrastructures including its functions will be harmed. Also, this will negatively influence the cooperation with the local actors (Cooten, 2015).

Military personal keeps thinking within the set of current military strategies (Kleijn, 2014; Cremers, 2014). Thereby interpreting the framework in the wrong context (Cremers, 2014). Also, water management can be regarded as an unimportant development theme (Kleijn, 2014). In addition, it can become a tool for only military or civilian organisations without cooperation or coordination between these actors (Post, 2015). Furthermore, the development side of the new framework is not a standard within military thinking and planning. The same is applicable for cooperation or coordination with NGOs. (Chubbs, 2015). Moreover, due to the high amount of stakeholders involved within NATO and UN missions which can be unaware of the enabling functions water possesses, water management as a development themes can get a low priority (Cooten, 2015).

Perception management: don't look and apply the framework from the western viewpoint (Koolhof, 2014).

Due to the scale of water management, it is sensitive to be "undermined" by strategies of the opponents (Koolhof, 2014).

Lack of staffing capacity and water management expertise in the Netherlands Armed Forces (Chubbs, 2014).

[28] HDV: Higher Defence Collage / Executive Master of Security and Defence at the NLDA (Netherlands Defence Academy).

Only executing this planning process, does not guarantee success (Koolhof, 2014).

The momentum of the 3D or Integrated Approach is fading away. The current missions in Mali and in Afghanistan are focused on Defence and Diplomacy, but not on Development. Due to budget cuts of the Netherlands Government, the development component in the Integrated Approach is disappearing. Also the short-term orientated planning of the Dutch Parliament focused on quick impact projects by means of emergency relieve and short-term military deployment, is not contributing (Berg, 2014).

Application of the framework dependents on political will at local, national, international levels (Berg, 2014; Cremers, 2014; Onencan, 2014). The biggest threat is at the local level. Here the host-nation government may not be willing to adopt the approach, because it may result in more independence for the local population thereby decreasing their own power position. For political, social or economic reasons, they can approve the approach, while not actualise it (Onencan, 2014).

Cooperation and Coordination. For successful implementation the framework needs strong boundary conditions, like; political will and civilian partners who wants to commit over the long-term. In the past, this has prove to be difficult to accomplish (Cremers, 2014). Also, most organisations find cooperation and coordination with other actors important. When it comes to real cooperation, it becomes difficult since these actors also become responsible and accountable (Berg, 2014).

Conflicting interests of external parties. Large actor diversity can result in a small or no support for implementation (Koolhof, 2014). Furthermore, other actors like NGOs and IOs may not see their vision and approach being represented in the framework. This can result in the scenario where they do not see the added value to participate (Onencan, 2014).

Competition with NGOs and IOs. The current development aid world is afraid that military organisation will perform development aid works. They are fundamentally against militarisation of development aid works, since that is there playing field. Be aware that although you cooperate or coordinate, NGOs, IOs and private enterprises always will have their own objectives (Lucius, 2015; Cooten, 2015).

The **"feel good trap"** or the fact that own personnel will develop their own projects and not following the made and agreements. The framework does reduce this change, but it can always occur (Koolhof, 2014).

Risk aberrant or deflecting behaviour of non-defence organisations in the entrepreneurship of stabilisation operations. Will parties like knowledge institutes want to face the risks of operating in a unstable and unsafe environment, is a question which needs to be answered (Ven, 2014).

The framework can stimulate linear thinking, while it is a flexible process (Lucius, 2015).

The framework can be explained as a commitment, while this is not the case (Matthijssen, 2015).

N.2 Validation Process

PURPOSE:

Validation of the conceptual policy model on completeness (thus it covers the entire spectrum) including the check if it can effectively (within the existing procedures) and efficiently be applied within the Integrated Approach. The results will be used to optimise the conceptual policy model.

METHOD:

By means of expert judgment who are specialized with one or multiple of the following 3D subjects: Defence, Diplomacy & Development (water and non-water related). In total 12 experts have attend the validation process, with a minimum of 2 experts for each 3D subject. The validation interviews will be semi-structured based and guided by means of the following questions.

1. Personal background:

- Name?
- Current working position and past working experiences?
- Expertise with regards to the 3D subjects / Integrated Approach and Water Management?

2. The new policy framework:

- Are there Integrated Approach activities missing?
- Are there Stakeholders missing?
- Are there Water Management Activities & Themes missing or superfluous?
- Are there Design Principles, based on water management & diplomacy best practices, missing?
- Are the connections between the Integrated Approach Phases, Water Development Phases and Mission Principles & Strategies complete and correct?
- Which items are relevant and irrelevant? Why?
- Are there important aspect not present?
- Are the Measurement of Effectiveness and Performance clear and complete? (thus these measure what need or want to be measured)
- Is the duration of the Short-, *Medium-*, and Long-term activities correct? Why?
- What can be improved? Why and how? Why is this aspect for improvement important?

3. Organisational and stakeholder involvement:

- How does the framework connects with the existing policy of your organisation?
- Are there internal organisational policies which support or compete with respect to the 'Water Management Development Framework for Civil-Military Stabilisation Operations' or the Integrated Approach?
- Will the framework contribute to a sustainable cooperation environment between the ministries of Foreign Affairs and Defence, NGOs, IOs, local GOs, the local stakeholders (residents, government and private industry), knowledge institutes and the private industry? What will be the challenges? How can these be optimised?
- How can your organisation apply the policy model?
- What is the potential of the framework when it will be integrated in the existing organisational policy? Does it ad value for your organisation? How? What can be optimised to make it work?
- How and in which part of the organisation should the framework be integrated to increase the potential of application?

4. Possible contributions of the new policy framework within the Uruzgan, Afghanistan mission:

- How were you involved in the Uruzgan mission?
- What water conflicts related issues were present?
- What water management activities were performed and which not?
- What were their effects?
- How did the performed water management projects contribute to the overall safety and stability in the region?
- How are the effects and performance of the implemented water management projects measured? Are they adjusted after the performance was known? Yes / No? Why?

- Are existing or planned water management activities of the local community, government or NGOs exploited? Why (yes/no)? How did you find out the existing of these projects?
- Is knowledge from the local community, government, NGOs and knowledge institute exploited? How?
- Is this framework conflicting with other objectives within the Campaign Plan and other development themes?
- Would the application of the framework have made a difference? How?
- In what way could this policy framework have contributed within the Uruzgan mission?
    - Positive & negative effects?
    - Checklist (open or closed)?
    - Creates local ownership?
    - Base for cooperation?
    - Bottom-up or top-down?
- What are the important lessons learned from the Uruzgan mission?

5. Application and performance of the new policy framework:

- Who should be leading in the implementation of the framework?
- What is your opinion of the proposal to make reserve officers from 1CMIco the project managers of this framework?
- Is the transition management approach between the Short-, *Medium*- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the *Medium*-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
- How can the framework be correct and complete (thus it covers the entire spectrum)?
- Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors?
- In what way is this generic framework relevant and/or applicable?

To conclude; can you please name 1 or 2 factors of each SWOT-analysis items with regards to the conceptual policy framework: 'Water Management Development Framework for Civil-Military Stabilisation Operations'.

ENDSTATE:

The goal is to validate the conceptual policy model on its completeness, effectiveness and efficiency. Moreover, by means of expert judgment the made assumptions and recommendations are checked. In order to make the conceptual policy model applicable for Civil-Military water crisis exercises or Stabilisation Operations, the model will be optimised based on the tips and recommendation from the experts.

N.3 Validation Interview - C. J. Matthijssen

Name: C. J. Matthijssen (Kees), Brigadier General.
Date: 7 January 2015.
Location: Royal Netherlands Army - 11 Air Assault Brigade, Schaarsbergen, The Netherlands.
Current profession: Commander 11 Air Assault Brigade, Brigadier General (Brigadegeneraal).
Professional Experience: Military Advisor at the Netherlands Ministry of Foreign Affairs (Integrated Approach, Civil-Military Interaction & Cooperation), Director of Staff/Chief Department of Integration, Commander Task Force Uruzgan NATO-ISAF mission (3D Approach, Stabilisation Operations).

Organisational & Stakeholder Involvement

1. Will the framework contribute to a sustainable cooperation environment between the ministries of Foreign Affairs and Defence, NGOs, IOs, local GOs, the local stakeholders (residents, government and private industry), knowledge institutes and the private industry? What will be the challenges? How can these be optimised?
   'Yes, that is the power of the Integrated Approach. This is also applicable with regards to your framework which gives a guidance how the situation needs to be analysed and what actions can be deployed with regards to water management. It also provides a common reference how the different actors can cooperate. Thereby the framework functions as guiding document. The framework who provides a starting point for the formulation of a common goal in which the details need to be discussed and agreed upon with the participating actors for each specific mission.'

2. How can your organisation apply the policy model?
   'Since the framework is based in the Integrated Approach, the Collaborative Decision Making process and the Tactical Decision Making Model (TBM = tactische besluitvormingsmodel), officers within the army will recognise and understand it. This is a solid base and will enhance application by the Netherlands Ministry of Defence.'

Contribution of the framework within the Uruzgan, Afghanistan case study

1. Would the application of the framework have made a difference? How?
   'Yes, because water was an issue in Uruzgan. In Uruzgan not the amount of water was a problem, the unequal distribution of in- and outflow during the year was a problem although. Additionally, water reservoirs were limited present, resulting in water scarcity in the dry periods.'

   'If we would have had this framework already from the start of the mission, we could have addressed the water distribution aspect (water for irrigation, healthcare and more) in an integrated, coherent and structured way from the very beginning. When these water related problems and possible solutions would have been detected at an earlier stage, there reconstruction effects and possible development contributions could have been more significant.'

   'Also the framework stimulates early IO, GO, IFI, NGO and private sector involvement. Since they did operate in Uruzgan, there should have been interaction before the Dutch deployment. This was although not the case. Since early stakeholder interaction and involvement is included in the framework, civil-military cooperation could have been better already from the beginning of the mission when the Integrated Approach in combination with this framework would have existed.'

2. What are the important lessons learned from the Uruzgan mission?
   - *'An Integrated Approach is essential.'*
   - *'Stimulate local ownership and capacity building from the most earliest possible moment.'*
   - *'Educate the local population in maintaining and optimising the development works.'*
   - *'Stimulate the local economy by contracting the local population and local companies as much as possible for the execution of the development aspects. Furthermore, this approach will enhance cultural understanding, stimulates a good working relationships and contributes to increasing the situational awareness.'*

- *'I would have liked more army engineering capacity for the execution of more water management and other reconstruction related activities and thereby stimulate quick impacts and short-term wins in the unsafe areas. These are shaping condition for increasing the "ink both" including peace and development. After, civil actors could have continued these projects.'*

'Points 2, 3 and 4 are more costly and time consuming compared to the execution by a Western organisation, but are crucial and essential to invest in for the creation of a self-reliance community and country.'

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'It should be a combination between the Ministries of Defence and Foreign Affairs. From the side of the Ministry of Defence, it should be initiated by Defence Operations also known as DOPS (IA phases 1 until 3). The implementation and execution (IA phases 4 and 5) will be done by means of a Task Force (mission focussed organisation with specific military units and civil experts, like Army Corps of Engineers, 1CMI-co and development and political experts for the Ministry of Foreign Affairs) in which ideally military and civil actors participate in one mission teams. The level of civil-military interaction depends on the aim of the mission.'

2. Is the transition management approach between the Short-, *Medium*- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
   'Yes, but it only will work when these actors find and start to know each other from the early beginning (preferred in IA phase 1 or 2). The formulation of a common goal in IA phases 2 or 3 is essential. Also, a joint performance of the Analysis and Assessment (IA phase 2) is preferred. Furthermore, the transition of responsibilities within the Implementation & Execution phase (IA phase 5) between the actors should be a step by step, gradual hand-over-take-over process.'

   The PRIMO-Chain[29] should be designed already in IA phase 4 (author comment).

3. How can the framework be made correct and complete (thus it covers the entire spectrum)?
   - *'Include common goal / common ground setting in the beginning of IA phase 3 which is based on a joint (Civil & Military actors together) performed Analysis& Assessment (IA phase 2). After the common goal is formulated and synchronisation of possible actions need to be investigated. Due to the different motivations of the involved actors, there will always be a certain level of tension in People-Centric-Operations, but cooperation of equivalence is a must. Additionally, actors who don't want to commit within the Integrated Approach, a good working relationship is important to establish and maintain.'*
   - *'Within IA phase 2, the involved ministries should interact and make agreements for cooperation. This should be included.'*
   - *'IA phase 1 is a continues "scoping the horizon" process if the Netherlands want / can do something. Ideally, also for water management you want to this twice a year with all the involved ministries and other actors like NGOs, IOs, the private sector companies, knowledge institutes, etc. Perhaps this can be done within in the "Stuurgroep Missies en Operaties''. Try to visualise this.'*
   - *'Include the decision making moment of the Parliament 100 letter (informing the parliament of Dutch military involvement) in the framework, which is within IA phase 4. The Parliament 100 letter describes how and with whom the mission will be executed. Therefore, actor involvement and participation is a must before its official publication. Furthermore, to increase awareness and gain political support for the mission, early actor involvement is helpful. If subjects are sensitive's, agreements for confidentiality can be made.'*

[29] PRIMO – chain: to guarantee a well functioning water management system, Policy, Regulation & Legislation, Implementation, Management & Implementation, Organisation need to be formulated and actively applied within the governance systems of the water management policies (Ven, 2011).

- *'The visualisation of the Integrated Approach suggest that the planning steps are defined. In reality, these steps are interrelated and have less strictly defined boundaries. Try to visualise this in your framework.'*
- *Include the PRIMO-Chain in IA phase 4 (author comment).*
- *Execution of the IA steps: analysis & assessment, setting a common goal, mapping of possible activities, synchronisation of activities, execution of activities, analysis of activities, optimisation of activities (author comment).*

4. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'Yes, absolutely, I believe so yes. Your frameworks gives coherence to the subject of water in stabilisation operations, secures and describes the required knowledge and makes priority setting with regards to the six water development themes possible. When water is a cause of conflict, related with the state fragility or other problems in the mission area, the framework can contribute in solving the problem. In combination of course with the other Campaign Plan pillars.'

SWOT-Analysis

Strengths:

- The framework provides structure for planning and implementation.
- The framework provides coherence between the short-term and long-term activities.
- All the items that should be in the scope, are in the framework. Thus, the framework prevents that crucial items and issues will be forgotten.
- By means of one visual schematic illustration, the framework clarifies and connects the Integrated Approach and water management in a quick and understandable manner. The aim of the framework is rapidly to understand.
- Water related problems and possible solutions are detected in an early stage.
- Early relevant NGOs, IFIs, GOs, IOs and private sector involvement is included. Since they can have crucial experience and knowledge with regards to the current or past situation (economic system, powerful companies, sensitive issues, etc.) their input and perhaps more cooperation is needed.
- In order to understand the implementation principles the illustration is complete, clear and understandable at the first glance (for a person who is acquainted with the substance a detailed report is unneeded) When needed, the details of the framework are described in the text document.
- Water is an important base within military campaigns, human and society survival and a base for socioeconomic development like agriculture, healthcare, energy supply and industry. The framework is therefore very relevant for application within stabilisation operations.

Weaknesses:

- The framework is focussed only on water, while the application of water management in stabilisation operations needs to be seen in connection with the other Campaign Plan Development Themes. Within the Analysis & Assessment phase, the theme water need to be seen in a wider context, in order to be able to assess which Campaign Plan Development Theme, water or non-water like safety, healthcare, energy / electricity supply, etc. is having the priority (based on the local needs and strategic scenario plan).

Opportunities:

- *The developed Integrated Approach (Leidraad Geïntegreerde Benadering) was first developed as a general framework for the Dutch parliament and ministers. Additionally, it is intended that in-depth studies for application by policy-advisors and policy-makers is needed. This framework is useful as an underlying and in-depth specific document how to apply and implement the Integrated Approach with regards to water related issues.*
- *Perhaps there is the opportunity to pilot the implementation of the framework with countries the Netherlands has bilateral water development aid / assistance contracts.*
- This methodology can also be applied for other Campaign Plan Themes like; Governance, Rule of Law, Security Apparatus, Education, Social Protection, Infrastructure & Rural Development, Healthcare and Economic Activities.

- *Perhaps the framework can have implementation within the education programs of CCOE (Civil-Military Cooperation Centre of Excellence), the NLDA (Netherlands Defence Academy), Netherlands Army Corps of Engineers, 1CMI-Co, Netherlands Ministry of Foreign Affairs "Klasje Clingendael".*

Threats:

- As a first impression the framework can be regarded as to complex, especially for persons who are not acquainted with the subject. For me although, this was not the case.
- The framework can be explained as a commitment, while this is not the case. So, explain it as a guiding framework which enhances coherence, which prevents that items will be forgotten and is always open for new suggestions and idea's for optimisations.

N.4 Validation Interview - N. Tak

Name: N. Tak (Nico), Brigadier General.
Date: 5 March 2015.
Location: North Atlantic Treaty Organization - Supreme Headquarters Allied Powers Europe (NATO-SHAPE), Casteau (Mons), Belgium.
Current profession: Director Comprehensive Crisis and Operations Management Centre (DCCOMC) NATO - SHAPE, Brigadier General (Brigadegeneraal).
Professional Experience: Advisor to Senior Civilian Representative NATO, Military Advisor at the Netherlands Ministry of Foreign Affairs (Integrated Approach, Civil-Military Interaction & Cooperation), Army Staff, Battalion Commander, Commander Provincial Reconstruction Team (PRT) Uruzgan NATO-ISAF mission (3D Approach, Stabilisation Operations).

Organisational & Stakeholder Involvement

1. Will the framework contribute to a sustainable cooperation environment between the ministries of Foreign Affairs and Defence, NGOs, IOs, local GOs, the local stakeholders (residents, government and private industry), knowledge institutes and the private industry? What will be the challenges? How can these be optimised?

   'Continuity and a long-term focus are key items for stabilisation operations. Due to this approach continuity is established by linking short-term activities with long-term objectives including the cooperation or coordination between the multiple helping organisations. By means of this approach, also essential experience and knowledge regarding water management reconstruction and development activities which is limited within the armed forces, is included. To conclude; yes, this approach will certainly have a positive contribution. In real-time this process is more complex than described due to the different working methodologies of the involved actors.'

   'The water related engagement of the Netherlands ministry of Foreign Affairs in Mali, is an interesting example of this approach. Due to an active engagement and commitment over decennia, probably 30 or 40 years, a well working water management system was established and maintained. Hereby the agricultural sector was positively influenced and famine resolved. Also socioeconomic development was established including a large population growth. Before this engagement, a bilateral contract was signed in order to guarantee long-term continuity. During the engagement in Mali, the present stability in the country was an important precondition. The current Netherlands engagement with Burundi is based on the same principles'. In paragraph N5, the validation interview with G. van Cooten, the Burundi engagement is explained in more detail.

2. How can your organisation apply the policy model?

   'At NATO-SHAPE political guidance formulated at the NATO headquarters (NATO-HQ) in Brussels is translated into military preconditions for the planning and execution of military operations and campaigns. After SHAPE has formulated these, the actual implementation and execution is performed by the subordinate operational levels, like the NATO Allied Joint Force Command Headquarters in Brunssum or Naples. SHAPE is the highest military level within NATO, characterised as a strategic organisation where the ways, ends and means for NATO operations are formulated. Moreover, SHAPE is responsible to provide the political decision-makers at NATO-HQ with the right information regarding current missions and possible future conflicts. Also, SHAPE provides military advise for the political-decision makers with regards to current and possible future crisis situations. This includes consulting possible action options and what resources will be necessary when an engagement is decided upon.'

   'With regards to your framework, an actual implementation will not be performed by SHAPE. First, in phase 1, the crisis identification takes place. These Crisis Identification Assessments are comprehensive in nature. Water however can be an issue, especially in dry areas. Internal and external actor- and power-relations including economic, national and international factors relevant for the conflict, are the main priority. Next, we will formulate possible options what we, NATO as a political organisation with military means, can do or is appropriate. NATO members and partners have to agree on common goals and possible objectives including the use of military assets.'

'I can think about a possible conflict where water is a crucial aspect, the Nile. In this case, water is or can become a factor of influence. In this situation, we would consult water experts for a briefing with the purpose to explain how water is related with the conflicts, what possible options are appropriate in order to deal with the water issues and what preconditions you need from NATO-SHAPE[30], CCOMC[31] to tackle the problems. Cooperation with UN water organisations and other partners for examples. This information will be shared with subordinate NATO military organisation, namely the NATO Allied Joint Force Command Headquarters in Brunssum or Naples and Task Force Headquarters which is located in the area of operations itself. For the actual implementation of your framework, these subordinate NATO military levels will be responsible for the planning and its implementation when water is identified as an issue and decided to be an applicable enabler. Due to the long-term focus and the fact that civil organisation possesses the needed knowledge, expertise and funds, the framework should be performed in cooperation with them.'

'To conclude; for NATO-SHAPE, CCOMC the framework can be applied for Non-Article 5 Crisis Response Operations[32] at the tactical level.'

Application of the framework within NATO-SHAPE, CCOMC (author conclusion):

A. An actual implantation will not be performed by NATO-SHAPE. When water is or can become an issue, the CCOMC probably will consult external water experts. Therefore it is important that certain niches within SHAPE; like the CMI, Military Engineering and Policy & Planning domains are aware of its existence and its usability (framework implementation step 1).
B. These water experts will provide the CCOMC, the Allied Joint Force Command Headquarters and Task Force Headquarters with the assessment how water is related with the conflict, how it can be used as an enabler within the DIME strategy in order to contribute to Stability, Security and Pease including socioeconomic development and what precondition are needed. The information needed for the water assessment can be gathered by means of the intelligence capacity of NATO-SHAPE, NATO Members States, NATO partners (like the UN and EU) and knowledge institutes located in the possible future area of operations or those of member states (framework implementation step 2).
C. When it is decided upon that water is an appropriate enabler within NATO's Comprehensive Approach or the Shape, Clear, Hold, Build & Transfer model, the planning and its actual implementation will be the responsibility of and performed by the NATO Allied Joint Force Command Headquarters, Task Force Headquarters or another subordinate military organisation. The implementation should be performed in close cooperation with civil organisation like the UNDP (United Nations Development Programme) who possesses the knowledge, expertise, funds and long-term development engagement (framework implementation steps 3, 4 and 5).

Contribution of the framework within the Uruzgan, Afghanistan case study

1. What are the important lessons learned from the Uruzgan mission?
    - *'Continuity and coherence focussed on long-term stability and socioeconomic objectives according to a flexible plan with set boundaries is key. An internal study of the British Ministry of Defence regarding their command and control in the Afghan province of Helmand by former military commanders, concluded this. The military command in an area of operations rotates every 4 to 6 months. Achieving the desired endstate derived from the Campaign Plan Goals are long-term orientated objectives. For stabilisation operations, the timetable for achieving these goals are generally years or decades.*

[30] NATO-SHAPE: North Atlantic Treaty Organization - Supreme Headquarters Allied Powers Europe.
[31] CCOMC: Comprehensive Crisis and Operations Management Centre.
[32] Non-Article 5 Crisis Response Operations includes:

- Peace support operations: Peacekeeping, Peace Enforcement, Conflict Prevention, Peacemaking, Peace Building and Humanitarian Operations.
- Natural, technological or humanitarian disasters.

Due to the different rotations, the absences of a coherent plan can result in a situation that every military commander wants to profile him- or herself by changing the course of its predecessor with other well-intentioned activities. In this situations the plans change every half year, which can result in not or partially achieving the long-term orientated desired endstates.'

- *'Achieving visible and measurable positive effects can take a while. The patience of Western democratic governments, including the Dutch one, was lacking at the beginning of the mission. After two weeks of the first rotation in 2006, the present Task Force Uruzgan Commander Theo Vleugels, received questions from Dutch parliamentarians how many development projects he already had accomplished.'*
- *'From day one of the mission in 2006, I had a water management expert in my Provincial Reconstruction Team (PRT). Every day he went out to consult local farmers and the Afghan ministry of Rural Rehabilitation and Development (MRRD). Also, water management reconstruction projects were realised, like constructing riverbank protection. Apparently this approach was "lost" and rediscovered later on. A constant level of awareness regarding important development subjects is therefore needed.'*
- *'Understanding the local economic situation and drivers is key. Rapid change in this system like, from poppy to saffron cultivation will have large impacts. Therefore it is appropriate to implement fundamental changes gradually over the long-term.'*
- *'Constructing water wells including knowledge related to the effects of its usage regarding aquifer drainage, is present within the 105 Netherlands Army Engineering Battalion. Within the Uruzgan mission, knowledge regarding its possibilities and constraints for Quick Impact Projects was gained and extended.'*

2. Would the application of the framework have made a difference? How?

   'Yes, because the "loss" of water management as a development theme would have been prevented. Also, the framework would have provided structure and guidance explaining what water experts, army engineers and 1 CMI-Co functional specialists actually could have been doing including how regarding the quick impact projects. Moreover, it would have been a good asset to guide us through the 3D approach principles, like cooperation and coordination with NGOs and other involved actors.'

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?

   'That depends on the development stage of the host-nation and the quality levels of its national and local governance systems. When a reasonably developed government is present with sufficient water management knowledge, ideally by them. The IFIs can assist in the execution of projects by providing funds on budget. When a local government is not sufficient accountable and transparent yet, the IFIs can provide the funds based on contracts and proof of its right execution.' Thus it depends on the level of stability, development and host-nation governments reliability and accountability (author comment).

   And who should be leading for the initiation?

   'Ideally conflict resolution stakeholders with long-term interests and commitment, like the UN or the EU. Not NATO, since we will likely outsource the related activities to experts. At NATO we can create awareness of the framework at the UN or EU. Therefore it is important that certain niches within SHAPE, like the CMI, Military Engineering and Plans & Policy domains are aware of its existence and usability.'

2. Is the transition management approach between the Short-, Medium- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?

   'Yes, because the armed forces will be present relative short. Their objective is to shape the necessary conditions for development related activities by NGOs and IOs, like a relative safe working environment and freedom of movement.

When the level of violence reduces they can gradually take over, because IOs and NGOs are better equipped in performing long-term reconstruction and development activities. In addition, continuity including using and improving local knowledge is better secured by this approach.'

3. How can the framework be made correct and complete (thus it covers the entire spectrum)?
    - *'Water can also be used as an disabler by your opponent. This is interesting to include.'*
    - *'When the crisis in Syria developed in 2011, the Netherlands ministry of Foreign Affairs engaged in the working group for reconstruction in 2012. Due to the dry landscape, water management was one of the first issues identified. Deltares and another Dutch company had extensive knowledge regarding water management in Syria, because there employees had worked for decades with the local population and government on water management activities based on local needs. A substantial amount of the water supply was used to cultivate cotton, a very water demanding crop. In a dry landscape, this is of course not smart. Change was almost impossible because the cotton cultivation was part of the 5 year national strategic-economic plan which had communist roots. How to engage with your framework in this kind of situations and anticipate on these constrains is an interesting item to study.' Creating awareness including the cost and benefits of changing towards another crop cultivation including its economic model based on local methods by means of Serious Gaming can be an option (author comment).*
    - *'If you want to succeed in the long-term, the country where the stabilisation operation is conducted should likely be responsible for spending the available monetary funds. This is also applicable for selecting and prioritising the funds spend on water management related projects. By means of this principle you empower the host-nation government to become self-reliant. That way service delivery from the local politicians to the local population is stimulated, instead of service delivery to the donors.' This money is provided by international donors like the World Bank and individual nations (author commend).*

4. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'Yes. You have chosen the right steps. Selecting the right partners with substantial experience will be key for a possible next step, a real-time implementation. Cordaid, as you already have indicated, could be a good partner.'

SWOT-Analysis

Strengths:

- The framework shapes the conditions to establish continuity by creating coherence and structure between the activities and the involved actors.
- It connects the quick impact projects with the long-term orientated development objectives according to a flexible plan with set boundaries.
- Shows in an understandable manner the enabling functions water possesses including its "handles and levers" for a military commander.
- Will prevent that water management is "lost" as a possible enabler and development team.

Weaknesses:

- Due to the complexity, it is a framework for specialists.

Opportunities:

- *When the result is a well structures plan including the necessary funds and engagement of the key actors, it is a good approach for "the way to ahead".*
- *Water is an useful item for winning the "Hearts & Minds" of the local population.*
- *It would have been very useful to have in the Syria example.*

Threats:

- Especially in a non-permissive ("un-safe") environment, military priorities will come first.

N.5 Validation Interview - G. van Cooten

Name: G. van Cooten (Gerrit).
Date: 12 March 2015.
Location: Royal Netherlands Army - Army Corps of Engineers, Vught, The Netherlands.
Current profession: Commander Netherlands Army Corps of Engineers, Colonel.

Organisational & Stakeholder Involvement

1. How can your organisation apply the policy model?
   'Since water will be a main issue in future stabilisation operations, it suits perfectly within the Integrated Approach model. Since the important role of water within each society, a water assessment should be made within the initials stage of the Integrated Approach in the cause of a possible involvement. Thereby the framework functions as methods for the planning of a Campaign including all levels within the ministries of Defence and Foreign Affairs, from the high level long-term focussed strategic planners until actual implementation at the military operational, tactical and technical levels.'

   'Awareness of the existence and understanding of the framework is key. Since the functional specialists of 1CMIco possesses the necessary water management knowledge, they should be included from IA phase 2 (analysis & assessment). Also, within this phase the 1CMIco specialists should cooperate with the army engineers reconnaissance unites who can be deployed to gather intelligence within the possible area of operations. By doing so, information can be gathered concerning the hydrological system and local water usage. This is new for us, since army engineers are focussed on engineering support during military operations with the focus on geographical conditions, safety, road clearance, building compounds, etc. Now, also social and technical water management aspects, a new domain need to be included within this type of operations. Therefore, the proposal of participating within the Civil-Military Water Group is a good solution in order to make optimum use of each other's expertise.'

2. What is the potential of the framework when it will be integrated in the existing organisational policy? Does it add value for your organisation? How? What can be optimised to make it work?
   - *'It will prevent that the problems will aggravate due to our well-intentioned but incoherent actions.'*
   - *'The aim of every stabilisation operation is decreasing the level and number of violent conflicts and shape conditions for a self-reliant society including rebuilding a host-nation governmental organisation. Due to the availability the framework, this process can be conducted faster.'*
   - *'The framework also has to potential to serve as a conflict prevention method using water. This action although is not within the domain of the Ministry of Defence, but is the responsibility of the Ministry of Foreign Affairs and NGOs. We can of course implement a part of the framework very locally in exercises abroad by means of small scale assistance in states we support with a continuous commitment, like Burundi. Here we combine army engineering exercises with development works, like; building water supply systems and the reconstruction of a hospital and medical stations. On a small scale we apply the Integrated Approach and create local ownership by cooperating in all stages (planning, design, construction and maintenance) with the local population and host-nation with the emphasis on training and education of both the Dutch troops and the local population.'*
   - *'In order to succeed in large missions like Afghanistan, the framework should be applied and supported at the top decision-making level.'*

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'From the very beginning a team of experts within the Ministry of Foreign Affairs and DOPS[33]. In the mission area itself, initially not the Army Corps of Engineer because this is not our primary function. This is the domain of 1CMIco and their water experts in combination with the political advisors of the Ministry of Foreign Affairs. Therefore the 1CMIco water experts, political advisors and military headquarters should be included within the implementation from IA phase 2 until 6.'

[33] DOPS: Directie Operaties = Management of Netherlands Military Operations, Ministry of Defence.

'Since the problems are not military, neither the solutions are. We as the army engineers can of course always support and cooperate during the planning and execution phases with regards to (re)construction activities or protecting water resources to prevent further escalation over them. Also army engineers reconnaissance capacity and expertise can be used in cooperation with 1CMIco specialists within IA phase 2 and 5. When no other actor is capable of executing the needed activities because the area is just not safe enough for NGOs and the host-nation government, the army engineers can perform them. Using our water drilling capacity, is just an example. In this situation, a fast and appropriate handover to the right actors is always the mindset.'

'In order to guarantee a possible application within a campaign plan, the framework should have a fixed position within the planning procedures of the Ministry of Foreign Affairs and DOPS, especially the question of implementation step 1.'

2. Is the transition management approach between the Short-, Medium- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
   'Yes, but be aware of the competition with NGOs and other IOs. Since you include common goals formulation and making agreements who is going to do which activity at what stage before the actual deployment, you reduce this chance significantly.'

   'Also, by including the 'Top Sector Water', private knowledge and possible investments needed for long-term development are included from the initial stage.'

3. How can the framework be made correct and complete (thus it covers the entire spectrum)?
   - *'Water can also become a future issue when wrong action are taken. This need to be prevented. Include this in Implementation Step 1.'*

4. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'Yes, absolutely, it is direct applicable for a stabilisation operation. I believe the root-cause of future conflicts and the key mechanism to solve them, namely water the most important and basic resource, is captured by your thesis research. In addition, the awareness created by your research will help us to conduct better stabilisation operations because now we have insight in what handles and levers we can use concerning water as an enabler'.

   'Awareness and structured generic knowledge at the top-level military planners is key. When water is identified as an applicable issue, the right experts within 1CMIco and Foreign Affairs should be consulted because within the army we don't have these specialists.'

SWOT-Analysis

Strengths:

- The framework creates awareness and describes how water management can influence and be used within conflict resolutions. Since the Netherlands Army has identified water as a potential root-causes of future conflicts, the framework is a very significant must have.
- It is accessible, structures, understandable and clear.
- By means of the framework direct and future harm including resulting conflicts can be prevented because a coherent plan can be created.
- The frameworks provides structure and cohesion for how water management can be applied from the top decision-making level until what actions the troops and NGOs in the fields actually can conduct.
- The framework provides a next step building further on the existing knowledge and answering how future predicted water related conflicts can be resolved.
- *By means of the framework common goals can be created with all the involved actors before the actual deployment. Including agreements who is going to do what at the different Short-, Medium- and Long-term stages.*

Weaknesses:

- The 'Do No Harm' peace mechanism principles is not firmly set in the military mindset until now.

Opportunities:

- *Create awareness at 1 German/Netherlands Corps. Since they are leading within NATO in the actual implementation of the Integrated Approach, the framework will be very interesting to implement within one of their exercises. Especially, because multiple NATO and partner nations, global NGOs and IOs do cooperate within these exercises. Therefore, this will be the perfect platform to verify / test the framework and optimise it. In addition, you will create a large inkblot of awareness at multiple NATO member states at the right organisational levels including the participating global NGOs and IOs.*
- *Creating awareness and opportunities of the framework by means of lecturing the subject at the HDV[34], CCOE[35] and the NATO School.*
- *When awareness and understanding is created, the framework possesses a large potential for possible implementation by the Netherlands. Within NATO the Netherlands has a unique and specific Army Engineers and 1CMIco capacity. Therefore the Netherlands can play a key role in enhancing future NATO, UN and EU conducted stabilisation operations regarding water management as an enabler.*
- *Initiating and conducting a workshop at 1CMIco with the water management functional specialists of network Infrastructures, how the framework can be translated into actual 1CMIco policy.*
- *By means of the Netherlands Ministry of Foreign Affairs, water can be initiated at the UN as a long-term development theme within Mali. If regarded as appropriate by the UN, the framework can be implemented within this stabilisation operation.*

Threats:

- The 'Do No Harm' peace mechanism principles is frequently not in the military mindset. Due to the hostile environment and safety provision for the own force, it is likely that we will do harm to water infrastructures including its functions. This also will negatively influence the cooperation with other and local actors.
- The formulation of a multiyear roadmap including a water management campaign line on a top level, like within NATO and UN missions is a long process. Due to the high amount of stakeholders involved which can be unaware of the enabling functions water possesses, the water management campaign line can get a low priority.
- Competition with NGOs and IOs.
- It should not become a military model or experienced as a military model by non-military actors. In order to reduce this chance, this 'thinking model' can be shared by means of a workshop with all actors in order to increase its efficiency because it is new. Civilians should give / lead these workshops.

[34] HDV: Higher Defence Collage / Executive Master of Security and Defence at the NLDA (Netherlands Defence Academy).
[35] CCOE: Civil-Military Cooperation Centre of Excellence (NATO).

N.6 Validation Interview - L. Chubbs

Name: L. Chubbs (Lloyd), Lieutenant-Colonel.
Date: 5 March 2015.
Location: North Atlantic Treaty Organization - Supreme Headquarters Allied Powers Europe (NATO-SHAPE), Casteau (Mons), Belgium.
Current profession: Staff Officer Environmental Management - Joint Engineer Division (JENG) NATO SHAPE, Lieutenant - Colonel.
Professional Experience: Consultant NATO Support Agency (NSPA), Environmental Engineer department of National Defence Canada, Infrastructure Engineer and Engineering Planning Officer department of National Defence Canada.

Organisational & Stakeholder Involvement

1. How can your organisation apply the policy model?
   'We can and should apply the framework in the SHAPE-CCOMC[36] operations planning process. Due to the effects which can be achieved with water both as an enabler or disabler, water issues should be a fixed item for investigation within the development of country profiles[37], the consistency planning procedure for potential operations and the planning for actual operations.'

2. What is the potential of the framework when it will be integrated in the existing organisational policy? Does it add value for your organisation? How? What can be optimised to make it work?
   'Technically speaking, water management is already incorporated in our Military Engineering Operations Planning Process. The focus is although on environmental protection in relation to our own water supply production and wastewater purification on military camps. Your framework on the contrary explains how water management can be used as an enabler in stabilisation operations focussed on wining the "hearts-and-minds" of the local population by means of development projects. This is new for SHAPE and a real asset for the planning and execution of crisis management operations, because by means of your framework we can be proactive from the beginning of our presence in the area of operations. At this moment, SHAPE does not have the capacity (staffing and experience) to manage and execute it to the level required.'

3. How and in which part of the organisation should the framework be integrated to increase the potential of application?
   'In order to structure it within the current SHAPE planning process, the plans branch (J5) should incorporate it during the planning of any operation. Within the intelligence branch (J2) a water issue "question mark" and a water do no harm, enabling or disabling" checkbox" should be included within the analysis and assessment phase regarding the country profiles, the planning for contingency and actual operations. Also, the experts within the Civil Military Interaction (CMI) and Military Engineering, including the GEO (geomatic specialists within the intelligence branch) domains should be aware and understand the potential of the framework. Due to the limited knowledge regarding water issues within the J5 and J2 branches, CMI/CIMIC and the Military Engineers within SHAPE are key players to support the J5 and J2 within in the planning and execution stages. Herby the chance of a potential implementation is increased because the local water issues are made understandable for non-specialists.'

[36] SHAPE-CCOMC: Supreme Headquarters Allied Powers Europe - Comprehensive Crisis and Operations Management Centre (NATO).
[37] Country profiles are made constantly in order to spot potential future conflicts.

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'Due to the long-term needed commitment and engagement, preferably not a military organisation like NATO but IOs or NGOs should be in the lead. Civil organisation like the UN and local NGOs are probably already in the area or have been in the past. Therefore, they possesses key information regarding the water management system, water development issues and needs including the local actor relationships before NATO will be present. Within NATO-SHAPE, the CMI branch or CIMIC (J9), can initiate the framework. Also, during the conduct of a NATO-led operation, SHAPE can facilitate certain aspect of the planning and execution parts.'

2. Is the transition management approach between the Short-, Medium- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
   'Yes, because by this means NATO's Comprehensive Approach is thoroughly executed including the engagement of all the key civil and military actors. From a military perspective CMI or CIMIC should be in the lead and coordinate with Foreign Affairs ministries, who would normally be leading such initiatives, or by military specialists.'

   'In the initial stages of the engagement the military aspect will be key, due to our ability to act in hostile and unsafe environments. In this phase CIMIC will coordinate water assessments, since they obtain the capacity to communicate with the local community. Military Engineers can assist in the execution of the water related projects, due to their civil and environmental engineering knowledge. Thus, on the ground within the mission area, they are the key players.'

   'Due to the Comprehensive Approach, the intention of CCOMC is to have representatives of different IOs within NATO-SHAPE in order to be able to deal with this issues in a coordinated and coherent manner. However due to security regulations and the ability to grant access to restricted areas, only a liaison officer from the EU is present.'

3. How can the framework be made correct and complete (thus it covers the entire spectrum)?
   - *'Expectation management is very important. Don't promise projects, when you don't have the capacity to execute them.'*
   - *In STANAG 2582 a water management annex is included. This can be interesting to study.'*
   - *'The Dahla Dam irrigation project in the Afghan province of Kandahar can be interesting to study.'*

4. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'Yes. According to me the framework is already complete with significant details. Also, within the framework you follow the same planning and execution sequence as we do within SHAPE; from the orientation trying to understand the problem, to planning the problem in an operation and execution within the area of operation.'

SWOT-Analysis

Strengths:

- It is an understandable and systematic strategy, since the concept is based on NATO's Comprehensive Approach and Military Engineering planning principles and the Provincial Reconstruction Teams (PRT) philosophy.
- The water management operation lines or development themes clearly indicate how you can apply water management as an enabling peace mechanism comprehensively.
- In reality, water and other development activities start when we are in the mission area. By means of your framework fast wins can be made in the initial stages of the mission planning and the actual deployment in a coherent manner.

Weaknesses:

- For the average general audience, it can be overwhelming. In order to be able to explain the importance of the framework in an understandable way for non specialists, make it easier / simpler/ less busy / step by step / deleting the technical details / applying the centre of gravity.
- The current NATO-SHAPE organisation has limited capacity or capability to investigate water issues related to the conflict in the initial planning stages or in operations.
- The development side of your framework is not a standard within military thinking and planning. The same is applicable for cooperation or coordination with NGOs.

Opportunities:

- *The CMI / CIMIC functional water specialists and Military Engineers of the Netherlands Armed forces, possesses a unique high level capability within the NATO alliance. These can be applied, to plan and execute the framework within NATO missions or exercises regarding crisis management operations. Thus awareness of this capability and the existence of the framework within CCOMC of NATO-SHAPE is key.*
- *Since water management also has an infrastructural component, intelligence regarding water management can be gathered by the Military Engineers.*
- *The described approach is also applicable for other issues, like energy security.*
- *It is a good training tool for NATO staff, for example; within a CIMIC or Military Engineering lecture at the NATO School.*

Threats:

- It can become a victim of its level of detail. My advice is to develop a quick and dirty approach of max 1 A4 page including the main aspects of the framework.
- Lack of staffing capacity within the CMI and Military Engineering branches at NATO-SHAPE. Also, water management expertise within the intelligence community at NATO-SHAPE for gathering the water related information within country profiles in order to execute the analysis and assessment phase is limited. Therefore, upfront analysis and assessment to identify areas of concern from a water management perspective, is at this moment not possible at NATO-SHAPE.

N.7 Validation Interview - P. Cremers

Name: P. Cremers (Paul), Major.
Date: 15 December 2014
Location: Royal Netherlands Army - Land Warfare Centre (LWC) department Integrated Deployments, Amersfoort, The Netherlands.
Current profession: Developing future concepts and updating current military land warfare processes on the military strategic, operational, tactical and technical levels in order to increase its effectiveness, Major.
Professional Experience: Responsible for the information operations at the 43 Mechanized Brigade, including civil-military cooperation; application of information to achieve military goals, common goal formulation between civil and military partners and enlarging the spectrum of military operations. Within this context water management was applied as the root-cause of the conflict within a brigade size military exercises.

Organisational & Stakeholder Involvement

1. Will the framework contribute to a sustainable cooperation environment between the ministries of Foreign Affairs and Defence, NGOs, IOs, local GOs, the local stakeholders (residents, government and private industry), knowledge institutes and the private industry? What will be the challenges? How can these be optimised?
   'Yes. If the framework will be applied as described, this will results in knowing each other's positive and negative cooperation opportunities, what is the fundamental base for cooperation. Thus, a key criteria for implementation of the framework is the 'willingness' factor of the actors. Developing upon previous positive cooperation experiences within the Uruzgan mission, is an item which need to be exploited. For real application, this should be tested although.'

   Cooperation is based on adding value for both actors. An example: sharing of knowledge, can be a sustainable cooperation mechanisms (author commend).

2. How can your organisation apply the policy model?
   'When water resources use is an important cause of conflict and has the characteristic of shaping opportunities to contribute to a peaceful resolution by creating the right effects for stability and peace, it is usable within the doctrine Land Deployment:
   - *Design stage = DOPS[38],*
   - *Implementation stage = Task Force including a political advisor (at this moments not present at the lower military levels due limited staff capacity at DOPS and 1CMI-Co).'*

Contribution of the framework within the Uruzgan, Afghanistan case study

1. Would the application of the framework have made a difference? How?
   'When the framework would have been applied based on an Integrated Approach including participation of civil actors based on a full commitment, a better synergy would have been present from the start of the mission. Because the framework is focussed on the long-term, the quick impact projects (QIP's) would have been more sustainable and not only focussed on winning the 'hearts-and-minds' of the local population. Furthermore, the stubbornness effects of politics would have been lower, because not only a plan for the military deployment is created, but also for the follow-up when the military component is pulled-out. What the successes of the water management activities would have been is for me difficult to determine, because I am not a specialist in this subject.'

[38] DOPS: Directie Operaties = Management of Netherlands Military Operations, Ministry of Defence.

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'Based on how the Integrated Approach is formulated, military involvement is the only constant factor. But it is not a soldiers job, although only soldiers can do it.'

   'No single actor should be leading. All kind of actors should have the opportunity to initiate the framework without any restrictions. Common objectives formulated by the willing actors should be the base for commitment and implementation. The leading organisation should be determined separately for each deployment. This is based on their kind and willing duration of the involvement. Since long-term involvement is key, only military actors are undesirable. Also, leading means accountable, which can result in unwillingness to participate. Therefore international organisations like, the UN or NATO are preferred. The Netherlands Army can act as the "supercharger / stimulator" for implementation of the framework.'

2. What is your opinion of the proposal to make reserve officers from 1CMI-Co the project managers of this framework? For the Implementation & Execution (IA phase 5), because continuity is important due to the constant learning cycles and since they understand and can act in both the civil and military domain.
   'The framework is a process or a programme, not a project. So it should be named a programme manager and not a project manager. Due to the complexity of the area of operation, I don't think that 1CMI-Co reserve officers are the right persons. Perseverance of these reserve officers is complex, due to their civil employer. For specific water management projects, yes, they are well qualified due to their knowledge and experience in the matter.'

   What about water diplomats from the ministry of Foreign Affairs (long-term orientation and commitment due to the closure of bilateral water development contacts)?
   'Yes, this is an option. But only when the military intervention is short in relation with the total duration of the stabilisation programme.'

3. Water management is by its characteristics, long-term focussed. Is the transition management approach between the Short-, Medium- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
   'It looks good on paper, because by this approach a long-term development is created. I really like the fact that the framework goes beyond the scope of solely military deployment, but also includes the follow-up when the military component is pulled-out. A diplomatic continuation of the initial military deployment is by this means guaranteed. This is an essential need, but unfortunately not the case within the Uruzgan mission. Perhaps you can call it "the political follow-up" in which the military component decreases during the duration of IA phase 5.'

4. How can the framework be made correct and complete (thus it covers the entire spectrum)?
   - *'The Integrated Approach should be clearly demarcated and described.'*
   - *'The Integrated Approach is not a linear process. Within each IA phase, the same six phases need to be executed. For military purposes, integrate the TBM-model within each IA phase.'*
   - *'Application of the V-model is commonly used in the IT industry. Perhaps you can use it to summarise the framework.'*
   - *'Implement "short-cuts" in the framework. What to do when the IA will be initiated by NGO (bottom-up)? Implementing or supporting (parts) of these NGOs activities should be possible.'*
   - *'Make the framework more reality proof and more specific for the military environment.'*
   - *'When does the framework stops? At the normalisation phase?'*
   - *'How does the framework connects with the not willing actors?'*
   - *'The red circle describes the iterative process of the complex implementation environment.'*
   - *'Figure N1 is correct because:*
     - The civilian organisations are different.
     - Civil = network, Defence = ranked order.

But figure N1 should be corrected. According to my impression figure N2 is a better representation of reality, because:

- *International political strategies are not 1 to 1 translated into national political strategies.*
- *National political strategies are not 1 to 1 translated into military strategies strategies. Military strategies are influence by both international political strategies, of the NATO for example and specific own national strategies.*
- *The Netherlands military strategies does influence the national (Netherlands Government) and International (NATO, EU, UN) strategies.*
- *The "non-willing" actors (gray) are also present at the lower military levels. My means of military deployment, it is tried to "control/steer" these actors indirect.'*

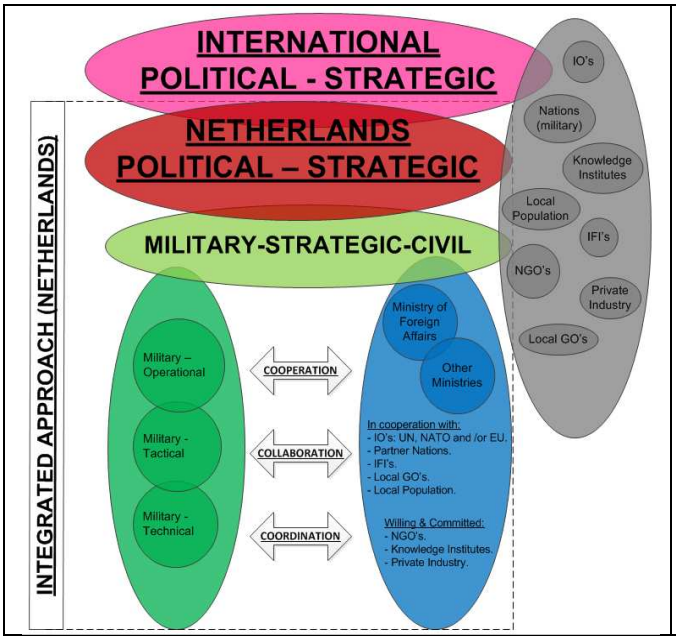

Figure N1.

Figure N2.

NOTE: the dimensions of the figures (circles and ellipsis) are not an indication of the power-interest levels of the actors.

5. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'Yes, since it is based on the military way of planning, thinking and acting. But be aware that within the defence organisation, frameworks and models are interpreted as reality. Since this is a process, good communication is essential.'

   Only implementing the process does not guarantee success, because the environment of operation is very complex and you are dependent on other local and international actors (author comment).

SWOT-Analysis

Strengths:

- Water management is made specific, described and visualised for application within military operations.
- Due to the different backgrounds and objectives, civil-military cooperation is often difficult. Since the phasing's are clear described, a common language and a line of reasoning is created for implementation by the civil and military partners within the water and safety domains.
- The framework is a solid base to formulate common water management objectives between the military and civil actors.

Weaknesses:

- For successful implementation the framework needs strong boundary conditions, like; political will, civil partners who wants to commit also for the actual implementation of water management activities in a (post)conflict areas. For both, long-term commitment and capacity for perseverance by the partners are essential. In the past, this has prove to be difficult to accomplish.

Opportunities:

- It professionalize linkage and cooperation between military and civil actors within the domains of safety and water management practices.

Threats:

- Everyday reality and routine cannot be planned or described by a framework. Therefore the Integrated Approach is "an" approach and not "the" technique. Because the world of stabilisation operations is complex and dynamic, the framework should be communicated as a process which is flexible during its implementation.
- Military personal keeps thinking within the set of current military strategies and thereby interpreting the framework within the wrong context.

N.8 Validation Interview - J. Kleijn

Name: J. Kleijn (Job)
Date: 26 November 2014
Location: Ministry of Foreign Affairs - The Hague, The Netherlands.
Current profession: Focal Point for Water Productivity and for Water Affairs Middle East at Climate, Energy, Environment and Water Department.
Professional Experience: Water diplomat in Yemen, Egypt, Israel-Palestine. Coordinator for Water Affairs Middle East.

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'Water use and water allocation is usually a political sensitive item, in which the Netherlands should not take a position, but stay neutral. Therefore preferably one or a combination of international organisation like the UN, NATO or the EU should take the initiative. They can redirect, the water part to the government of the Netherlands. Since water is a domain within multiple Dutch ministries, a combination of the following ministries can implement the framework based on cooperation and/or coordination; Defence, Foreign Affairs, Infrastructure & the Environment and Economic Affairs. Another option is to outsource the implementation to a knowledge institute, like currently is done for water diplomacy at IHE-UNESCO. UNESCO-IHE is involved in analysis and data collection; Trusted Basic information excepted by all parties concerned is a prerequisite to start negotiation process.'

2. What is your opinion of the proposal to make reserve officers from 1CMIco the project managers of this framework?
   'I was not aware of this organisation, but it can be an option if they can operate within multiple disciplines like; policy and engineering within the specific local culture. But be aware that they will be responsible and accountable.'

3. Is the transition management approach between the Short-, Medium- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
   'Yes, this is a good and accepted approach. Within the 3 phases all the actors who play a role, should be included. The power positions of these actors differs per culture. As example; within Egypt the government will take the lead and the private sectors follows, while in the Netherlands private companies have a powerful position and the government functions more as a facilitator.'

4. How can the framework be made correct and complete (thus it covers the entire spectrum)?
   - *'For development, you always need Banks! => Include IFIs (International Financial Institutions) like the World Bank and EU Investment Bank in the phases 3, 4 and 5 of the Integrated Approach. Always ask them at an early stage what their ideas and opinions are, to make sure that they are included. Moreover, they have experience and knowledge what development acts are successful and non-successful in different situations.'*
   - *'Cultural aspects; the political economy is crucial and should have a central position in the entire framework as a Guiding Principle or Design Principle. Also, cultural anthropologists should be included in the Situational Awareness Assessment team, since the local culture determines the kind of approach and policies:*
     - *Top-down: by means of the key leaders, social and religious institutions or the government.*
     - *Bottom-up; trough the local population or private sector.*
     - *Or a combination of Top-down and Bottom-up, but take the right persons!'*
   - *'Upfront Stakeholders identification is thus crucial. Who should be included at what conflicts stage; Stabilisation and Normalisation need to be known.'*

- *'IA Phase 4: Include scenario development with regards to the future direction of the area of operation, like; agriculture based, industrial based, 'land bearing capacity' (until what population size and / or scale of industrial activities can the country provide the basic needs like water and food), urbanization trends, energy needs, ext. Early stakeholder involvement is crucial for the needed knowledge. Visualise scenario development in the Water Management Development Themes.'*

5. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'Yes, it has potential, but now it's too complicated. In practice, frameworks are rarely applied one to one. For applications simplify it by formulating Guiding Principles (say 5 blocks of max 2 A4 pages), Include the details by using different layers and clear simple blocks. Moreover connect it with existing policies and trigger the reader, by (example):
   - Water scarcity will be a future problem and cause for conflict (Existing Army Statement);
   - International stability by means of water diplomacy and water planning is a focus point for the Netherlands government (include in Dutch international policy).'

SWOT-Analysis

Strengths:

- The framework visualise and discusses how water management can be applied within the military system. Due to the importance of water, the potential as a development theme is indicated and explained.

Weaknesses:

- People don't belief in models. Thus for successful implementation it is important to make the framework very simple. Perhaps by means of the help of a communication experts.

Opportunities:

- It can be used as a tool for the Netherlands to fulfil an important role within the international water domain. Especially when the ministries of Foreign Affairs, Infrastructure & the Environment and Economic Affairs link this framework with the 'top sector water'. By this means the private sector and knowledge institutes are included, thus making optimum use of the available know how.

Threats:

- Military personal keeps thinking within the set of current military strategies and thereby regarding water management as an unimportant development theme.

Points of discussion

- *'Design Principles: the willing stakeholders are often not the key stakeholders, since they will benefit. Crucial are the unwilling stakeholders due to their formal or informal power position.'*
- *'Use the existing formulated and approved local, national and international strategic water plans (long-term) in IA phase 3, 4 and 5.'*
- *'Apply knowledge of the local knowledge institutes and universities.'*
- *'Do not take sides! Stay neutral and accomplish that all parties get water.'*
- *'With development, the process is more important than the product. Especially when cooperation is established. But include short-term wins for 'selling' the project in the press and political arena.'*
- *'Winning of Heart-and-Minds, by means of basic water provision and agriculture is crucial!'*
- *'When actors feel safe, they will take part in the negotiations. At that moment you need to start working at the Water Management system.'*
- *'Local social structures are leading. They will solve the problems. Assist them in the process.*
- *'Be very clear in what your purpose, goals and resources are => be good in the management of expectations!'*
- *'IA phase 5 is a Bottom-up approach. Make this clear in the framework and the text document.'*
- *'Rank the Design Principles.'*
- *'The projects should be executed by the local population and/or governments.*

- *'Donor coordination is important. Need to be coordinated and communicated with one voice at levels like the EU or NATO.'*
- *'Apply American Strategic Water Reports!'*
- *'There are plans for a large coherent database including the global hydrological data and water use to answer the question if there is enough water in the future for the basic needs of the world population. FAO (Food and Agriculture Organisation of the United Nations) is executing these plans now by means of information from satellites and drones. The Netherlands government is supporting this by means of the Dutch knowledge in remote sensing. This data can be applied for conflict analysis and assessments with regards to water and efficient resources use. Data need to be trustworthy for application by the UN and NATO!'*
- *'Since water is transboundary, analysis & assessment of the system at basin level is crucial.'*
- *'Most of the time there is sufficient water, but only utilised for the wrong purposes.'*
- *'Short-term = Army, Medium-term = NGOs, BUZA, IFI, ext., Long-term =private industry.'*
- *'Who owns the water?'*
- *'Political-economics => which powers and stakeholders are working against you. Identify these by means of cultural-anthropologists of 1CMIco.'*
- *'Long-term projects are difficult to sell. You need to connect it with the direct and short-term effects to increase the political will and thereby to be able to realise the long-term effects.'*

N.9 Validation Interview - G.J. Lucius

Name: G. J. Lucius (Gerard).
Date: 6 January 2015.
Location: Ministry of Foreign Affairs - The Hague, The Netherlands.
Current profession: Netherlands diplomat at Ministry of Foreign Affairs, Editor Springer Science + Business Media, Functional Specialist / Reserve Officer (Captain) 1CMI-Co, Network Politics.
Professional Experience: Counsellor and Deputy Head of Mission - Embassy of the Netherlands to Iraq, First Secretary Political and Economic Affairs - Embassy of the Netherlands to Qatar, Consultant, Joint Integrated Units - United Nations Mission in Sudan, Development Adviser Uruzgan Provincial Reconstruction Team (Civil-Military Interaction & Cooperation, Integrated Approach, 3D Approach, Stabilisation Operations).

Organisational & Stakeholder Involvement

1. Will the framework contribute to a sustainable cooperation environment between the ministries of Foreign Affairs and Defence, NGOs, IOs, local GOs, the local stakeholders (residents, government and private industry), knowledge institutes and the private industry? What will be the challenges? How can these be optimised?

   'For this purpose the framework is helpful and supporting. These actors although need to be aware of the conditions and the position they obtain within the discussion. In order to make them aware of their possible contribution and position within the Integrated Approach, it is important to explain what their possible contribution in each IA phase can be by explaining the how's, why's and what's before an actual contribution. Therefore, these actors should be aware of each position and mandate of the other possible participating actors. Inviting people for a discussion does not mean that you can tell them what they should do. Neither you should agree on all issues, because different perspectives are an added value within the broad consultation process. Due to these discussion, you will create more certainty concerning the possession of the right and all information there is. Also, by consulting a broad range of different experts in multiple different organisation you have more brainpower to generate a wide range of better options. Considering and assessing the generated options and deciding what role you want to play within the actual implementation, is and will be the responsibility of the decision-makers of each specific possible participating organisations.'

2. How can your organisation apply the policy model?

   'Since your framework is based in the Integrated Approach, the potential of applying your framework within the Ministry of Foreign Affairs is large. Especially because it is recognisable for a substantial amount of our employees working within the security and development domains. Including the right issues and interests of these domains in one plan will be although challenging. Synchronisation is thus an important item in your framework.'

   'For implementation within the Ministry of Foreign Affairs, the people dealing with these specific conflicts should be aware of the framework. These are: the Directorate-General for Political Affairs, the Security Policy Department and the Stabilisation and Humanitarian Aid Department. Also the Regional Departments should know your framework, because they are dealing with existing and possible future conflict in their specified areas in the world.'

   'For implementation within the Ministry of Defence, the commander of 1CMI-Co and the J9 (CIMIC) of DOPS[39].'

[39] DOPS: Directie Operaties = Management of Netherlands Military Operations.

Contribution of the framework within the Uruzgan, Afghanistan case study

1. Would the application of the framework have made a difference? How?
   'Yes it would have made a difference, mainly for a better execution of the IA phases 1, 2 and 3. The political assessment was well performed by the Tribal Liaisons Office (later on changed into The Liaison Office), but a hydrological assessment was not performed within the Uruzgan mission. If we would have executed this at the start of the mission including assessments for other development themes like agriculture, we would have had a better understanding on the possible reconstruction options. Furthermore, by means of this framework we would have had a well defined implementation method in advance.'

2. What are the important lessons learned from the Uruzgan mission?
   - *'Although we cooperated and coordinated the development activities with the NGOs, they always will have their own objectives. Like Cordaid criticized in the Dutch press militarization of development aid works, while in the field we worked together. This is politics mainly for their own public relations profiling and funding purposes.'*
   - *'The media is key in how the mission is framed, explained and thus supported.'*
   - *'Investigate how you can contribute to the current development activities, respecting the knowledge and effort of the already involved actors and try to establish a good working relationship by synchronisation of activities.'*
   - *'Sometimes you cannot prevent and is it even essential to do quick impact projects, without a proper assessment. Hereby the projects are based on common sense and experience, because doing nothing is not an option especially in crisis situations.'*
   - *'You always will be limited in time and geographical space. At the same time you can use time and space for de-escalation purposes, preferably by a non-military actor.'*
   - *'Do no harm is essential in development aid.'*
   - *'Apply development project to enlarge the ink blot / area of influence.'*
   - *'Coherent management of the short-term activities and long-term objectives is essential, but not easy in reality. When well performed the effects can be very satisfying.'*
   - *'Expectation management by means of explaining where you come from, what your boundaries are, what the expectations of your organisation are, etc. is crucial in gaining trust of your own staff and that the local population including the host-nation governmental organisations.'*
   - *'Be aware of the conflicting issues and interest of all the involved actors and stakeholders (local / host-nation governmental organisation, Netherlands Ministries of Defence and Foreign Affairs).'*
   - *'Don't focus to fast on solutions. First make a proper analysis and assessment of the situation and problems.'*
   - *'Focus on the right effects aimed at right target group. It is not going about us, but about them.'*
   - *'Be aware of the different time perspectives; "you have the watch, we got the time" between the local-population and Westerners. The same is applicable between military personnel and development workers.'*
   - *'Discovering and validating the real important issues of the local population is difficult, especially in a conflict area. For example, people are being threatened and thereby forced by an actor to gif a certain answer. Also, like in western countries, people just give a social satisfying answer due to group pressure or to protect their social status and position in the society. Like: "the mosque is for me the most important thing in my village" and by saying this I am proving that I am a good Muslim.'*
   - *'By having knowledge in the matter, you will earn respect. By having knowledge in this situation about water, you can ask the right questions to discover the real problems. Like, Is the water for the hospital clean? or Do you face flooding problems? etc.'*
   - *'Be flexible.'*
   - *'Use the energy of the local population in order to make their society self-reliance.'*

- *'Respect and accept that the locals of the host-nation have another way of doing their things. Know the local culture, use / apply and support it in order to stimulate self-reliance. Don't perform the activities which can be performed by the local population themselves. Instead only support them by means of management advice, technical support, materials, tool, educations, etc.'*
- *'While doing your projects, always keep the political agendas in mind.'*
- *'By only acting as a mediator, small conflicts were resolved (talk, make suggestions, find solutions).'*
- *'Sharing of information with the host-nation of local projects was not always common practice. While this is essential for a good hand-over.'*
- *'The process is more important that the outcome.'*

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'The Ministry of Foreign Affairs, because:
   - *Engagement with the host-nation should be established by means of the political channels. Foreign Affairs has these contacts due to our global embassy network.*
   - *Also, because Foreign Affairs can better focus on the long-term development objectives compared to the Ministry of Defence.*
   - *Furthermore, because Foreign Affairs maintains contact with the host-nation continuously, we are able to guard continuity of the implementation.'*

   'Ownership of the framework although should be at the Ministry of Defence, ideally ad DOPS. Furthermore, awareness should continuously be created by an internal knowledge institute like the Military Engineering Centre of Expertise. Also, to make it consistent in the mindset of military and civil personal of mission teams, the framework should be included in lecture material of the NLDA[40] and CCOE[41]. Most significantly, "sell" the framework by talking with a lot of relevant people from different organisations.'

2. What is your opinion of the proposal to make reserve officers from 1CMIco the project managers of this framework? For the Implementation & Execution (IA phase 5), because they understand and can act in both the civil and military domain.
   'Ideally it should not be a 1CMI-Co functional specialist but a development specialist from the Ministry of Foreign Affairs. This expert has a long-term orientated mandate and has the ability to focus on all the planned or executed development programs of the multiple development domains/themes in the area of operations (like: governance, education, healthcare, etc.). Especially when there is a bilateral development aid and cooperation contract with the host-nation. A 1CMI-Co functional specialist is a second best option. This should be a pro-active person finding connections on his own with the relevant counterparts or experts at the Ministries of Foreign Affairs, Defence and the NGOs. Also, this person should have the right understanding in both the technical, political, development and management domains.'

3. Is the transition management approach between the Short-, Medium- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
   'The principle is correct. In this stage it is crucial to focus on the long-term objectives while conducting short-term activities at the same time. This mindset is crucial for successful implementation. Personal contact an cooperation between the short-term (mainly Defence), and long-term (mainly Foreign Affairs) orientated staff, should be well during the mission and established from the early beginning. The long-term orientated staff should explain their objectives and help to shape the short-term activities.'

[40] NLDA: Nederlandse Defensie Academie = Netherlands Defence Academy.
[41] CCOE: Civil-Military Cooperation Centre of Excellence (NATO).

4. How can the framework be made correct and complete (thus it covers the entire spectrum)?
    - *'The framework is displayed as a linear process, while in reality this does not have to be the case. Try to visualise this, or explain it.'* Include sinus curve of CDM process in the thesis report (author comment).
    - *'The position and support of the host-nation is very important. They need to be included in the beginning of the IA. Thus include the ambassador of the host-nation and other relevant host-nation experts at least in IA phase 3. Ideally they are involved within the IA phases 2 until 6.'* This also stimulates local ownership and problem responsibility by the local government from the early beginning. These are key implementation principle. Furthermore, the common goals and implementation plan also becomes their idea, making the execution easier (author comment).
    - *'Include the official political decision-making moment in the framework; "the Parliament 100 letter", which is situated after IA phase 3 and before IA phase 4. By means of this letter from the Netherlands Government addressed to the Netherlands Parliament under Article 100 of the Constitution, describes precisely that the government has taken the political decision to participate in Operation X, at the request of Organisation Y, for the reasons A, B C and D, taking into account Risks I, II and III, with the deployment of the resources Alpha, Bravo, Charlie according the Command Structure P. Before its publication the Dutch Government selects one or a combination of the options generated within IA phase 2 and 3. The approval of the Dutch Parliament is not needed, but desirable although. By means of this approach the government is and stays always responsible for the actual deployment and can be held accountable for by the parliament.'*
      'Within IA phase 1 until 3 and before the publication of the Parliament 100 letter, national and international partners are consulted. This is an important process because the why's, how's, whom's and what's of the mission are also explained in the Parliament 100 letter. Early involvement and consultation of possible partner nations, the host-nation, IOs, development aid organisation, knowledge institutes and other non-governmental actors is thus not a barrier. This is even an essential requirement in order to gain support for the mission in the public and political arenas. Based on agreements of confidentiality, also essential knowledge can be shared resulting in synchronisation of possible activities and better mission options.'
    - *'Also include the letter of notification (request if the Netherlands want and can participate and make a contribution by an IO like; NATO, UN, EU a coalition of the willing or a partner countries) which is situated between IA phase 1 and 2.'*
    - *'The framework is a simplification of reality and it includes multiple loops. This should be mentioned.'*
    - *'Develop a flyer (max 2 A4's) of the research objective and results for internal and external communication. Creating awareness by spreading the word is essential to increase the chance of a real-time implementation.'*
    - *'Make a simplification of the framework to enhance the communication. Perhaps an scientific article is appropriated.'*

5. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'Yes, absolutely, because you have applied and build upon the right underlying fundamental policies. Thereby its is well recognisable for experts in the domains of safety, development and crisis management.'

SWOT-Analysis

Strengths:

- The framework gives guidance and makes explicit how water management can be applied in stabilisation operations or crisis management circumstances in a coherent manner.
- Water is a useful theme and good opening to start the discussion about problems and needs.
- The Water Management Development Themes are providing a flexible portfolio of possible effective activities, which can be applied or focussed on. This is depending on the local safety situation, needs,

time and geographical location. Having this flexible portfolio is very useful in the dynamic world of conflict areas.

- The framework is recognisable by NGOs and does connect with the current policies of the Ministries of Defence and Foreign Affairs. Furthermore, it connects with the predicted future challenges and problems of the large think tanks.
- Because the framework uses "the same language", it functions as a bridge between the Ministries of Defence, Foreign Affairs and the NGOs. Also applying water management as a development theme including the displayed exit strategies to hand-over the responsibilities to another actor, will contribute to establish a well working relationship and cooperation between these actors.

Weaknesses:

- As how the framework is presented, it gives a risk of linear thinking while it is a flexible process. This can reinforce the tendency of the linear working method within the armed forces. If not managed and explained properly, a linear execution of the framework can result in a disappointments when the implementation of the framework is not going according to how it is formulated. The 'not readiness' of the current affairs and local situation can be a cause for this.

Opportunities:

- *The framework can be added or included within existing policies of the* Ministries of Defence and Foreign Affairs. The only question are: how and where?
- *The framework can be applied by the Netherlands government, but also by NGOs.*
- *It is a useful tool to implement within the education of civil and military mission teams. Depending on the students like, diplomats or military engineers the education material can be made more specific to their domains. It would be interesting to explore if this framework can be included in the education material of the NLDA.*

Threats:

- The current development aid world is afraid that military organisation will perform development aid works. They are fundamentally against militarization of development aid works. since that is there playing field. Thus, it is important to have the development aid NGOs and IOs onboard. Be aware that although you cooperate or coordinate, they always will have their own objectives.
- The Uruzgan Campaign Plan was developed in 2008, 2 years after the start of the mission. This plan was based on the Afghanistan Campaign Plan and that of the local government. The development of a totally own formulated Campaign Plan, is thus restricted. Within the mandate you have from the international community, the one of your own national government and that of the host-nation you need to find a way to implement this framework. Since the details of a Campaign Plan are in most situations not formulated and decided upon solely by Netherlands Government, including the Water Governance & Use campaign plan development theme can be difficult.

N.10 Validation Interview - P. van den Berg

Name: P. van den Berg (Paul)
Date: 3 December 2014
Location: Cordaid - The Hague, The Netherlands.
Current profession: Political advisor. Areas of expertise include: Link between peace, security and development, Human rights, Gender, Sustainable development, Emergency aid.
Professional Experience: The 3D Approach, Integrated Approach, Civil-Military Cooperation, Water risk reduction in Afghanistan.

Organisational & Stakeholder Involvement

1. Will the framework contribute to a sustainable cooperation environment between the ministries of Foreign Affairs and Defence, NGOs, IOs, local GOs, the local stakeholders (residents, government and private industry), knowledge institutes and the private industry? What will be the challenges? How can these be optimised?
   'Yes, If it will be applied as described in the policy framework, I believe so, yes. All stakeholders although should be taken seriously, without double agenda's. Important is an open communication and dialogue with regards to the mission goals, approaches and activities including organisational beliefs, issues, points for cooperation, but also the point of no-cooperation.'

2. How can your organisation apply the policy model?
   'Cordaid applies the same planning cycles for development programs, but normally not based on the Integrated Approach philosophy. We find real cooperation and / or coordination important. With regards to the Integrated Approach, the focussed is still too much on cooperation between the involved ministries. While we are really keen in a real integrated approach which includes all stakeholders who want and can contribute. Therefore in May 2015, we will attend an exercise of 1GEM/NL army corps in Berlin based on the South-Sudan scenario (existing fragile / falling state) which is planned together with the MFA and NGOs from IA phase 1. According to me this is how it should be.'

Contribution of the framework within the Uruzgan, Afghanistan case study

1. Would the application of the framework have made a difference? How?
   'Yes, especially in the first two years a lot went wrong (total duration was 4 years). The focus of the PRT was too much on CIMIC short-term QIP's. In the last 2 years the situation improved, because the focus was more on the long-term development, especially when the missing knowledge disciplines with regards to development en diplomacy were added in the PRT. Also the power of these civil actors increased. As a result the NGO activities increased (long-term focussed) and CIMIC (shot-term) decreased. This framework would have been very useful to stimulate cooperation and have a clear overview what could have been done ad which stage by whom.'

2. What are the important lessons learned from the Uruzgan mission?
   - *'Talk with each other; Defence, Foreign Affairs, NGOs, IOs. Direct association although in the conflict areas is not wise. NGOs can be regarded as an 'extension' of the military force and thereby becoming a target for the OMF.'*
   - *'Behind the sciences, information can be shared with regards to the safety situation (IED locations, road block) which are live saving. But also the kind and scale of the development projects, with which local stakeholder do I or can I collaborate and 'open source' date (internet sites) of projects. This need to be a double-side, giving-getting and open based.'*
     'Also explain what you are going to do with the information to increase trust in each other and show that the shared information is not abused for PSYOPS or combat operation. Especially if the safety of the NGOs activities, personnel and local contacts will be threatened due to the fact that they have shared their information.'
   - *'Cooperation between NGOs, by means of Dutch Consortium Uruzgan.'*
   - *'A Shared political vision, makes cooperation easier. Also, be open with regards to you motives, objectives and activities. Make the cooperation explicit and plan the activities together.'*

- *'The time horizons differs. To reconstruct a country toward stability, Cordaid maintains the principle that the stabilisation and normalisation period is the same as the total conflict duration. Commonly Cordaid formulates its development policies and activities over a time horizon of 20 years. This differs compared with that of military deployments, which are shorter.'*
- *'Need a well 'hand-over-take-over' and continuity in staffing (same persons in the teams).'*

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'CIVIL!'

   Continuity is important, thus one organisation should act as the organiser and facilitator. Who should be this project manager?
   'This should be the "Stabilisation and Humanitarian Aid Department" of the Netherlands ministry of Foreign Affairs (Directie Stabiliteit en Humanitaire Hulp). They are the most neutral and respected actor who can function as a bridge between Defence, MFA Safety, Stability and Development Assistance departments and the NGOs. Moreover, this department is focussed on long-term, stabilisation, normalisation and development.'

2. What is your opinion of the proposal to make reserve officers from 1CMIco the project managers of this framework? For the Implementation & Execution (IA phase 5), because they understand and can act in both the civil and military domain.
   'Yes this is right. But there mandate should be right. An implication although is the fact that they function as a civilian expert with a development aim in a military uniform. Cooperation between civil partners therefore needs explanation.'

3. Is the transition management approach between the Short-, Medium- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
   'Yes, on paper this is a good distribution. In reality these boundaries are not that strict fixed.' In the planning the details should be included with regards to the long-term focussed objectives which are performed and based on the local culture (author comment).

4. How can the framework be made correct and complete (thus it covers the entire spectrum)?
   - *'Already in IA phases 1 and 2 (Orientation and Analysis & Assessment), blind spots can be identified, scenarios developed and possible policy options and activities mapped. This should be done within a permanent dialogue team.'*
   - *'Include a "permanent water management mission platform" with all relevant stakeholders (Defence, MFA, NGOs) in IA phase 2. Map possible water activities already in this stage and share information and knowledge in this stage as well.'*
5. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'Yes. The conflict is local and not simple. It cannot be simplified as NATO-ISAF against the Taliban or OMF. The real conflict, the root causes, are about water resources use, exclusion of groups of people (based on religion, tribes, etc.) within the political process or access to natural resources. IA phase 1 and 2 should be the bases for the conflict analysis. I have experienced that water is a root cause for conflict, which can be reframed as a conflict resolution mechanism enabling opportunity for peace, stability and development. Especially when all stakeholders have access to water, you are already acting preventive. So this framework is crucial for civil-military stabilisation operations. In agriculture based economies especially, since water is everything. Thus linking the framework with the pillars food security and water of the Dutch development programs is indeed a good way.'

   'To test the application, I recommend you to make a pilot for an exercise or mission. The mindset of the ministry of Defence, ministry of Foreign Affairs and the NGOs is ready for it.'

SWOT-Analysis

Strengths:

- Starts from a long-term orientated perspective, which has the correct central position in the framework.
- The strategy is made coherent because the short- and medium-term activities are connected and formulated based on the formulated long-term goals.
- The planning steps of the Integrated Approach are correct, made specific and are clear formulated. Also the right connection between the activities and actors is made.
- The conceptual framework is, coherent, logical, easy to understand, well arranged, clarifying and clear.
- *This framework stimulates cooperation and trust establishment. T*he personal aspect, having a 'click' between army, diplomat and development workers and personal, has a high value. A high rate of effectiveness and efficiency can be accomplished when the team works a team. This means trust is needed and understanding of each other's ideas, values, goals and approaches. Tender and open communication including constructive critiquing, are key elements. *On the planning and implementation level, it is important to have continuity in staffing. The Uruzgan 3D approach has proven this.*

  Once there was trust in the team of NGOs, army and diplomat personnel the willingness to chare confidential and sensitive information increased.

Weaknesses:

- Political willingness and those of the involved actors is needed for the implementation. Also, some actors and organisations should hand in their autonomy, thereby becoming less powerful.
- Most organisations find cooperation and coordination with other actors important. When it comes to real cooperation, it becomes difficult due to the fact they become responsible and accountable.

Opportunities:

- Water management has been applied in Afghanistan - Uruzgan, but not yet coherent in such a way the framework describes. If it water management was implemented as the framework described, the rate of success would have been higher.
- Now it becomes time to implement this framework within an exercise or an actual mission. The new mission of the Netherlands to the Afghan province of Kunduz for the NATO mission Resolute Support (start is January 2015), could be a great opportunity. In this area Cordaid already supports water management projects because water scarcity and quality is an expected root cause of future conflict between up- and downstream actors in the agriculture based economy of the area (see mailed document).

Threats:

- The momentum of the 3D or Integrated Approach is fading away, especially with regards to the current mission in Mali and the further one in Afghanistan which are focussed on Defence and Diplomacy but not on Development. Due to budget cuts of the Netherlands Government, the Development component within the Integrated Approach is disappearing. Also the short-term orientated planning of the Dutch Parliament focussed on quick impact projects by means of emergency relieve and short military deployment, is not contributing. This is very important, but not a base for sustainable socioeconomic development, self-resilience and creating the perspective for a better further. Linking is essential, because only long-term orientated development can enable this, like water management in its characteristics is (threat by the external environment on the implementation of the framework).

N.11 Validation Interview - F. van de Ven

Name: F. van de Ven (Frans)
Date: 16 December 2014
Location: Deltares - Delft, The Netherlands
Current profession: Team leader Urban Land & Water Management (Deltares) & Associate professor Urban Water Management (Delft University of Technology).
Professional Experience: Climate resilient cities, urban flooding and impact reduction, adaptable cities, "closed city" (enhancing the functional use of all types of water in the urban area), adaptation for drought and land subsidence control in urban areas, water supply and water resources management, effective and applicable blue-green solutions for urban flood, drought and heat management.

Organisational & Stakeholder Involvement

1. How can your organisation apply the policy model?
   'I see a possibility for cooperation from Integrated Approach phase 2; Analysis & Assessment until phase 6; Evaluation & Optimisation.
   - *IA phase 2 and 3 (civil-strategic water management staff): Deltares staff assisting in the team for making the hydrological, soil and water use assessments and investigating how water management can contribute (staff with a helicopter view in the domains of surface water, groundwater and soil experts).*
   - *IA phase 4, 5 and 6 (civil-operational water management staff): Deltares staff within the design and execution team of water management projects ranging from technical solution, transition management, policy and legislation development, financial models, socioeconomic effects of water in relation with development contributions. This can be performed within the area of operation or from within the Netherlands (e.g. Deltares - Department Scenarios and Policy Analysis).*

   The details depend on the natural and human characteristics of the project area. But a cooperation based on continuity, is preferred to enhance the learning curve for Deltares. This can be done by means of a 1CMIco reserve officer but also based on a civilian cooperation contract. Personal safety though is a very important issue for the experts. In order to be recognised as non-military water experts, it is essential to dress as civilians.'

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'The government of the Netherlands, more specific the ministry of Defence, especially with regard to Integrated Approach phase 5 within the short- and medium-term orientated activities. Probably the NATO, EU or UN makes the requests to the Netherlands government. So the Ministry of Foreign Affairs is automatically involved. But I am only willing to invite water management staff to a mission area under the responsibility of the military commander present which is responsible for their safety. With regards to sharing of information and making initial assessments, Deltares can be involved from IA phase 2 based on a confidentiality agreement.'

2. What is your opinion of the proposal to make reserve officers from 1CMIco the project managers of this framework? For the Implementation & Execution (IA phase 5), because they understand and can act in both the civil and military domain.
   'I would rather prefer 100 % civil leadership under military protection.'

3. Is the transition management approach between the Short-, Medium- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
'This approach seems correct. Only with good transition management, the long-term orientated development goals can be reached. Also communication and capacity building are important aspects. But be careful with involving the private sector. Due to other primary interests, like making a profit, these parties can disrupt or destroy the positive contribution made by the previous actors (NGOs, ministry of Defence and Foreign Affairs) when involved in a too early stage. We also have to realise that the private sector has other purposes and meanings in non-western societies. Applicability and timing of private sector involvement is thus culture based. With regard to having a sustainable transition management including sustainable local training and capacity building, private sector involvement should not take place within the Short- and Medium-term activities.'

4. How can the framework be made correct and complete (thus it covers the entire spectrum)?
   - *'It comes across to me from a western view point and a western way of working. Local ownership is very important and should be an important design principle.'*
   - *'Soil knowledge is an important factor to determine which water management activities can be applied. Soil research should be added within IA phase 2.'*
   - *'Involvement of civil water management expertise within phase 2 and 3 is essential. Due to the "Parliament 100 letter", these experts can be involved based on a confidentiality agreement. A permanent water management team including NGOs , Knowledge Institutes and the ministries of Foreign Affairs and Defence is indeed a good plan, because this enables constant evaluation of possibilities to establish peace with water.'*
   - *'Important QIP's are Flood Early Warning Assessments & Systems: flood protection with regards to river floods. This can be implemented fast. With the help of satellite information and remote sensing assessments, prediction of a catchment flood event and its consequences can be made already in the Netherlands before the actual deployment (Quick and Dirty). By having this within the initial deployment stage, Flood Early Warning Assessments can contribute to wining of the Hearts-and-Minds of the local population. Once in the field, data from the aeronautical industry can be applied first and later own measurements (static stations or with autonomic or remotely operated land, water, air based vehicles). Of course depending on the safety situation and local relevance. In Mali for example, wadi flash floods occur, causing people to drown in the desert. These events are spotted hours in advanced and therefore can be prevented with an Early Warning Assessment & Systems. This also needs an operational alarm system, which need to be specified in the area of operations.' Author: PSYOPS instruments can be used to warn the local population and explain what they need to do.*
   - *'Water quality assessments of surface- and groundwater resources including sharing of information on what water resources can or cannot be used for drinking or irrigation purposes, is another important QIP.' Author: For education purposes and to create ownership, data collection needs to be performed in cooperation with the local population. This also creates a trustworthy relationship with the local population.'*
   - *'Water emergency relief has the priority within the short-term activities.'*
   - *'Fishery is also food production which goes beyond ecosystem protection. Assisting in establishing a higher catch of fish, by means of the distribution of good fishing gear (nets, traps), can be an important QIP and winning of hearts-and-mind activity. Also training and education are possibilities. Fishery is thus an item of Water for Food.'*
   - *'Other possible blue-green solutions including multiple ecosystems services are: water retention and drainage, water purification, fishing, fish production, habitat for reptiles and birds, recreation, decreasing the local heat stress / cooling island function, delivers sand, clay and wood as construction material, wood production for fuel, agriculture fields for different crop (depending in the amount of water, soil, solar energy, etc). This can be created within the following solutions:*
     - *Retention basins with increased infiltration capacity,*
     - *Wide or small retention basins,*

- Bioswales / wadi's which increase the infiltration capacity,
- Ground cover of shrubs and trees,
- Connection / water flow interconnection,
- Compartments,
- Channel small or wide for drainage,
- Elevated houses or flood resilient made buildings,
- Green roads,
- Urban Wetlands / aquatic plants.'

- *'What conditions do you measure in phase 6? Not only evaluate what is done by / within the Integrated Approach mandate, also evaluated what shaping conditions you have created for future development which will be executed by others, like; the local population and local government or other NGOs, IOs GOs. Especially within the short mandate of military deployment, these effects are important to communicate.'*

5. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'I think it can be applied successfully. And I am keen in following the progress and discuss the options of participation.'

SWOT-Analysis

Strengths:

- The framework synchronises the organisational strengths and knowledge of the ministry of Defence, ministry of Foreign affairs, NGOs and Knowledge Institutes, with regards to the combined use of civil and military efforts focussed on the use of water management in conflict areas.
- How the integration is formulated is well done from the standpoint of Deltares as a water and environment knowledge institute.

Weaknesses:

- A lot of challenges are involved. Cohesion between the involved actors in not yet present. Implementing the framework will take a lot of effort from all actors with regard to: organisation, communication, getting to know each other, operationalisation of the actual deployment of personnel, safety issues, the integration of civil and military staff in the area of operations and the kind of needed assessments. These are still questions, which need to be learned during the process and made specific for each mission.

Opportunities:

- The frameworks is for the Defence, and Water sectors an opportunity to apply water management, a Dutch niche expertise and export product, in a coherent and structured manner within stabilisation operations. Moreover, the worlds of Defence, Development and Diplomacy with regards to water management, can be connected by means of this framework.
- In particular when water is a root cause of conflict, the water related issues can be dealt with in a sustainable way in order to enhance stability and security. *"Begin met Water, de rest komt later"* = Start with Water, and the rest will follow.
- Development and security successes can be made by means of a relative innocent subject (water), except when there are actual fights over water resources.

Threats:

- Risk aberrant or deflecting behaviour of non-Defence organisations in the entrepreneurship of stabilisation operations. Will parties like knowledge institutes want to face the risks of operating in a unstable and unsafe environment is a question which needs to be answered . During a possible deployment, it is essential that we can speak openly and support each other at all times.

N.12 Validation Interview - H. Post

Name: H. Post (Henk).
Date: 16 January 2015.
Location: Cafe Amersfoort Central Station - Amersfoort, The Netherlands.
Current profession: Director Water Management and Manager Water Systems Department of waterboard Reest & Wieden, Functional Specialist / Reserve Officer (Major) 1CMI-Co network Infrastructure.
Professional Experience: Manager Research & Development waterboard Reest en Wieden, Projectleader Hydrology province Overrijsel, Functional Specialist Water Management in Uruzgan Provincial Reconstruction Team 8 (Water Management, Civil-Military Interaction & Cooperation, 3D Approach, Stabilisation Operations).

Organisational & Stakeholder Involvement

1. Will the framework contribute to a sustainable cooperation environment between the ministries of Foreign Affairs and Defence, NGOs, IOs, local GOs, the local stakeholders (residents, government and private industry), knowledge institutes and the private industry? What will be the challenges? How can these be optimised?
   'Yes, I believe so, yes. In this situation it is powerful that you have developed the framework as a civilian from a civil-military perspective and not as an army officer, since NGOs have a reserved attitude and some even a barrier to cooperation with military actors. I regard this partly correct and partly an old fashion way of working.'

   'I also judge your framework from my profession as the director of a waterboard. As you have described in the framework, we also conduct area focussed water management policies in the Netherlands. This is a real strength, since NGOs and other non-military actors will recognise the framework and can connect with it. Every actor will although have their own objectives, which probably will be conflicting in some points with the military objectives. The framework thus provide structure, gives room to discuss the different objectives and find connections including possible point for synchronisation of activities.'

2. How can your organisation apply the policy model?
   'Because your professional formulated approach need to be in the DNA of every functional specialist, I would like that 1CMI-Co will implement your framework as official policy as soon as possible. Therefore it should also be included in the standard CCOE[42] education material and be taught at every mission team before a deployment.'

   'It can be of course applied in a mission itself, but and with the same level of importance the framework should be applied in the training exercises focussed on how we should conduct, support and report the work we do including how this connects and is integrated with the actions of the other actors and the long-term objectives. Especially the last one is important, since the military component will be present relatively short.'

Contribution of the framework within the Uruzgan, Afghanistan case study

1. Would the application of the framework have made a difference? How?
   'Yes, because by means of this framework we could have worked more effective and efficient. Especially with regards to the rainwater harvesting projects and the importance of Water Governance, which came into the scope at the end of the mission. By means of the this framework we would have known earlier that water governance is an important aspect and a common interest which could have been used to stimulate cooperation or coordination.'
   'The framework can be regarded as a checklist, explaining how the assessments and implementation should be performed. More significantly, the framework is a perfect education tool for the mission teams and functional specialists regarding how the short-term objectives need to contribute and not be conflicting with the long-term objectives. In this sense, the framework provides the red line the follow.'

[42] CCOE: Civil-Military Cooperation Centre of Excellence (NATO).

2. What are the important lessons learned from the Uruzgan mission?
    - *'Do no harm.'*
    - *'What has no monetary value, has no value.'*
    - *'Leave your own value of judgment (waardeoordeel) at home with regard to how the local population manages and execute their things.'*
    - *'Reporting should be better in order to establish a continuously development progress.'*
    - *'Uruzgan is a tribal society, where you need to own the trust of the local population. This was achieved by actually doing what you have promised to do (a deal is a deal).'*
    - *'If you damage a water system or farm land, apologize and compensate or reconstruct it.'*
    - *'Water means live, live means development, which is located in the green zones.'*

3. Did the performed water management projects contribute to the overall safety and stability in the region? If yes, how?
   'If you ask me to confirm a causal scientific funded relation, I cannot give you an answerer to this question. However, based on my Uruzgan experience, yes, I am suggesting that water management did contribute to the safety and stability in the region. This presumption is based on the fact that in every region, permissible ("safe") and non-permissible ("un-safe"), water was always an issue we could start a conversation about with the local population and have had interesting outcomes. Like: there was the idea under the local population that neighbours did steal their water. This could turnout in an armed conflict, since every local has a weapon. By means of organising water shura's (meetings) these issues did not result in an escalation. Water was and is thus an important issue, but a direct causal relation if only proper water management contributed to the overall safety and stability in the region, is difficult to confirm.'

4. Are existing or planned water management activities of the local community, government or NGOs exploited? Why (yes/no)? How did you find out the existing of these projects?
   'No, water plans did not exist during my presence, but there were idea's which I had the privilege to start and have got the confirmation that they were executed, like:
    - *Reconstruction Dolanday Karez.*
    - *Reconstruction irrigation channels.*
    - *Fishing ponds construction.*
    - *Riverbank protection.*
    - *Rainwater harvesting.*
    - *Quick Scan Water Management Uruzgan and possible solutions[43].'*

   'The cooperation with the local population went well. At the end I even received the names of the local water managers and we did perform the water shura's to re-establish a water governance system. With regards to personal safety reasons, they did not what to reveal themselves in the beginning.'

   'From the NGOs, AUSAID and USAID I always got full assistance with regards to data sharing and vice versa. But we did not see any projects of each other, because we were acting in different areas within Uruzgan. USAID and AUSAID worked in permissible areas and we, the Dutch forces worked in non-permissible areas.'

   'Due to the fact that I was a functional specialist and thereby a civilian expert with a military uniform, the communication between the NGOs and Netherlands Ministry of Foreign Affairs went well because we speak/spoke the same language. Also the fact that a civil representative of the Ministry of Foreign Affairs was leading the PRT, did contribute to a well coordination of the development activities and cooperation with the involved actors.'

[43] Parts of the Quick Scan Water Management Uruzgan are included in the research report. Consultation of the quick scan need to be approved by the author H. Post.

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'The commander of 1CMI-CO, since that is the unit which should stimulate and implement civil-military cooperation. He also should take the lead in the implementation of your framework within 1CMI-Co exercises and the education material of CCOE.'

   And who should be leading for the initiation?
   'A combination of the 1CMI-Co network managers advising the 1CMI-Co commander, who again advises the commander of the Royal Netherlands Army or supreme commander of the Royal Dutch Armed Forces.'

   'For initiation and implementation it is key to talk with a lot of people, improving your framework and thereby creating awareness of its existence. After a bottom-up awareness creation approach, a top-down implementation will be appropriate. The Military Engineering Centre of Expertise is an ideal institute for its initiation.'

2. What is your opinion of the proposal to make reserve officers from 1CMIco the project managers of this framework? For the Implementation & Execution (IA phase 5), because they understand and can act in both the civil and military domain.
   'Yes, but this will only work when this officer will work embedded for 1 or 2 days per week on the subject. By this it has a serious position inside the organisation. But be aware that you select the right person with the right qualifications for the job.'

3. Is the transition management approach between the Short-, Medium-, and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
   'Yes, in the civil world this is a normal perspective, but be aware that the military commander in the field can think differently because military units should be able to perform military actions. Also, when you have established this transition management approach for a specific mission together with the involved actors, it is not a guarantee that it will be performed as it was agreed upon. A kind of management process should be in place, ideally civil and locally owned and performed. If not possible yet, civil-military management is preferred with fast local engagement and a proper handover to appropriate civil actors.'

4. How can the framework be made correct and complete (thus it covers the entire spectrum)?
   - *'Include examples to explain the framework.' Include example boxes in the report (author comment).*
   - *'Include a causal relation diagram of the interrelation between the 9 Campaign Plan Development Themes.'*
   - *'Knowledge and education are essential. Include this.'*
   - *'Common interest, is the starting point for cooperation. The second is trust. Find early in the process the local water managers in the area of operations and establish a good working relationship to create trust and after cooperation.'*
   - *'Governance & Water are pillars of common interests and essential needs in every society. Without water there is no live and without live there is no governance (primo-chain). Thus make water as a pillar for governance.' Water as cooperation mechanism need to come back constantly (author comment).*

- *'In the Netherlands, there should ideally be a permanent team of water-development related experts (NGOs, Knowledge Institutes, Ministry of Foreign Affairs and 1CMI-Co) constantly investigating how water can contribute to peace and security (in IA phase 2). Also, in this stage you want to explore the mission area by yourself, because this is the best way to gain a full situational awareness and understanding of the problems since you also have the opportunity to ask questions to the local population. Herby the 1CMI-Co functional specialist can have a strong positive contribution, because they have the required civil knowledge and military skills to perform a civil-military assessment together with the military colleagues in the possible area of operations.'*
- *'Make the sanitation theme better and higher up the ladder in the development themes.'*
- *'Perhaps make a Drinking Water theme.'*
- *'Include in your key design principles:*
  - Do no harm (priority number 1, starts in IA phase 2 until 5).
  - Common interest is the starting point for cooperation. The second is trust (priority number 2, starts in IA phase 2 until 5).
  - Ask the local population what they need, and how they are willing to contribute to the provision of this need. IDEA philosophy: "What has no monetary, labour or resources value, has no value". In order to know if something has value, ask if and how the local population wants to contribute to the project (priority number 3, starts in IA phase 2 until 5).
  - Know, respect and use the local culture (priority number 4, starts in IA phase 2 until 5).
  - Make appointments for maintenances.
  - Who owns the water? Make appointments for water governance.
  - Explore the problem in the field by yourself: follow and using the geographical contours (hoogtelijnen) as a water distribution system, can be regarded as my main example to understand the system by field research.
  - Western norms and values are not the guiding principles. Development should be based on the local norms and values.
  - Take all actors serious and interact on a level of equivalence (priority number 5, starts in IA phase 2 until 5).'

5. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'Yes, because water is not a weapon, it's a common interest and thus the key factor in solving conflicts. Your framework clearly describes how you can do this in a coherent and appropriate way.'

SWOT-Analysis

Strengths:

- It is a professional formulated approach.
- Logical and clear.
- It provides a "line to follow" connecting the short-term activities with the long-term objectives.
- The framework provide structure, gives room to discuss the different objectives and finds connections including possible point for synchronisation of activities with the involved actors.
- It does connect with current policies and way of thinking of the ministries of Defence and Foreign Affairs including those of NGOs.

Weaknesses:

- As a first impression by a person who is not acquainted with the matter, the framework can be regarded as complex and overwhelming. Explain the framework step by step and give examples to increase the clearness and understanding (especially for persons who have non-water and non-stabilisation operations knowledge and experience). Also examples make it more fun to read.

Opportunities:

- *The framework can be used as a tool in the training of functional specialist. Therefore the possibilities to include this framework in the CCOE trainings should be explored. Especially, because the described key implementation principles will be very useful since these are essential must haves in the DNA mindset of every functional specialist. These should be taught from the start and throughout every 1CMI-Co training exercise.*
- *Modern diplomacy will probably be focussed on water management and energy in relation with security and poverty. The framework can make an important contribution in this playing field.*
- *The framework methodology can also be applied for the development for other development themes, like education and IDEA. Perhaps this can be interesting to develop by the 1CMI-Co specialists of each network in an exercise setting.*
- *Also in civilian project, it is an good approach to apply.*

Threats:

- It can become a tool of/for only military or civilian organisations without cooperation or coordination between these actors.

N.13 Validation Interview - F. Koolhof

Name: F. Koolhof (Fred)
Date: 17 December 2014
Location: Cafe Zouk - Amsterdam, The Netherlands.
Current profession: Owner 'Ontdekkingsreiziger BV' (Interim management, change consult, team coach and inspiration), Board Member ViAfrica (NGO), Speaker / trainer CNV Vakmensen, Lecturer and syndicate coach at the Civil-Military Cooperation Centre of Excellence (CCOE) (relation- and reputation building, communication/negotiation/dialogue and media, peacekeeping and disaster response topics), Functional Specialist / Reserve Officer (Major) 1CMI-Co network Economic Development (IDEA).
Professional Experience: Manager at Achmea, due to the NATO-ISAF deployment as a 1CMI-Co IDEA functional specialist; the 3D Approach, Civil-Military Cooperation, Socioeconomic Development and Entrepreneurship in (post)conflict / disaster countries, Micro business development and Micro finance.

Organisational & Stakeholder Involvement

1. Will the framework contribute to a sustainable cooperation environment between the ministries of Foreign Affairs and Defence, NGOs, IOs, local GOs, the local stakeholders (residents, government and private industry), knowledge institutes and the private industry? What will be the challenges? How can these be optimised?
   'Yes, based on the lessons learned from the past and If it will be applied as described in the policy framework, I believe so yes. At this moment I don't see points for optimisation.'

2. How can your organisation apply the policy model?
   'Within the Army we can apply this framework as described. Now you need to go from abstraction towards action. It is time to work on perception management. It is a well developed plan, but you need to create believe in it. This comes down to relation and stakeholder marketing and showing the enabling champions the frameworks potential by describing how it was done before and how this new method contributes in a positive / better way. Communicate it in a general way and don't go into the details to much.'

Contribution of the framework within the Uruzgan, Afghanistan case study

1. Would the application of the framework have made a difference? How?
   'If it could have been applied from the initial planning stage, yes it would have made a difference in a positive way. On paper it coffers items which did not went according how it should have been performed. By means of the phasing's, action points are easy to formulate within working teams and different military levels.'

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'A combination between governmental and private organisations from IA phase 2 onwards is preferred. By this approach the strengths of both kind of organisations will be applied, which are needed for sustainable local orientated socioeconomic development within a (post)conflict area. During the implementation the Netherlands government, IOs and NGOs function as the baselines setters or engine starters. When the time is right (there is enough local capacity and knowledge), these development activities can be handover to the local population and local governmental organisations.'

2. What is your opinion of the proposal to make reserve officers from 1CMIco the project managers of this framework? For the Implementation & Execution (IA phase 5), because continuity is important due to the constant learning cycles and since they understand and can act in both the civil and military domain.
   'Yes this is right, especially because functional specialists are trained and experienced in working within the military and civilian organisational structures. Thereby they act as the interface, especially because they speak both 'languages' which is important. Also with regards to water management, they have knowledge which the army possesses on a very limited scale. But, I would not name them project managers, but programme managers.'

3. Is the transition management approach between the Short-, Medium- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
'Yes, on paper this is a good and common applied distribution. Moreover, it is a condition for a well handover-takeover process by another actors. In reality although, these boundaries and time durations are not static and fixed. The right time to handover the responsibilities toward another actor, needs to be evaluated per subject (Awareness assessment: am I the right person, or is it better that another should do it?). Especially with regard to whom you will involve in which stage of the process. This need to be an actor which has enough resources to enable future successes and shares the same Campaign Plan Goals. Within this process local entrepreneurship is an important aspect. On the long- term, this can be taken over by larger companies.'

4. How can the framework be made correct and complete (thus it covers the entire spectrum)?
    - *'Start with local entrepreneurship from the very start of the mission. 'Where people work, the chances of armed conflicts are small (Waar gewerkt wordt, wordt niet gevochten) is the credo of 1CMI-Co- IDEA (Integrated Development of Entrepreneurial Activities). By means of business case formulated micro-finance programs executed by the local population, micro business development and private sector development can be established. This is the base for socioeconomic development, which is one of your Campaign Plan Goals. Moreover, stagnation or a decrease in the local economy in the area of operations is a significant threat for stability. With regards to water management, local contractors can be contracted for construction purposes. Moreover, maintenance contacts can be made with local entrepreneurs with regard to maintain water wells and irrigation systems.'*
    - *'Lightning is a key need for socioeconomic development. Without it the economy just stops. By means of lighting, home industry and entrepreneurship is stimulated because the working day is increased. Also the local population can study longer. Furthermore, by means of lightning of homes and streets, the safety and security is improved. By means of hydropower and storage basins, electricity supply for lighting can be established.'*
    - *'Infrastructure is another important key need for socioeconomic development. Flooding can result in the destruction of bridges. During my NATO-ISAF deployment, I have experienced this events. Due to the flood a vital bridge link was destroyed, with great negative effects; a part of the local population could not reach the city resulting in the fact that they were not able to trade their products on the local market, get day-to-day live supplies including provisions and were cut off from healthcare. Because the Afghan and Dutch forces could not patrol in this area on a regular base, the area of influence of the Opposing Military Force (OMF) increased in the area which was cut-off.'*
      Flooding events also cause a threat with regard to the agriculture sector, industrial activities and a safe living near rivers. Mitigating or preventing floods is thus essential in order to have a constant positive loop of socioeconomic development (author comment).
    - *'Staying align with the key stakeholders is important. When you want to implement a plan, consult all the stakeholders internal and external (army, foreign affairs, NGOs local population and the local government) from the bottom toward to top organisational levels. By consulting them and include their input, it becomes also their idea. By this approach you will develop support for the implementation of your plans.'*

5. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
'Based on my working experiences in the private and military sectors, yes. But be aware that for every activity an exit strategy (handover-takeover by another actors) needs to be in place from the early beginning and communicated with the local population and government. We only stay as long as needed, and this will be as short as possible. Moreover, this approach (structure and way of thinking) can also be applied for other PMESII development themes within a campaign plan, like Education, Healthcare and Security.'

SWOT-Analysis

Strengths:

- The framework gives meaning and contributes to how water management can be applied in military operations, especially on the higher strategic level.
- The framework is coherent, well-arranged, good structured, easy to understand and complete.
- Due to the planning phases, the principles for application in civil-military operations are correct.
- The framework fits within the military mindset and models, like the TBM military planning process. Therefore it is easy to communicate it within the army. Also, it includes all the military planning and implementation levels: Strategic, Operational, Tactical and Technical.
- Making locals responsible for their own development is essential. By lodge on their appeal you apply their knowledge and enable them to develop the right authentic solution. This approach is well formulated in the framework.
- The water management activities within the short-term QIP's are formulated based upon a bottom-up approach. This is good also with regards to private sector development.

Weaknesses:

- The frameworks should not be interpret as a fixed process. Input flexibility for improvement and room to maneuver into windows of opportunities in the area of operations, is a must.
- Perception management; don't look and apply the framework from the western viewpoint.
- Since we know the importance of water management, also the OMF does. Due to the scale of water management, it is sensitive to be "undermined" by the strategic enemy soldiers.

Opportunities:

- Due to the Afghanistan - Uruzgan mission, the timing for implementing the framework is right. Within the army, there is the right mindset for follow-up ideas based upon the past experiences.
- *The link with socioeconomic development and water management is strong, both in a positive and negative way. Try to exploit and link the positive ones in the creation of win-win effects and mitigate the negative effects by using the strengths of both approaches.*
- This approach can also be applied for other development themes within a campaign plan, like Education, Healthcare and Security.

Threats:

- The 'feel good trap' or the fact that own personnel will develop their own projects and not following the made and agreed upon plan. The framework does reduce this change, but it can always occur.
- Only executing this planning process, does not guarantee success.
- The conflicting interests of external parties. Large actor diversity can result in a small or no support for implementation.

N.14 Validation Interview - A. Onencan

Name: A. Onencan (Abby)
Date: 25 November 2014
Location: Delft University of Technology, faculty Technology, Policy and Management - Delft, The Netherlands.
Current profession: PhD researcher at Delft University of Technology, faculty of Technology, Policy and Management, department Multi Actor Systems, section Policy Analysis.
Research topic: Looking at water governance and water diplomacy issues within the Nile basin, in order to come up with a workable solution with regards to the current water insecurity issues.
Professional Experience: Worked as an adviser with the EU within local authority water projects in Kenya. Later she worked as the Regional Manager of the Nile Basin Discourse, focussing on the management of water within the African countries in relation with public participation of large infrastructural water projects. Also, applied different diplomacy and development initiatives at the national and international level to ensure that water brings peace by means of cooperation and is not a source of conflict.

Optimisation points

- *'IA Phase 2: at what level is the hydrological assessment performed? Too detailed and complex. The level of abstraction in terms of analysis is too high and thus too general => Thus the kind of assessment is specific for each country.'*
- *'IA Phase 2: add stage of conflict assessment.'*
- *'IA Phase 2: add resolution techniques have been applied before and their effects to water management and conflict resolution?'*
- *'Campaign Plan Goals: The term Equal should be replaced with 'equitable and reasonable utilisation' as defined by UN water courses convention' CHECK THIS!'*
- *'LASDAP approach: Local Authority Service Delivery Action Plan.'*
- *'Ad Recreation in Water Management Development Themes?'*
- *'Long-term focussed planning before Short -term projects start => Visualise in framework.'*
- *'Add stages; Stabilisation and Normalisation in framework.'*
- *'Design Principles should be short, to the point. Explain in text document.'*
- *'Planning is top down (performed in NL).'*
- *'Implementation is bottom-up (in cooperation with local population in mission area).'*
- *'Bridge the gap between IA Phase 4 & 5 by means of: Apply already made and developed short, medium and long-term plans based on the existing plans made / established before the conflict.'*
- *'IA Phase 5: Restore previous good working water management systems & management policies.'*
- *'Include the analysis on how the WM project intervention impacts on water access and rights of men and women.'*
- *'IA Phase 6: Bottom-up evaluation and evaluate if the process is coherent and leads to integration in accordance to the research aim.'*

Application & Performance of the framework

1. Who should be leading in the implementation of the framework?
   'Inhabitants and local government ideally, but depends on the situation. A bottom-up process is preferred because the local population will benefit and own it, resulting in local ownership and sustainable development in harmony with the local culture.'

2. What is your opinion of the proposal to make reserve officers from 1CMIco the project managers of this framework?
   'The local community should be leading and appoint their own project manager. 1CMIco officers should be the project advisor, because at one moment the mission will end. This will make it is easier to leave so long as there is the inclusion of a good handover plan because the local community will have already established knowledge and capacity to continue.'

3. Is the transition management approach between the Short-, Medium- and Long-term activities correct (from civil-military Quick Impact Projects on the short-term, towards and connected with Water Development, Aid & Cooperation policies on the Medium-term, connected by means of the private sector activities on the long-term)? Why? What is the potential and challenges of this approach?
   'Yes, I agree with it. The times although depend on the individual situation which might vary. => DON'T quantify it by time, but by defining what results you want to have achieved. Short-term = restoring what has been destroyed in the conflict.'

4. How can the framework be correct and complete (thus it covers the entire spectrum)?
   - *'Link between phase 4 + 5 = missing.'*
   - *'Add analysis.'*
   - *'Evaluation of the process itself.'*
   - *'IA Phase 4: be specific at what level of abstraction you are doing the planning. Now not bottom-up but on a high strategic level. The assumption is that there will be already long-term development plans by government and or local community based NGOs+ IO input.'*

5. Can the policy framework, after it is corrected and optimised be applied within a civil-military stabilisation mission? Yes, No, Depends => What are the determining factors? In what way is this generic framework relevant and/or applicable?
   'Yes, it takes the focus away from the conflict. It is not focussed on the problem but on cooperation by means of water management to bring peace. This is a very strong characteristic. It links peace building with water management. Will be interesting to see how it works in reality.'

SWOT-Analysis

Strengths:

- The framework gives more impetus to water management in peace building, instead of only connecting water management as a small section within agriculture or infrastructure.
- Helps the peace builders to think and plan more strategically through the long-term thinking and planning and this increases the awareness of the importance of a coherent action plan including its implementation.
- It connects the Short-, Medium-, and Long-term activities within the peace-building process, which is a very powerful and essential thing.
- Makes all involved actors, like the NGOs and governments, accountable for their peace-building and development actions within the stabilisation operation. This stimulates cooperation and the efficient use of the available resources (finance, manpower, materials, equipment) at the fragile stage when questions with regards to spending money in a sustainable way, are hardly asked.

Weaknesses:

- Technical framework which is going to be imposed in a highly political system. Because each case is different it is uncertain how it will enable peace. Especially because other root causes can bring you back into a conflict. Whether the framework will actually work will become clear after implementation and a clear assessment of how the framework lead to peace building.

Opportunities:

- The framework can be applied at so many levels, such as; at the entire spectrum from UN top decision-making to the level of the local farmer, at basin level and also within the regional-economic blocks like the EU and the African Union RECS, in order to establish peace through fostering cooperation in water.

Threats:

- The Ministry of Defence may have its own frameworks which it may be already implementing and may not be flexible to change because of the already established culture (Internal).
- Other stakeholders like NGOs may not see their vision and approach being represented in the framework, resulting in the scenario where they do not see the added value of being involved (external).
- Application of the framework is dependent on political will at national, international and local levels (external). The biggest threat is at the local level; the government of the host-nation may not be willing to adopt the approach because it may mean more independence for the local population and a decrease of their governmental power position. They may diplomatically approve the approach for political, social or economic reasons, without the requisite political will to actualize it.