Master Thesis Report
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Creative Policy Generation in Integrated Water Resources Management
A Case Study in the Upper Citarum Basin

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In the Upper Citarum Basin in Java, Indonesia, the Creative Policy Generation Method was used to study the applicability of the integrated Business Model Canvas (Osterwalder, 2010) and the creation track (Gray, 2010), which is a creative, solution-focused thinking theory. The goal in the Upper Citarum Basin was to create better, safer and more sustainable living conditions for the residents in the basin. The combination of emerging physical issues (flood, erosion, sedimentation, pollution, water scarcity, uncontrolled urbanization and land subsidence), poor living conditions, poor policy execution by the government and generally inflexible, government-reliant communities have caused a degradation of the basin and thus the living conditions.

This research focuses on testing the Creative Policy Generation Method for Integrated Water Resources Management in Indonesia. The method incorporates three phases in order to devise alternative policy concepts to solve complex problems in multi-stakeholder settings. The three phases are:

- **Assessment**: Assessing the strengths, weaknesses, opportunities and threats to the physical, institutional and social economic aspects;
- **Generation**: Creating ideas for new policy concepts. These ideas will ultimately be presented in a Business Model Canvas;
- **Evaluation**: Evaluate the policies regarding their strategic value, risks and economical value.

During workshops in the generation phase, the issues mentioned above were discussed and alternative policy concepts were generated. This resulted in seven concept policies, which focus on creating solutions that have a more non-infrastructural character. By integrating educational and social economic characteristics, the policy concepts require a lower investment and can be tested on a smaller scale. This provides the opportunity to obtain data, learn from this information, alter the concept policies and make them more effective.

From the perspective of this study, the Creative Policy Generation Method achieved positive results. It has been proven that business models and creation tracks are applicable in the field of Integrated Water Resources Management, but it has also been found that iterations are needed in the future to optimize this method.
# 2. Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Executive Summary</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>Content</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>Preface</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>Challenges</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>Out-Line</td>
<td>6</td>
</tr>
<tr>
<td>6.</td>
<td>Method</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>6.1 Assessment</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>6.2 Generation</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>6.3 Evaluation</td>
<td>9</td>
</tr>
<tr>
<td>7.</td>
<td>Case Study</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>7.1 Context</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>7.2 Assessment</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>7.2.1 Physical Assessment</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>7.2.2 Institutional Assessment</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>7.2.3 Social-Economic Assessment</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>7.3 Generation</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>7.3.1 Case Identification</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>7.3.2 Presentation Concept Policies</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>7.4 Evaluation</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>7.5 Conclusion</td>
<td>52</td>
</tr>
<tr>
<td>8.</td>
<td>Method Review</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>8.1 Process</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>8.2 Workshops</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>8.3 Results</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>8.4 Conclusions</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>8.5 Recommendations</td>
<td>56</td>
</tr>
<tr>
<td>9.</td>
<td>Appendices</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>9.1 SWOT-analysis</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>9.2 Semi-structured Interviews</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>9.3 Flood Damage Analysis</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>9.4 Qualitative Stakeholder Analysis</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>9.6 Q Methodology</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>9.7 Creation Track</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>9.8 Business Model Canvas</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>9.9 Policies and Regulations</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>9.10 Literature</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>9.11 Acknowledgements</td>
<td>90</td>
</tr>
</tbody>
</table>
In the field of Water Resources Management, the on-going trend of the holistic or integrated approach has brought forth a new point of view in creating new policies and solutions in river basins all over the world as shown by Radif (2013). This integrated method involves stakeholders and issues from various levels of the organisational hierarchy, which creates a high level of complexity in policy-making. The difficulties that arise from this complexity with Integrated Water Resources Management can be seen when policy makers work towards compromises and when they are making decisions. These same difficulties create opportunities as well, or as Plato said:

‘Necessity is the mother of invention’

Plato

In other words, necessity brings the opportunity for creativity, which can produce new and innovative solutions for the present and upcoming issues in Integrated Water Resources Management. In this thesis, a method called the Creative Policy Generation Method will be presented to encourage creativity in a complex, multi-stakeholder setting. The method focuses on turning ideas into tangible policies, in a step-by-step approach. The new policies will ultimately be presented and evaluated in a so-called ‘Business Model Canvas’ (Osterwalder, 2011).

To test this method, a case study in the Upper Citarum Basin, Java, Indonesia was conducted. This river basin is of great importance for the province of West-Java as it provides the area with water, arable land, energy, living environment, etc. Due to constant exploitation, the river basin faces issues in many different sectors and fields. Examples of these issues are floods, erosion, sedimentation, water scarcity and pollution. For about 70 years, many structural measures, such as the normalisation of the rivers and the construction of dikes, have been taken to manage these issues with no favourable outcomes (Iwan, 2013; Sobirin, 2013). The technocratic decisions for these structural measures have resulted in a complex stakeholder setting. The combination of the physical challenges in the basin and the many different groups involved creates a good opportunity to look for alternative solutions, which will create better, more sustainable and safer living conditions in the Upper Citarum Basin. In other words, it is a good setting to test the Creative Policy Generation Method.

Enjoy Reading!

Anthony Meyer zu Schlochtern
4. Challenges

This thesis will present a new method in Integrated Water Resources Management, the Creative Policy Generation Method. Currently in water management, the application of best practices is the standard and in a select number of cases alternative solutions have been tested. This lack of innovation is emphasized by the education in water management that does not challenge students to think differently. This method has to lead to more a more innovative way of thinking. In product design, this method has already become a more standard practice.

The Creative Policy Generation Method in combination with multi-stakeholder decision-making and interrelated issues can lead to more holistic concepts for Water Resources Management policies. Complex situations, such as that in the Upper Citarum Basin, are seen as a starting point for using creativity to devise a win-win situation for all parties involved. To achieve this win-win situation, the method uses a path to force creative ideas and the business model canvas to present these ideas as a concept policy. In this study, the method will be tested based on a case study that was done in the Upper Citarum Basin, where living conditions, due to the previously mentioned issues, are not safe, healthy or sustainable for the residents of the area.

The research challenges that have been set for this research are listed below. The first challenge is to focus on testing the Creative Policy Generation Method, while the second challenge is to use the method to devise new concept policies that will improve the conditions in the Upper Citarum Basin.

- Research the applicability of creation tracks and the business model canvas in Integrated Water Resources Management policies and solutions.

- Find alternative conceptual policies to create better, more sustainable and safer living conditions in the Upper Citarum Basin.
With a new way of thinking comes a new way of reporting. The way this report has been structured is therefore different compared to a standard report. This has been done primarily to improve the readability and accessibility of this thesis, which is how information is currently used. To enhance the clarity of this report, only the general method, the results of the analyses, conclusions and recommendations have been elaborated in the main report. The elaboration of the analytical tools can be found in the appendices. Through hyperlinks in the report, marked by underlining, these explanations and elaborations can be accessed quickly.

The “Creative Policy Generation”-method consists of three phases:
1. Assessment
2. Generation
3. Evaluation

The assessment phase consists of multiple analyses, which test: The physical conditions, the institutional setting and the social-economic conditions. The overall assessment is finally presented in a SWOT analysis.

The generation phase is when new solutions and policies will be created. This will be done with workshops during which challenges from the assessment will be presented to multiple groups of students. These challenges will be addressed by using tools that stimulate creative thinking and force alternative ideas to arise. These ideas will ultimately be presented as a policy in the Business Model Canvas.

The last phase, the evaluation, is when the solutions will be assessed using multiple criteria. These criteria analyse the strategic value, the risks and the economic value. Finally, conclusions and recommendations will be given for the conceptual policy for the Upper Citarum Basin.

After the Creative Policy Generation Method has been detailed, the method will be reviewed. The review will evaluate and conclude the process, the workshops and the results of the method and finally, recommendations for the method will be given. This last, formal chapter will be followed by the appendices where the explanations and clarifications of the tools used as well as the reference literature can be found.
6. Method

The Creative Policy Generation-method was developed to create new insights for policies and solutions in Integrated Water Resources Management. The method motivates 'out-of-the-box' thinking and pursues a more holistic view of the issues found in the field of interest.

This is done by using a configuration of tools that are used mainly in business and entrepreneurial science. These tools have separately proven their value in many business and strategy cases (Osterwalder, 2011; Gray, 2010).

In this research, this configuration has been implemented by using a step-by-step approach and was tested by a case study in the Upper Citarum Basin. Finally, the research method will be reviewed in the reflection chapter. This will be done by evaluating the process, the workshops and the results.

The method consists of three general phases: Assessment, Generation and Evaluation.

Figure 6.1 Creative Policy Generation Method
6.1 Assessment

In the preparation phase, the challenge, the context and the boundaries of the system will be set. Subsequently, the Upper Citarum Basin will be assessed based on three criteria by using different tools and will finally be presented in a SWOT-analysis (Wikipedia, 2013). This SWOT analysis will be used as a basis for identifying the starting points in the next phase. The three assessment criteria are:

Criteria 1: Physical Assessment
The physical assessment will be based on semi-structured interviews (West Lothian Psychological Services Research and Development, 2004), literature research and a hydraulic model in SOBEK. This will provide an overview of the physical issues and flood sensitive areas in the basin. The Sobek model will be used further in combination with so-called 'damage curves' to create damage maps (Jonkman, 2007). These can be used to quantitatively analyse tangible damage due to floods in the area.

Criteria 2: Institutional Assessment
Semi-structured interviews and literature research will again be used to create the stakeholder analysis and the policy review.

The stakeholder analysis consists of two sections; a qualitative and a quantitative analysis. The qualitative section will focus on the power, interests and urgency of the stakeholders (Currie, 2008). While the quantitative analysis uses the Stakeholder Value Network (Fu, 2011) to analyse the most important stakeholders and value flows relative to the focal organisation.

The policy review analyses the past and present policies of three fields of interest:
- Regulations: Is there a suitable regulation framework for Water Resources Management in Indonesia?
- Planning: What is the vision of Water Resources Management in Indonesia?
- Operation: How is this framework and vision converted to action?

Criteria 3: Social-Economic Assessment
The Social Economic Assessment is based on a survey using the Q method (Brown, 1993). The Q method indicates different groups of like-minded respondents using a single questionnaire. This analysis gives an overview of the interests of the residents of the basin and their perception of the urgency of the issues.

6.2 Generation

The next phase is where new ideas and solutions to the issues will be generated. To collect the appropriate answers for the correct issues, multiple cases will be identified using the SWOT-confrontation matrix (Wikipedia, 2013).
Thereafter, ideas and solutions will be generated using a creation track. A creation track is a configuration of games that provides a path towards solutions or so-called 'fuzzy goals'. This will be a team or group process. A creation track follows a game design (Gray, 2010; Tassoul, 2009), which is depicted by a diamond-shaped pattern (see figure 6.2) that represents divergent or convergent ways of thinking and the number of ideas and solutions in the process.

![Figure 6.2 Diamond Theory](image)

Divergent thinking is when ideas are generated and convergent thinking is when ideas are combined or repelled. In the game design, 3 acts, each represented by one or multiple games (Gray, 2010) can be distinguished.

**Opening Act**
In this act, the cases are identified and discussed by the teams. The case is based on one or more 'fuzzy goals'. After agreement on the themes, information and the stage, an extreme goal is set by setting a Mission Impossible. This enables the team to think big and outside-the-box. Subsequently, ideas are generated by using the brainwriting-game. This game focuses on generating as many ideas and solutions as possible.

**Exploring Act**
In the exploring act, the generated ideas and solutions are explored by discussion and comparison. Using the Concept-Cluster Map, ideas and solutions can be grouped into clusters, that represent concepts that form the basis for new policies and solutions.
Closing Act
The closing act focuses on filtering the concepts and making them tangible. To filter the concepts, the SMART-goals method (Doran, 1981) is used, which is a quick feasibility check. The best concepts that are accepted by the team as feasible are turned into a Business Model using the canvas. The Business Model Canvas (Osterwalder, 2010) is a strategic tool that shows how the policy catches, creates and delivers value. In combination with a short explanation, this Business Model, hereafter referred to as a concept policy, is the result of the creative track and should solve or manage one or multiple issues in the basin.

6.3 Evaluation
In the final step of the Creative Policy Generation, the multiple Policy Models and their explanations will be evaluated. This evaluation will be done based on three criteria:
- Risk: Are the risks solved, managed, avoided or accepted? (Fekete, 2012) Is this concept a long or short term solution?
- Strategic: Are the concepts feasible, useful and new in the Upper Citarum Basin? (Gray, 2010)
- Economic: What are the costs and benefits of the policy and what is the impact-effort ratio?
The results of the evaluation will ultimately be presented in an evaluation matrix, that will provide a clear overview of the different policy models and their evaluation.
In the following paragraph, the case study will be introduced. In this case study the Creative Policy Generation Method will be used to generate alternative policies that will create better, safer and more sustainable living conditions in the Upper Citarum Basin.

The Upper Citarum Basin is located in Indonesia in the province of West-Java. The basin exists of 5 sub basins (Cikapundung, Citarik, Cirasfa, Cisanqkuy and Ciwidey) and has a total area of 3000 km². The geographical location of the basin is situated near the city of Bandung (coordinates: 6°54’53.08”S 107°36’35.32”E ). The altitude of the basin is between 700 m and 2000 m above sea level. The physical conditions of the area vary from mountainous in the high altitude areas to swampy in the low-lying regions. The climate of the Upper Citarum Basin can be described as wet and humid, with an annual average rainfall of 1830 mm and an average temperature of 23.6 °C. (Wikipedia, 2013)

Bandung, the third largest metropolitan area in Indonesia and the capital of the West-Java Province, is situated in the basin. This metropolitan area was colonised in the 17th and 18th centuries by the Dutch who started building large plantations around the city. At that time Bandung became a luxury resort for Europeans and obtained the nickname ‘Parijs van Java’. After the Indonesian Independence of 1945, the city and its surrounding area started to urbanise at a high rate. People of the rural regions were attracted by opportunities of the metropolitan area and settled in Bandung. (Wikipedia, 2013)

Currently, approximately 7 million people inhabit the basin and this number continues to rise. The citizens of this region depend mainly on agricultural activities; the textile industry and domestic tourists from Jakarta. Their general economic situation is poor, with low incomes and low quality of living conditions (housing and public service).
7.2 Case Study - Assessment

In this paragraph, the results and conclusions of the physical and technical, institutional and social-economic assessments will be shown. Each assessment will be based on one or multiple analyses.

7.2.1 Physical Assessment

In this assessment, the physical issues in the basin will be presented. In the flood damage analysis, the issue of floods will be explained from a more economic perspective.

7.2.1.1 Physical Issues in the Upper Citarum Basin

In the Upper Citarum Basin, many physical issues have lead to the degradation of the area. Many issues are interrelated and drive one another, therefore the possibility of unfolding, vicious circles is large. The issues discussed in this assessment are:

- Flood;
- Pollution;
- Uncontrolled Urbanisation;
- Water Scarcity;
- Land Subsidence;
- Deforestation;
- Erosion and Sedimentation.

Flood

The occurrence of floods has been a historic phenomenon in the Upper Citarum Basin. Floods have been occurring since the first settlements in the area (Sobirin, 2013). The increasing severity of the economic damage from the floods due urban development along the river is currently the largest issue in the valley and has resulted in the degradation of the basin. In addition to the economic damage, the floods also cause, among other issues, health problems and disturbance in the urban and residential areas. In figure 7.2 we can see that the flooding problem is a result of many causes and relates to many other issues and is therefore a key indicator of the situation in the basin. In 2007, measures were taken to combat the floods by normalising large parts of the river. This seems to have transferred the problem from downstream to upstream (figure 7.3). In this figure the severity of the floods can also be seen in terms of the amount of surface area that was inundated.
Figure 7.2 Drivers and issues in the Upper Citarum Basin

Creative Policy Generation in Integrated Water Resource Management: A Case Study in the Upper Citarum Basin
Pollution

Another key indicator in the basin is the amount of pollution in the area. In this case, the quality of the water is an efficient way to measure the state of the pollution. The status of pollution in the basin is currently considered critical (Roestam, 2013). The pollution is the result form industrial waste and trash disposal in the river.

“Citarum, Dirtiest River in the World”

*International Herald Tribune,* 5 December 2008

This chemical pollution and litter in the watershed results in complete degradation of habitats for humans, animals and nature in the basin. The effects of the pollution can even spread beyond the basin’s boundaries due the strategic status of the river. The river supplies for example, water to Jakarta, the capital of Indonesia with about 10 million inhabitants. (Lohani, 1985)

Uncontrolled Urbanisation

The uncontrolled urbanisation of the metropolitan area of Bandung is a physical effect of mostly social-economic factors (low incomes and poor education). Also the uncontrolled urbanisation is the underlying cause of many other issues in the basin. During the Dutch colonial occupancy, when the city of Bandung was established, the spatial plan for the urban area was designed for about 2,5 million inhabitants (Kusuma, 2010). Today, nearly 7 million people inhabit the area and the infrastructure is no longer sufficient.

In addition, due to the increasing population, the attraction of the city, low incomes, poor spatial planning and enforcement, people have been forced to live in locations that are unsuitable for development. This makes these people more vulnerable to disasters such as floods (Linda, 2013).
Water Scarcity

The potential water availability in the entire Citarum River Basin is approximately 13 billion m$^3$ per year. Only 57.9% of this potential is utilized and the rest is considered a loss. 86.7% of this utilized water is used for irrigation.

The increasing trend in cultivation, the pollution, the climate (dry and rainy seasons) and the lack of alternate water sources creates a scarcity of usable and good quality water. Especially in the dry seasons. In this issue, the large potential of available water still offers opportunities for the future. (Nippon Koei Co, 2006)

Land Subsidence

Land subsidence from groundwater extraction and the development of unsuitable land is currently not yet a real problem in the basin. However, land subsidence increases the risk of flooding and failure of construction in the future and therefore it should be dealt with. (Roestam, 2013)

Deforestation

The denudation of forest areas is generally occurring in the mountainous areas of the Upper Citarum River Basin. The cultivation of these areas to create income is the main reason for this trend. Today about 110,000 ha of the 200,000 ha of forested area in the basin is in critical condition. This land is privately owned and is vulnerable to land use changes. The conservation of this forest area should be a high priority. (Sobirin, 2013)
Erosion & Sedimentation

A direct effect of the increasing cultivation and deforestation in the upstream areas of the river basin is the erosion of the soil. This is caused by the failure of the slopes and the decreasing persistency of the soil due to the absence of roots. This erosion also results in less arable land, which makes cultivation in the upstream areas more difficult.

The eroded soil enters the streams and is transported downstream in the river as sediment. In the downstream area of the river, the soil particles start to sediment, because of the low gradient and hydraulic structures. This causes the river to clog, which results in more floods. The river is now dredged on an annual basis, which is a costly and unsustainable situation (Hasanudin, 2013).

7.2.1.2 Flood Damage Analysis

The flood charts that were generated using the method from Jonkman (2007) provides insight into how much damage and where the damage was done by certain rain events. The severity of the rain events is based on rainfall statistics: 5 storms in 3 hours were simulated with different return periods (T= 2, 5, 10, 20 and 50 years). In figures 7.7-7.11 the damage maps are shown for each return period and in figure 7.12 the total damages for each return period is calculated.

When analysing the damage charts, a very sensitive relationship between rain events and damage can be seen. Rain, with a small return period causes remarkable damage in the low-lying areas, especially around Dayeuhkolot and the major confluence near Rancaekek. (Triweko, 2013)
These are also the areas that the flood spreads from when the storm events worsen. The rain events with the largest return periods even create flood situations upstream and in the city area of Bandung. Small-scale preventative actions or relocations can eventually lead to enormous damage reduction. On the other hand, due the sensitivity of the basin during rain events, doing nothing can lead to dangerous situations, with more damage as a result.

Figure 7.7 – 7.11
Damage Maps with return period T=2, 5, 10, 20 and 50 (from left to right)
### Qualitative stakeholder analysis

The following stakeholders are identified in the basin.

**BBWSC (River Basin Organisation Citarum)**

The BBWSC is the representative of the Ministry of Public Works in the Basin. In this research, the BBWSC is the focal organisation and has multiple tasks in UCB. The main tasks of the organisation are:

- Operation and maintenance of the system and infrastructure in the basin;
- Enforcement of the regulations in the basin;
- Project identification and initiation.

The interests of the BBWSC lie within operating and maintaining a well-functioning, clean and reliable river system. The urgency to achieve this goal is great, due to the many issues and resulting damage and nuisance that are currently taking place in the basin. The focus on infrastructural measures to accomplish these interests is remarkable.

### Institutional Assessment

The institutional assessment focuses on how the governmental and non-governmental organisations (NGO’s) position themselves within the Upper Citarum Basin. This was done with a qualitative and quantitative stakeholder analysis and a review of the current and past policies.

The qualitative stakeholder analysis will describe the power, legitimacy and urgency (Currie, 2008) of the identified stakeholders in water management issues in the Upper Citarum Basin.

In the quantitative analysis, the results of the Stakeholder Value Network (Fu, 2011; Cameron 2008) will be shown. Finally, the two analyses will be compared and conclusions will be made. The policy review will cover the regulations, planning and the execution of the policies.

![Figure 7.12 Flood Damage Chart](chart.png)

#### 7.2.2.1 Qualitative Stakeholder Analysis

**Figure 7.12 Flood Damage Chart**

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Creative Policy Generation in Integrated Water Resource Management: A Case Study in the Upper Citarum Basin

18
Central Government

Within this report, the Central Government is referred to as a collection of institutes that work on the national level in Indonesia and manage the country’s policies. In reference to Integrated Water Resources Management, this Central Government includes:

- The ministry of Public Works, where the general directorate for water resource management is situated;
- The ministry of Forestry;
- The BAPPENAS, the central planning department.

The main tasks of the Central Government are: Creating and enforcing national regulations and policies and choosing and funding large projects. Due to the numerous and wide variety of issues in Indonesia, the different institutes each focus each on their own expertise. This has been found to cause a low level of synergy between the institutes.

Provincial Government

The so-called DINAS (departments) of the Provincial Government have the same connections with Integrated Water Resources Management as the Central Government: WRM, Forestry and BAPPEDA (planning department). These departments are tasked with integrating and coordinating the national policy in the the local districts. With this, an autonomy issue arises because the Provincial Government has a low level of influence on policies at the local level. In addition to coordinating the policy, the Provincial Government collects water taxes from large industries.

District Government

The district or local government has again the same set up as the other higher governments. The same departments are important for Integrated Water Resources Management: WRM, Planning, Forestry. The local government has a large autonomy in their own district and is at the same time responsible for enforcing the national policies and collecting the general taxes. This results in conflicts between national provincial and local policies.

Figure 7.13 Overview Government on Integrated Water Resources Management
TKPSDA (Strategic Water Council)

In Indonesia, many water councils exist on different levels in the hierarchy. To promote the Integrated Water Resources Management approach in the Citarum Basin and due to the strategic status of the river, an initiative has been started to set up the organisation of the TKPSDA (strategic water council). The TKPSDA consists of 50% government (provincial, local, central government institutes) and 50% non-government stakeholders such as business and industry associations (Sobirin 2013). To join the water council, these non-governmental stakeholders must pass a selection procedure. The function of this council is to determine the agenda and raise issues regarding Integrated Water Resources Management in the Citarum basin. The TKPSDA is not functioning yet and problems with empowering this council have already arisen.

Research Centres

The Research Centres are knowledge institutes that are funded and controlled by the central government. Their main task is to consult the government. There are three research centres that are relevant to the issue of IWRM. The research centres for: WRM, Human Settlement and Social-Economics and Environment.

Residents

The residents of the Upper Citarum Basin are the driving force behind the economic growth. They deliver the needed labour to keep the industry and cultivation running even though a large part of the residents also work in the informal sector. Surviving on minimal salaries makes the overall economic conditions of the residents poor. Due to the issues in the basin, many residents have adapted to or accepted the conditions they live in. The theory of Hofstede (2012) emphasises that the residents are experiencing a collective mind-setting, which means that they depend on their community.

Universities and consultants

To bring in more Integrated Water Resources Management expertise in Indonesia, governmental institutes like the BBWSC are consulting universities and consultants from all over the world. This requests gives the universities and consultants the opportunity to test new practices.
Business

Many SME’s conduct their day-to-day business in the basin. Their goal is to maximize their profit and to achieve this goal, dangers and risks must be minimized. The issues in the basin make it difficult for these businesses to survive.

Industry

The Industry in the Upper Citarum Basin is focused largely on textile. The textile industry employs many people in the area, but it is very water intensive and causes a great deal of pollution. Because of this, textiles are a positive and a negative force in the area.

Cultivation

Agriculture and fish ponds are also an important source of income in the region. The mountainous areas are more suitable for cultivating crops, while the valleys are more suitable for rice paddies and fish ponds. The cultivation of these lands is water intensive throughout the entire year and therefore depends heavily on irrigation.

NGO’s

Many NGO’s are active in the region. Most of them are focused on preserving the environment or are organisations that are largely supported by industries and businesses. The NGO’s are not empowered in the decision-making processes, therefore they often use to media to attract attention.

Based on the theory that was presented by Currie (2008), the stakeholders have been classified. In figure 7.14 and table 7.1, the classification is visualized.

<table>
<thead>
<tr>
<th>#</th>
<th>Stakeholder</th>
<th>Urgency</th>
<th>Legitimacy</th>
<th>Power</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>High</td>
<td>High</td>
<td>Medium</td>
<td>Definitive</td>
</tr>
<tr>
<td>2</td>
<td>Central Government</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>Dominant</td>
</tr>
<tr>
<td>3</td>
<td>Provincial Government</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Dependent</td>
</tr>
<tr>
<td>4</td>
<td>District Government</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Definitive</td>
</tr>
<tr>
<td>5</td>
<td>TKPSDA</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Demanding</td>
</tr>
<tr>
<td>6</td>
<td>Research Centers</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Demanding</td>
</tr>
<tr>
<td>7</td>
<td>Residents</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Dependent</td>
</tr>
<tr>
<td>8</td>
<td>Universities and Consultants</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
<td>Demanding</td>
</tr>
<tr>
<td>9</td>
<td>Business</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Dependent</td>
</tr>
<tr>
<td>10</td>
<td>Industry</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Dependent</td>
</tr>
<tr>
<td>11</td>
<td>Cultivation</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Dependent</td>
</tr>
<tr>
<td>12</td>
<td>NGO</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Demanding</td>
</tr>
</tbody>
</table>

Table 7.1 Overview Stakeholders
Four types of stakeholders have been identified with the classification: Dominant, Definitive, Demanding and Dependent Stakeholders. For each new idea or concept, the involvement strategy of these stakeholders must be evaluated.

### 7.2.2.2 Quantitative Stakeholder Analysis

#### Mapping

The previously identified stakeholders have been used as inputs to map the stakeholder relations. Each relation or value flow is represented by a coloured arrow, which categorizes the different relations between the stakeholders. In figure 7.15 the results can be found.

#### Quantifying

Each value flow will be quantified based on the interviews and literature research. This is done by giving each value flow a score based on need and source importance. The Multi-attribute utility theory will be used to combine the scores from these criteria.
Searching

All of the value paths or value chains in the Stakeholder Map will be generated by the software MatrixPath (Feng, 2010; Cameron, 2008). By multiplying of all the different value flows in the value path, a final score for each unique value path is presented. In table 7.2 the ten highest value paths are shown.

Analyzing

In the final step, the MatrixPath software generated two statistical indicators for each stakeholder and each value flow. These indicators are called the Weighted Stakeholder Occurrence (WSO) and the Weighted Value Flow Occurrence (WVFO).
The indicators show the relative importance of each stakeholder or value flow compared with the focal organisation, which in this case is the BBWSC. The results of these statistical indicators are presented in the figure 7.16 and 7.17.

Table 7.2 10 Highest Scoring Value Paths (Maximum Score is 1.0)

<table>
<thead>
<tr>
<th>Length</th>
<th>Score</th>
<th>Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.92</td>
<td>Policy(BBWS,Central) Policy(Central,BBWS)</td>
</tr>
<tr>
<td>2</td>
<td>0.92</td>
<td>Policy(BBWS,Central) Regulations(Central,BBWS)</td>
</tr>
<tr>
<td>3</td>
<td>0.30</td>
<td>Policy(BBWS,Provincial) TaxCollection(Provincial,Central) Policy(Central,BBWS)</td>
</tr>
<tr>
<td>3</td>
<td>0.30</td>
<td>Policy(BBWS,Provincial) TaxCollection(Provincial,Central) Regulations(Central,BBWS)</td>
</tr>
<tr>
<td>4</td>
<td>0.29</td>
<td>Policy(BBWS,Central) Regulations(Central,Provincial) Opinion(Provincial,TKPSDA) Advice(TKPSDA,BBWS)</td>
</tr>
<tr>
<td>4</td>
<td>0.29</td>
<td>Policy(BBWS,Central) Policy(Central,Provincial) Opinion(Provincial,TKPSDA) Advice(TKPSDA,BBWS)</td>
</tr>
<tr>
<td>4</td>
<td>0.29</td>
<td>Policy(BBWS,Central) Regulations(Central,District) Opinion(District,TKPSDA) Advice(TKPSDA,BBWS)</td>
</tr>
<tr>
<td>4</td>
<td>0.28</td>
<td>Policy(BBWS,Central) Regulations(Central,District) TaxCollection(District,Provincial) Advice(TKPSDA,BBWS) Opinion(Provincial,TKPSDA)</td>
</tr>
<tr>
<td>4</td>
<td>0.17</td>
<td>Policy(BBWS,Central) Regulations(Central,District) Coordination(Provincial,TKPSDA) Advice(TKPSDA,BBWS)</td>
</tr>
<tr>
<td>4</td>
<td>0.17</td>
<td>Policy(BBWS,Central) Policy(Central,Provincial) Coordination(Provincial,TKPSDA) Advice(TKPSDA,BBWS)</td>
</tr>
</tbody>
</table>

WSO = Score sum of value paths containing a specific stakeholder/Score sum of all the value paths

WVFO = Score sum of value paths containing a specific value flow/Score sum of all the value paths

Creative Policy Generation in Integrated Water Resource Management: A Case Study in the Upper Citarum Basin
In the qualitative as well as the qualitative analysis, the importance and the high scores of the different governmental institutes is remarkable. It can be argued here that this stakeholder system is government driven and that the government is a stakeholder that should always be involved at all levels.

The TKPSDA that is not yet operational has a great deal of potential as an important stakeholder and even though the TKPSDA has no real power, it can function as an outlet for the different parties in the basin. This is confirmed by the high scoring value flow (of advice) between the TKPSDA and the BBWS.

The residents and the value adding branches (cultivation, business, industry) are rated as dependent stakeholders. This dependence is merely based on the level of dependency on the government. If these parties are more involved in the policy and challenges in the basin they can add more value to the entire system and play a more important role in making changes.

The NGO’s, research centres and universities & consultants have no important role in this system. The research centres, consultants and universities are useful for gathering information and expertise on the matters at hand. The NGO’s have not yet found enough public support to actually influence the direction of events in the basin. If certain living standards in the basin change radically this could change.
7.2.2.4 Policy Review

The policy applied by the governmental institutions regarding water resources management in the Upper Citarum Basin has been reviewed within three different areas: regulations, planning and execution. The reviews are based on the author’s interviews with different institutions and from the planning documents that were obtained from the various agencies.

The regulation framework is directed by a list of governmental and presidential acts, laws and decrees (Directorate General of Water Resources, 2011) and is summarized in the Government Regulation of Republic of Indonesia Article 23 Number 42 / 2008 on the Management of Water Resources, which is a guideline for technical procedures for the preparation of water resources management. This document is a very detailed description of how the governmental institutions should plan and execute their tasks. The articles in the regulation framework are very interesting in that they encourage community empowerment, stakeholder involvement and a holistic approach.

The leading document in the planning of water resources management for the Citarum is the Roadmap Citarum River Basin, published by the BAPPENAS in 2011 (the national planning department). This roadmap focuses on an integrated approach with five pillars and two foundations (see figure 7.18) and is the basis for a 15-year project to improve multi-sectorial issues in the Citarum River Basin. The main responsibility of this project lies with the Director General of Water Resources under the Ministry of Public Works. The Director General manages a large number of governmental institutions, mainly local and provincial governments in order to execute this project. The local and provincial governmental institutions have a planning document of their own. These documents are focused on the function of their institution (spatial planning, water resources management, forestation, etc.) and often do not coincide with one another. The roadmap and various planning stages are not well-communicated between the authorities.

Figure 7.18 Base roadmap Citarum River Basin (Bappenas, 2011)
This miscommunication between the different government authorities occurs again in the execution of the planning: The authorities focus on their own area of expertise; projects are developed independently and the execution of different policies that overlap are not well coordinated. The result is that the different institutions have significant problems with enforcement of their policies. The focus is and has been mainly on structural solutions and (JICA Project Stage 1&2) and the spatial planning does not properly allocate people, companies and environment. This is because the non-structural measures often need a larger public support and a good coordination.

A possibly solution to this problem in the strategic river basin of the Citarum has already been suggested by the regulations of the government: the implementation of the TKPSDA (strategic water council on Water Resources). This council strives to involve all stakeholders, both governmental and non-governmental, in order to determine the issues for the water resources agenda in a integrated way. This TKPSDA is not functioning yet and is currently in the set-up phase.

Using this analysis, an evaluation can be made, which can be found in table 7.3. In this table, the regulations, planning and execution have been evaluated based clarity, communication and focus.

<table>
<thead>
<tr>
<th>Table 7.3 Evaluation Regulations, Planning and Execution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarity</strong></td>
</tr>
<tr>
<td>Regulations</td>
</tr>
<tr>
<td>Planning</td>
</tr>
<tr>
<td>Execution</td>
</tr>
</tbody>
</table>
7.2.3 Social Economic Assessment

The Social Economic Assessment for this research is based on the Q method analysis (Raadgever, 2008; Brown, 1993) and its results conducted from two areas in the Upper Citarum Basin, Tegelluar and Dayeuhkolot. Tegelluar is an area where flood was a problem, due to normalisation of the river floods now occur less. Dayeuhkolot is an area that has daily problems from the floods and thus the degradation of the river basin. Tegalluar has got a rural character, while Dayeuhkolot is part of an suburban area where many people live from the industrial, business and informal sector.

The Q method focuses on getting an insight, which perspectives live under the respondents. 58 respondents sorted 18 statements from their point of view from important to not important. These 58 sorts were analysed by using the software PQMethod. An iterative process between the author and the software identified the following 4 perspectives for the interviewed areas.

Table 7.4 Q statements

<table>
<thead>
<tr>
<th>#</th>
<th>Statements</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>If I could change my living conditions, I would not change a thing.</td>
<td>Living</td>
</tr>
<tr>
<td>2</td>
<td>I want better living conditions and I like to contribute financially.</td>
<td>Active</td>
</tr>
<tr>
<td>3</td>
<td>I want better health protection against pollutants and garbage in the water during flooding.</td>
<td>Health</td>
</tr>
<tr>
<td>4</td>
<td>I want no more damage to my house because of flooding.</td>
<td>Living</td>
</tr>
<tr>
<td>5</td>
<td>I want to be warned before flooding, so I can prepare myself.</td>
<td>Help</td>
</tr>
<tr>
<td>6</td>
<td>I am more productive when there is no flooding</td>
<td>Living</td>
</tr>
<tr>
<td>7</td>
<td>I want the government to protect me from these flooding</td>
<td>Help</td>
</tr>
<tr>
<td>8</td>
<td>I want to help creating better living conditions in my neighbourhood.</td>
<td>Active</td>
</tr>
<tr>
<td>9</td>
<td>I want to get relocated to a flood-free location under the condition of financial support.</td>
<td>Relocation</td>
</tr>
<tr>
<td>10</td>
<td>I want the government to pay for the damage created by flooding.</td>
<td>Finance</td>
</tr>
<tr>
<td>11</td>
<td>I want financial support, so I can protect my house from flooding.</td>
<td>Finance</td>
</tr>
<tr>
<td>12</td>
<td>I want to give my opinion in creating better water resources policies.</td>
<td>Active</td>
</tr>
<tr>
<td>13</td>
<td>I have learned to protect myself from the flooding.</td>
<td>Education</td>
</tr>
<tr>
<td>14</td>
<td>I want better rescue teams during flooding.</td>
<td>Help</td>
</tr>
<tr>
<td>15</td>
<td>I want more help in recovering and cleaning-up from the flooding.</td>
<td>Help</td>
</tr>
<tr>
<td>16</td>
<td>I want to learn how to protect myself from flooding.</td>
<td>Education</td>
</tr>
<tr>
<td>17</td>
<td>I would like to move to a safer, flood-free place.</td>
<td>Relocation</td>
</tr>
<tr>
<td>18</td>
<td>I am scared of floods and this is giving me a lot of stress.</td>
<td>Health</td>
</tr>
</tbody>
</table>
**Perspective 1: “Home Sweet Home”**

The “Home Sweet Home” perspective tells the story of the people who are emotionally attached to the place they live and to the community they live in. They have no intention to move, because this is the place where they work and live. They think the government should take care of them and improve the living conditions of their public and private places.

**Perspective 2: “Where Life Takes Me”**

The second perspective pertains to the people who have a bit of an opportunistic point of view. They want to have a better life, but think the government should provide this to them. They have no intention of contributing themselves or helping their community, but with the appropriate conditions and perspectives, they become much more flexible.

---

**Table 7.5 Perspective 1**

<table>
<thead>
<tr>
<th>Perspective 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>&quot;Home Sweet Home&quot;</td>
</tr>
<tr>
<td><strong>Significant Loadings</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>Statements Agree</strong></td>
<td>I want the government to pay for the damage created by flooding.</td>
</tr>
<tr>
<td></td>
<td>I want financial support, so I can protect my house from flooding.</td>
</tr>
<tr>
<td><strong>Distinguishing Statements Agree</strong></td>
<td>I want better health protection against pollutants and garbage in the water during flooding.</td>
</tr>
<tr>
<td></td>
<td>I want no more damage to my house because of flooding.</td>
</tr>
<tr>
<td><strong>Statements Disagree</strong></td>
<td>I would like to move to a safer, flood-free place.</td>
</tr>
<tr>
<td></td>
<td>I want to get relocated to a flood-free location under the condition of financial support.</td>
</tr>
<tr>
<td><strong>Distinguishing Statements Disagree</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>Relevant Reasons</strong></td>
<td>I live here for 25 years and created my family here</td>
</tr>
<tr>
<td></td>
<td>Wants to be relocated but better solve problems here otherwise people get expelled from the community</td>
</tr>
<tr>
<td></td>
<td>More attention should be given to flood victims,</td>
</tr>
<tr>
<td></td>
<td>Needs money to recover from damage and losses</td>
</tr>
<tr>
<td></td>
<td>Government should take responsibility and not blame nature</td>
</tr>
<tr>
<td></td>
<td>Job is in the neighbourhood</td>
</tr>
<tr>
<td></td>
<td>Emotionally attached to location</td>
</tr>
<tr>
<td></td>
<td>Emotionally attached to community</td>
</tr>
<tr>
<td></td>
<td>Cannot afford a better living condition</td>
</tr>
<tr>
<td></td>
<td>Near work location, lived here since childhood</td>
</tr>
</tbody>
</table>

---
Perspective 3: “Work Hard, Live Hard”

The perspective “Work Hard, Live Hard” is characterized by the people who are neither positive or negative. They rely strongly on their religion and believe in faith. Their point of view on life is to work hard and make the best out of their living. Health and their families are important factors in their life and they will do everything to protect that.

Perspective 4: “You Must Fight For Your Rights”

This last perspective is associated with the more proactive and entrepreneurial residents in the areas. They want to contribute by sharing their knowledge and their opinion about the living conditions in their surroundings. They are also open-minded about new developments and physically help to make their community and public areas better and safer.

<table>
<thead>
<tr>
<th>Perspective 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
<td>&quot;Where Life Takes Me&quot;</td>
</tr>
<tr>
<td><strong>Significant Loadings</strong></td>
<td>8</td>
</tr>
<tr>
<td><strong>Statements Agree</strong></td>
<td>I want to get relocated to a flood-free location under the condition of financial support.</td>
</tr>
<tr>
<td></td>
<td>I want the government to pay for the damage created by flooding.</td>
</tr>
<tr>
<td><strong>Distinguishing Statements Agree</strong></td>
<td>If I could change my living conditions, I would not change a thing.</td>
</tr>
<tr>
<td><strong>Statements Disagree</strong></td>
<td>I want to help creating better living conditions in my neighbourhood.</td>
</tr>
<tr>
<td></td>
<td>I want better living conditions and I like to contribute financially.</td>
</tr>
<tr>
<td><strong>Distinguishing Statements Disagree</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>Relevant Reasons</strong></td>
<td>Low financial resources</td>
</tr>
<tr>
<td></td>
<td>Willing to relocate if the location is developed and has facilities</td>
</tr>
<tr>
<td></td>
<td>Enough suffered from the flood, government’s responsibility to care for the people</td>
</tr>
<tr>
<td></td>
<td>Government should pay a fee for relocation</td>
</tr>
<tr>
<td></td>
<td>No financial resources to relocate, government’s responsibility</td>
</tr>
<tr>
<td></td>
<td>I want a better live and it is the responsibility of the government</td>
</tr>
<tr>
<td></td>
<td>No point in spending more money the results will be the same</td>
</tr>
<tr>
<td></td>
<td>Want to move to a safer place</td>
</tr>
<tr>
<td></td>
<td>It is the government’s duty</td>
</tr>
<tr>
<td></td>
<td>Is not able to do activities as usual</td>
</tr>
</tbody>
</table>

Table 7.6 Perspective 2
Conclusion

From the Q analysis, four different perspectives on the matter have been identified. To put these perspectives in a context, they can be placed on two axes: The axis from inflexible to flexible, which represents the flexibility of the residents, and the axis from government-reliant to self-reliant, which represents the dependency of the residents. (figure 7.19)

This provides a good overview of how to communicate with the different groups of like-minded individuals and how to determine whether they should be involved in a certain strategy. For example, the like-minded people from perspective 2 are much easier to activate if you establish the proper conditions compared to the people from perspective 1.

In addition to identifying the different perspectives, some other conclusions from the survey can be made that repeatedly return to the arguments and discussions:

<table>
<thead>
<tr>
<th>Perspective 3</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant Loadings</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statements Agree</th>
<th>Statements Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I want no more damage to my house because of flooding.</td>
<td>I want better living conditions and I like to contribute financially.</td>
</tr>
<tr>
<td>I want better health protection against pollutants and garbage in the water during flooding.</td>
<td>If I could change my living conditions, I would not change a thing.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distinguishing Statements Agree</th>
<th>Distinguishing Statements Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am more productive when there is no flooding</td>
<td>-</td>
</tr>
<tr>
<td>I want to get relocated to a flood-free location under the condition of financial support.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relevant Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low financial resources</td>
</tr>
<tr>
<td>God’s will</td>
</tr>
<tr>
<td>People do not have any resources to overcome the flood,</td>
</tr>
<tr>
<td>Why do we not change while we can, we have to be a better human</td>
</tr>
<tr>
<td>Health is the most important</td>
</tr>
<tr>
<td>Health is No. 1</td>
</tr>
<tr>
<td>It brings difficulties to others</td>
</tr>
<tr>
<td>If the government gives guarantees it feels safe</td>
</tr>
<tr>
<td>Stress as a relation to the floods</td>
</tr>
</tbody>
</table>

Table 7.7 Perspective 3

- Residents are low on financial resources;
- Residents are in general very community-driven;
- Residents depend on their religion;
- Residents depend on their families.
### Perspective 4

<table>
<thead>
<tr>
<th>Title</th>
<th>&quot;You Must Fight For your Rights&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant Loadings</td>
<td>5</td>
</tr>
</tbody>
</table>
| Statements Agree | I have learned to protect myself from the flooding.  
I want to help creating better living conditions in my neighbourhood. |
| Distinguishing Statements Agree | I want to learn how to protect myself from flooding.  
I want to give my opinion in creating better water resources policies.  
I want to get relocated to a flood-free location under the condition of financial support. |
| Statements Disagree | I want better health protection against pollutants and garbage in the water during flooding.  
If I could change my living conditions, I would not change a thing. |
| Distinguishing Statements Disagree | I want the government to pay for the damage created by flooding. |
| Relevant Reasons | God’s will, Help each other because of religion  
Does not have the financial resources, better life is important for our people and environment  
Low education on flood knowledge needed to overcome flood  
We all deserve a better live  
I got used to the floods and gives me great experience to handle this problem  
Used to the flooding  
Life will change if we are not lazy |

#### Table 7.8 Perspective 4

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0.2294</td>
<td>0.477</td>
</tr>
<tr>
<td>2</td>
<td>0.2294</td>
<td>1</td>
<td>0.3132</td>
</tr>
<tr>
<td>3</td>
<td>0.477</td>
<td>0.3131</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>-0.1847</td>
<td>0.0138</td>
<td>-0.108</td>
</tr>
</tbody>
</table>

#### Figure 7.19 Position of the perspectives (flexibility vs. self-reliant)
In this summary assessment of the basin, the SWOT-methodology (Wikipedia, 2013) has been used to present the strengths, weaknesses, opportunities and threads of the Upper Citarum Basin. These insights are based on the different assessments and analyses from the previous sections. The goal is to create an overview for the next step in the research process. At this point the SWOT is used in a confrontation matrix to identify questions for the Generation phase of the Creative Policy Generation Method.

![Figure 7.20 SWOT Theory (Wikipedia, 2013)](image)

### Strengths

- The Basin has a large water potential;
- The Basin has a strategic value for the entire Western-Java region, which gives it a priority status.

### Institutional

- The government has a great deal of influence on all levels. The society is government-driven;
- Positive central government vision regarding community empowerment and stakeholder involvement.

### Social-Economic

- Community- and family-driven residents.
Weaknesses

Physical
- The system is very sensitive due to damage from storm events;
- The allocation of space for forest and cultivation is critical;
- Heavy sedimentation in the river valley;
- Heavy erosion in the mountainous areas;
- Floods cause yearly damage (up to 50 million dollars per storm event), health problems and nuisances arise;
- The river is heavily polluted by industry and residents.

Institutional
- Poor enforcement of regulations;
- Fragmented interests on all governmental levels and departments;
- No communication between governmental levels and departments;
- Only interested in implementing large structural measures by the government.

Social-Economic
- Residents have low or no financial resources.

Opportunities

Physical
- Small interventions can have immediate effects on the improvement of the basin.

Institutional
- The water council, TKSPDA, appears to have great potential to involve and engage stakeholders;
- The engagement of the cultivation, industry and business sectors;
- More influence from the NGO’s on the system when residents are more organised.

Social-Economic
- Large groups of residents (perspective 2 and 3) are deployable under the proper conditions and perspectives;
- Small group of residents (perspective 4) that has a desire to contribute.
Threats

Physical
- Poor spatial planning and infrastructure;
- Water scarcity in the dry season;
- Land subsidence due to groundwater extraction;
- Degradation of arable land in the mountainous areas due to erosion;
- Large rain events can potentially damage the urban areas.

Institutional
- Too detailed level of regulations is too detailed;
- Allocation of resources between people, environment and profits in the basin.

Social-Economic
- Large group of inflexible and government reliant residents (perspective 1).
7.3 Case Study - Generation

The generation phase of the method will identify the cases and will ultimately present the concept policies. The cases have been used in two workshops with Dutch and Indonesian MSc. Water Management students. The concept policies generated in these workshops have been altered and clustered by the author and are presented in this report in the second section of the generation phase.

7.3.1 Case Identification

The cases consist of one or more problem statements that have been identified using the SWOT-method (Wikipedia, 2013). Putting the strengths, weaknesses, opportunities and threads on the axis as in figure 7.21 creates an inside-out SWOT or a so-called confrontation matrix. In this matrix, each intersection between the strengths, weaknesses, opportunities and threads presents one or more questions that offer a solution direction or 'fuzzy goal'. The participants of the workshop have combined one or more 'fuzzy goals' to create a case that can be used in the creation track.

![Figure 7.21 SWOT Confrontation Matrix (Wikipedia, 2013)](image)
Quick wins
- How can the community organise bottom-up initiatives in the Upper Citarum Basin?
- How can the farmers organise bottom-up initiatives in the Upper Citarum Basin?
- How can the industry organise bottom-up initiatives in the Upper Citarum Basin?
- How can businesses organise bottom-up initiatives in the Upper Citarum Basin?
- How can the government facilitate bottom-up initiatives in the Upper Citarum Basin?

Easy to defend and counteract
- How can the government enforce the regulations and policies in the Upper Citarum Basin?
- Can the community play a role in the enforcement of polices and regulations?
- How can a sense of urgency, responsibility and awareness be stimulated with the residents in the Upper Citarum Basin?
- How can the residents be involved in planning and policy-making?

Potential attractive options
- How can planning and stakeholder involvement be integrated?
- How is income generated for the residents in the Upper Citarum Basin?
- What are non-structural measures that can have a positive effect on the Upper Citarum Basin?

High Risks
- How can we control and mitigate physical threats or issues by implementing a combination of structural and non-structural measures?
- How can we create more autonomous, local governments that have a sense for sustainability?

7.3.2 Presentation Concept Policies

Use of the creation track and the Business Model Canvas with the previously determined challenges in the workshops with Dutch and Indonesian MSc. Water Management students, allowed the identification of the following concepts:

- “Pay it forward”
- “Destination Bandung”
- “Micro reservoirs”
- “Collect and recycle”
- Using existing infrastructure”
- “Upgrade the community”
- “Water enforce team”
These concepts could be the basis for solutions to the challenges in the Upper Citarum Basin and have been written from the perspective of the the focal organization BBWSC. In this section, the ideas created in the workshops have already been clustered into conceptual policies. The policies will be described with a detailed explanation of how the policy works and with a Business Model Canvas (Osterwalder, 2010).

**Policy Concept 1 “Pay it forward”:**

This first policy works as an umbrella for concept 2,3 and 4. However, each concept should be able to work as a 'stand alone' policy as well.

This umbrella solution should provide a network in which all social and sustainable initiatives that challenge the issues in the Upper Citarum Basin are gathered in a database. The next step is to bring these local initiatives in contact with each other within a community. In this way, a cross-pollination between the initiatives is established and initiatives can learn from each other.

The second and more interesting purpose of this concept is that by collecting information on the initiatives, they can be analysed based on their successes and risks. Subsequently, robust blueprints with a large chance for success can be extracted and used as an educational tool. In this way, value is created for the government, because no large investments are needed to control the degradation of the basin and also for the residents, whose living conditions will be improved.

To promote these successes and educate the residents, mobile knowledge centres should be employed. This option is in addition to the traditional mouth-to-mouth method which is a key aspect in the promotion of this concept. To improve the rate of success, a link between predecessors and the new initiators should be established. The ‘teacher’ could provide the details to the initiator which has lead to success in the past. These predecessors now contribute by 'paying forward'. Rewarding these initiators in this stage is very important, because this can generate more motivation and responsibility, especially when ownership of land or assets are given (Reerink, 2010).

![Figure 7.22 “Pay it forward’-Business Model](image-url)
The infrastructure that is needed to support this concept is an organised back office which will manage the research, a knowledge database and the network of initiatives. This back office should be financed by a contribution from the initiatives that are connected to the network. In the following business model (figure 7.22), the key aspects of the concept are shown.

**Policy Concept 2: “Destination Bandung”**

Bandung has a high potential for tourism with many beautiful sights and natural attractions. Developing eco-tourist locations is a way to create an income for the residents and at the same time create awareness among them. The development of eco-tourism provides tourists with sustainable attractions such as biological farms with green hotels.

![Figure 7.23 “Destination Bandung”-Business Model](image)

*Figure 7.23 “Destination Bandung” Business Model*

This awareness can lead locally to less deforestation, pollution and erosion, but on a larger implementation scale the entire basin could benefit. By educating and motivating local residents to adopt the ‘pay it forward’-concept this policy can create win-win situations for the governmental institutions and the residents themselves. When engaging the residents, the concept should be a robust blueprint that details what is needed to be successful. This also means that the tourist opinion should be considered. By connecting with travel agencies, insight into the market can be gained and a lines of communication with the tourist industry can be opened. A pilot location to test and validate the concept could also help to attain promotional goals. In figure 7.23 the business model for this concept is shown.

**Policy Concept 3: “Micro reservoirs”**

The concept of small and large reservoirs are already well-known as assets in the area of water management. However, the implementation of micro-reservoirs on a residential level is still relatively unknown (Liebe, 1999; Basima, 2006). In figure 7.25 an idea is presented that shows how the concept could work. The reservoir would be constructed at the lowest point of each farm parcel.
In the reservoir, water and sediment is collected, which results in the maintenance of the reservoir. The water can be saved for periods of water scarcity and the sediment can be sold and used to create bricks or other building materials. Again the ‘pay it forward’ concept would be used to promote this concept and create an impact in the basin. Figure 7.24 shows the business model of this concept.

**Policy Concept 4: “Collect and recycle”**

Collecting litter in and around the river and processing it into finished and semi-finished products could be a quick solution that would amount of pollution in the river. This also could prevent clogging and subsequent flooding of the system. The litter would be collected by boats or nets and then processed on land. Semi-finished products that can be created by grinding are for example, granulates, bulk aluminium and shredded wood. These materials can be reused for the production of building materials. The heavy machinery needed for this operation is a large investment and therefore deals with the manufacturers should be made. This concept policy has the potential to create significant and would therefore provide a great deal of economic value to the local economy. This concept can be optimized by using the ‘pay it forward’-concept. The business model of the ‘Collect and Recycle’-concept is shown in figure 7.26.
The following concepts do not coincide with the ‘Pay it forward’-business model and are ‘stand alone’ concepts.

**Policy Concept 5: “Using existing infrastructure”**

Many rice paddies and fish ponds are situated along the Citarum River. These fields have a great deal of extra water storage capacity and they are generally already connected with the river for irrigation purposes. The idea is to move water in from the river to this fields when a large flood wave is passing. In this way, the flood wave will be flattened and becomes less of a threat to the urban areas downstream.

**Figure 7.26 “Collect and recycle”-Business Model**

This concept is to move the inundations from an area of high value to an area of lower value which would result in less economic damage. In principle, this is a century-old idea and has been a best practice until today (Disco, 2009). The novelty of this concept is found in the way in which it is organized and especially in the way that potential damage to the fish and rice products of the farmers would be handled.

A fund should be established to which the urban communities would pay a small contribution for their protection. This fund would work as a type of insurance fund for the farmers. Personal relations between the urban communities and the farming communities would be essential to ensure participation. Therefore, when a farmer puts his harvest at risk by allowing his field to be used for water storage; he can be assured that any damage will be covered and that he is helping to save the community downstream.

To make this idea successful, a well-controlled water and flood warning system should be developed, which would guarantee that the system will work. The business model (figure 7.27) gives the insight into this concept and clarifies the fact that safety and less flood damage are the driving force behind this policy.
The conditions in which most of the residents live in the Upper Citarum Basin are poor and unsustainable. To improve these conditions, programs at the resident and community levels can be implemented. These programs should focus on flood proofing, health improvement, energy generation and educational improvement. A few examples are water filtration systems, separated dumping sites, WIFI systems, water collectors, flood proofing modifications and windmills.

These programs can be integrated by the community through a government subsidized program. This program makes the programs available with lease-contracts. In this way, every resident or community can obtain the program they need the most by contributing a monthly fee. To create a sense of responsibility among the residents and motivate them to invest in their community, land ownership can be given to the residents (Reerink, 2010). This policy can be promoted with a pilot program and promotional campaigns, which will educate citizens to make them aware of the influence they have on their environment and what they can do to improve the situation. Policies such as these help communities like the basin to become more sustainable.

In figure 2.28 the policy is explained as it relates to the business model.
Policy Concept 7: “Water enforce team”

The enforcement of regulations and policies seems to be as difficult in the rest of Indonesia as it is in the Upper Citarum Basin. The water enforcement team can be a solution throughout the country. This team is elected by the community and enforces the integrity pact that is made within the community. In this integrity pact, issues such as handling environment and each other can be addressed. Failure to live by these moral fibres can have consequences such as fines or community labour. The set-up of the elections and integrity pacts can be promoted by the government and tested in a pilot.

In the business model (figure 7.29) the policy is illustrated.
The presented concepts and their business models have been evaluated based on three different aspects. This assessment provides an indication of which concepts are achievable and will have a chance of success. The three aspects are:

- **Strategy**: using the FUN-method (Gray, 2010) which assesses the concept on feasibility (stakeholder level), usefulness (solving issues) and novelty (innovation).
- **Risk**: Assessing whether the issues have been accepted, avoided, managed or solved (Feteke, 2010) and whether the solution is sustainable over time (long, medium or short term).
- **Economical Value**: assessing the costs and benefits and the impact-effort ratio.

In table 7.10, a matrix has been created which provides an overview of the scores for each criteria. These scores are explained below.

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Strategic</th>
<th>Risk</th>
<th>Economic</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Feasibility</td>
<td>Usefulness</td>
<td>New</td>
<td>Handling</td>
</tr>
<tr>
<td>1</td>
<td>Pay it forward</td>
<td>High</td>
<td>High</td>
<td>Yes</td>
<td>Solve</td>
</tr>
<tr>
<td>2</td>
<td>Destination Bandung</td>
<td>Average</td>
<td>High</td>
<td>No</td>
<td>Manage</td>
</tr>
<tr>
<td>3</td>
<td>Micro Reservoirs</td>
<td>Low</td>
<td>High</td>
<td>Yes</td>
<td>Manage</td>
</tr>
<tr>
<td>4</td>
<td>Recycle</td>
<td>High</td>
<td>High</td>
<td>No</td>
<td>Manage</td>
</tr>
<tr>
<td>5</td>
<td>Using existing infrastructure</td>
<td>Low</td>
<td>High</td>
<td>Yes</td>
<td>Manage</td>
</tr>
<tr>
<td>6</td>
<td>Upgrade your community</td>
<td>High</td>
<td>High</td>
<td>Yes</td>
<td>Manage</td>
</tr>
<tr>
<td>7</td>
<td>Water enforce team</td>
<td>Average</td>
<td>Average</td>
<td>No</td>
<td>Solve</td>
</tr>
</tbody>
</table>

Table 7.10 Evaluation matrix
Policy Concept 1: “Pay it forward!”

Strategy

This concept focuses on the initiators in the communities in the basin, who are currently in the minority as can be seen in the social-economic assessment. By empowering these highly motivated people by offering this platform, success on a small scale can be achieved and imitated. These successful initiatives can be imitated, because they are most likely an example of ‘Jugaad Innovation’ (Radjou, 2012), which promotes the idea that innovation can be achieved with few means and resources through creative thinking. This initiative is started on a very small scale and thus requires few stakeholders to operate. This low cost start-up combined with empowering the initiators make this a very feasible concept.

The usefulness of this concept can be seen in a direct and indirect way. Direct advantages can be seen in the issue of raising awareness and providing education. In an indirect way, this concept is dependent on initiators and predecessors (the people who have already joined the program before) who propose solutions for issues in the basin.

In Indonesia, this concept is new and does not exist. In the Netherlands there is an initiative that presents this concept of social entrepreneurship in an alternative way. This initiative is called “Kracht in NL” (Strength in the Netherlands), but it is based online, which is not yet possible in Indonesia. The novelty of the proposed concept for Indonesia is that it is in an offline environment with education centres, which is an alternative to the existing Dutch initiative. This vision is empowered by Linders (2012), who explains the power of citizen co-creation and co-production.

Risk

The initiation and ultimate success of this concept could immediately begin to solve the problem of the education and awareness in the basin. Instituting the ‘Paying it forward’ initiative and the mobile knowledge centres could provide motivation for the communities to take control of their future, which would result in long term advantages for the entire basin.

Economic Value

The economic costs and benefits in the short term should both be small. In the long term however, by depending on the “pay it forward” principle, the benefits would easily outweigh the costs and could even produce revenue from the successful initiatives. This means that the concept has a high impact-effort ratio. If it fails, the economic risk is small, due to the lack of large structural investments.
Policy Concept 2: “Destination Bandung”

Strategy

The feasibility of the eco-tourism concept depends on the motivation and pro-active initiative of the communities and the popularity of the Upper Citarum Basin as a holiday location. The first criterion from the social-economic assessment was covered but the second criterion has not been addressed. The small scale initiatives that will create the eco-tourist sights need to be a part of a larger mission in order to create attractive tourism in the basin. This should be a priority in the policies of the provincial and central government., which would include many different parties.

When the tourist economy begins to grow in the basin, the eco-tourism concept can be of great value to the basin. Involving local residents in the policy, offers them an opportunity to generate an income, which will result in even more awareness for the environment. This makes this policy very useful for promoting the social economic, pollution, erosion and deforestation issues.

For the Upper Citarum Basin, this policy is a good alternative to the existing plans. The concept is not completely new and already exists in large tourist area such as the island of Bali in Indonesia or other locations in the world (Ioppolo, 2013). This previous use of the policy offers the opportunity to study the successes in a similar context and implement it in the Upper Citarum Area.

Risk

Implementing this policy could manage the issue of awareness regarding pollution and deforestation. The attraction of mass tourism could also have disadvantages for the environment, which may only add to the problems. For this reason, the concept is a medium-term solution for the area, because the balance between sustainable eco-tourism and extensive mass tourism would need to be monitored.

Economic Value

The investment costs for this concept are low, but in the 'bigger picture' in which the government would promote the area or Indonesia as an eco-holiday location, the costs are more extensive. However, the return benefits could be favourable. In addition to generating income for the local business and residents, intangible benefits are also generated, which lead to a better environment and eventually safer living conditions with less damage. The relationship of the large investments that need to be made and the return benefits make the impact-effort ratio average.
Policy Concept 3: “Micro reservoirs”

Strategy

Potential benefits from the micro-reservoir concept depends on the scale of implementation and on the location-initiator relationship. The scale determines how much impact the concept can have on the basin. Benefits will only be achieved if the concept is executed on a large scale. The issue of location and initiator is also important to consider. A micro-reservoir can not be built at every location in the mountainous areas of the basin and few residents in these areas are of a proactive mind-set. Finding a positive combination of location and initiator is therefore an issue. In combination with the fact that it is only effective when implemented on a large scale makes it a complicated concept. Thus, the feasibility for this concept is low.

If this large scale implementation is possible, it could potentially be extremely useful for the basin. The micro-reservoirs could provide solutions for the erosion problems and could generate income by re-using the sediments. The greatest advantage is the control of the water, which can prevent floods in the wet season and prevent water scarcity in the dry season.

The implementation of micro-reservoirs on private parcels in mountainous areas to collect sediment and water is a new alternative to many studies that have been conducted with small reservoirs all over the world (Liebe, 1999; Basima, 2006).

Risk

Well-functioning and numerous micro-reservoirs in the basin could significantly reduce the risks of flooding and clogging. However, large rain events and poor maintenance of the system could still lead to damage and unsafe conditions in the flood-prone areas. If maintenance is done properly by the initiators it would be a medium-term solution.

Economic Value

only be mitigated if there are numerous reservoirs, which is in accordance with the fact that benefits will only be obtained if the concept is implemented on a large scale. On a small scale, the initiators could benefit directly from the water storage and the income from selling clay-sediment as a base product for building materials. The implementation of the system would be by education and sharing knowledge which would make the costs minimal.
Policy Concept 4: “Recycle”

Strategy

Collecting and recycling the litter in the river and throughout the basin could have immediate, small scale advantages for the local environment and the local residents. Transforming trash into building materials or other semi-finished products following the Jugaad-principle (Radjou, 2012) can save or generate financial resources. This makes it a perfect concept to be implemented on a resident-level with almost no large parties involved, except for the educational ‘pay it forward’-program.

The use of the concept focuses on generating income for the local communities and the control of pollution, which indirectly prevents clogging of the river.

Recycling is not yet a working concept in Indonesia as it is in the more developed parts of the world. The fact that techniques and knowledge have already been used and perfected elsewhere can help in selecting the proper method of recycling for the Upper Citarum Basin situation.

Risk

The pollution in and around the river has been already in contact with the ground or river water. Collecting this litter is therefore a ‘last ditch’ solution and is a way to manage the pollution issue in the basin Pollution management is therefore a short term solution.

Economic Value

Transforming litter into useful products requires expensive machinery, that must be leased, purchased or subsidized. This requires an investment that should be returned in order to maintain a sustainable business model. As a benefit, there is a large potential to obtain a direct return on this investment by selling the newly created products. Indirectly less clogging of the river could be a benefit, but are many pollutants still in the basin. If this is taken into consideration, the impact-effort ratio would receive an average score.
Policy Concept 5: “Using existing infrastructure”

Strategy

Setting up a network of numerous farm parcels to reduce the risk of flood in highly valued areas and creating a local insurance fund is a convoluted task. The number of of small parties that would need to be involved and managed is the most significant issue. The concept would only work if the insurance fees are paid and the infrastructure between the parcels is working properly. This means that a great deal of enforcement of the policy would be needed and this is an issue in the Indonesian culture. The involvement of personal relationships between farmers and the insured could have a positive effect on the feasibility of this policy.

The concept of using existing infrastructure to reduce flood damage could be of great use in the area. The flood damage in highly valued areas would immediately be reduced and would have a positive effect on the local economy and health problems.

Giving the river space to reduce flood damage is a well-known principle throughout the Netherlands as well as with insurance funds. What makes this policy unique is the combination of the two at a local level. This puts the concept in a new context and could be a new way to deal with flood risks.

Risk

Using the existing infrastructure to transfer flood damage from highly valued areas to less valued areas is a clear way to manage risks. The approach is not based on how to solve the problem of floods and inundation, because it does not deal with the source of these issues. Therefore this a short term solution.

Economic Value

In order to alter the infrastructure, a large investment would need to be made. In addition, a good warning system and the introduction of an insurance fund would need to be integrated. After this investment, the concept should be quite sustainable because of the incoming insurance fees. The additional advantage would be less flood damage in the urban areas, which would have positive effects on the local economies. Taking this all into account raises the impact-effort ratio compared to the other concepts that had a lower score.
Policy Concept 6: “Upgrade your community”

Strategy

The small scale start-up opportunities offered by this policy concept makes this a good initiative to try. Local governments can be involved with local manufacturers of solutions to devise suitable solutions at the resident and community levels. Thus, 'best practices' can be developed and the concept can be scaled to the basin level. This process corresponds with “the Lean Start-up”-method published by Eric Ries (Ries, 2011) and makes it a very feasible option.

By applying small scale solutions, the environment, health, education and damage issues will all be reduced at the local level. In combination with the increased motivation of the residents by giving them ownership causes them to become more aware and responsible (Reerink, 2010). They will notice that small investments can improve their living conditions. When implementing this policy on a large scale, the entire basin will benefit and issues such as pollution, health and flood will cause less damage.

The basis of this concept can be reduced to microcredits (Ahlin, 2008), but instead of giving money, a suitable solution or modification would be offered on a lease or payment basis. This is a new way of letting the local residents taking control of their own future.

Risk

Dependent on the modification or solution the risk can be managed, avoided or solved. If addressed from the perspective of the entire policy, the risk is managed by creating awareness and responsibility. These two aspects in combination with small upgrades can lead to a long term improvement in the basin.

Economic Value

To initiate this project on a large scale, investments or subsidies would be needed. These will provide the opportunity to create a good spectrum of applications and modifications and should cover the land rewards. The direct return on these investments would be the lease incomes from the people who joined the program. This could reduce the costs of the project drastically, and even more if the intangible benefits from the applications were considered. The intangible benefits are unfortunately only visible on a basin scale when the policy is successfully implemented in the Upper Citarum area. This results for the impact-effort ratio receives an average score.
Policy Concept 7: “Enforce team on water issues”

Strategy

In this format, the community would have the opportunity to regulate themselves by signing an integrity pact. This means that almost no interference with any other stakeholders would be needed. The local government would be the only party that should be involved in designing the pact. This self-regulation should be possible the community in which the local residents live is considered. This feasibility can be confirmed by the social-economic assessment in this report and the theory of Hofstede (The Hofstede Centre, 2012).

The usefulness of the concept depends on how the local residents deal with the integrity pact and the responsibility that it requires. If the content of the pact is at a high level, it could solve or manage many issues in the area, for example, pollution. The pact could also have downsides due to misinterpretation or content which would make the situation worse.

The concept is not completely and has been used worldwide (Pathirana, 1992; Henocque, 2001) to deal with challenges in community based cultures. This however can make it a good alternative for the Upper Citarum Basin, which can be altered by learning from previous studies.

Risk

Risks with this concept have been solved and the source of the pollution and groundwater extraction issues have been tackled. The concept would make a very good long term alternative for the issue of degradation of the basin if the pact is set up properly.

Economic Value

The costs of this policy are very low, because no large structural investments need to be made. The policy could even make profits through the income from fines and social labour. If the policy implementation is done well, the intangible benefits could be of great value. This would result in a high scoring impact-effect ratio.
The policies presented in the case study are generally good alternatives to the existing policies. They address the challenges and attempt to find alternative conceptual policies to create better, more sustainable and safer living conditions in the Upper Citarum Basin. This is done by combining educational and social characteristics with small-scale infrastructural solutions. This combination helps to create policies with a real, integrated character. According to this case study, policies 1, 4, 6 and 7 have a good initial evaluation and would create the most value. In general, these concepts all have low start-up costs. This makes it less of an economic risk to implement the policies on small scale, validate if they are working and determine if they can achieve the desired result. This is the only way the real costs and benefits can be ascertained and a decision on up scaling the initiative can be made.

Further research could be to elaborate on these policy concepts and their business models more before actually implementing them. This research should focus on setting up a solid first experiment to get more specific details about the execution. A good way to do this is by using ‘The lean start-up’ method (Ries, 2011) (figure 7.30), which focuses on testing and validating the principles and the business model of the policy in the earliest stage in actual environments. The data obtained from these experiments can help determine the chance of success, the effectiveness and the scalability of the policies. This method should be applied continuously so that in the long term, the policy continues to evolve and remains relevant.

It is still interesting to consider the other concepts as a partial solution or as a basis for other new concepts. They could possibly lead maybe to new policy ideas with which more value can be created and thereby increase feasibility.
In this section the Creative Policy Generation Method will be reviewed. Discussion and conclusions will be made about the method process, workshops and results. The process section will discuss the time frame of the method and the advantages and disadvantages of the tools used. The workshop section will examine the differences between the two workshops and the processes followed in the workshops. In the results section, the outcome of the method will be discussed. This section will be finally concluded with recommendations for further research.

8.1 Process

The idea of the Creative Policy Generation Method is to assess, generate and evaluate new and alternative policy concepts in an efficient manner. The timeline of this method is therefore a key indicator. Looking at the time needed for the different steps in the method, it is clear that the assessment phase is the most time consuming step. In this step, a large amount of data needs to be obtained and processed, which will subsequently be presented in a SWOT analysis of the different fields of interest (physical, institutional and social-economical). More fields of interest could have lead to a more integrated approach, but also to a more extensive assessment. The time consuming elements in this phase are:

- Literature research must be done to generate a context of the area;
- Interviews and surveys need to be prepared, conducted and turned into data that is usable as a basis for the different analytical tools;
- Setting up the hydrological model and generating the damage maps.

The upside of this extensive work is that the result can also be used in different or parallel research. The generation and the evaluation phases are less time consuming. The workshops can be planned and executed in a short time frame and the evaluation of the results of the workshops can also be done over a short period of time. However in theory, if more workshops are planned with one group in a series, more detailed ideas can be obtained. In this study two workshops were done with two separate groups, which produced more ideas instead of more detail. In table 8.1 an estimation of the duration per phase has been given assuming the work load is divided over 1 educated person.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Time (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>4</td>
</tr>
<tr>
<td>Generation</td>
<td>1</td>
</tr>
<tr>
<td>Evaluation</td>
<td>1</td>
</tr>
</tbody>
</table>

The different tools that were used in the method gave a clear overview on the preset fields of interest (physical, institutional and social-economical) in the challenges and issues of the case study.
The use of semi-structured interviews and surveys were by far the most valuable information streams compared with the other tools. The different perspectives that the interviewees shared, provided a solid basis for the research. On this basis, other tools such as the Q-method, the damage maps and the stakeholder analyses (quantitative and qualitative), could generate useful, in-depth information. The multiple perspectives from the residents and the power of the future TKPSDA (water council) are examples of this extensive information.

The strengths, weaknesses, opportunities and threats in the basin were presented in the SWOT analysis and were eventually converted into challenges in the confrontation matrix. The confrontation matrix was a very clever tool that was used to create questions that lead to challenges that were used as input for the next phase. Comparing internal advantages or disadvantages with external trends and risks immediately produced challenges that dealt with issues in the basin.

The tools that were subsequently used for the game design in the generation phase during the workshops (where solutions for these challenges were generated) were examples of games that facilitated the steps in the creative thinking process (the diamond-shaped pattern: opening, exploring and closing). This means that they could be replaced by games that pursue the same function. In this study, the games in the game design did what they were intended to do and it was more the mind-set of the participants in the workshop that created obstacles. In contrast, other games could have always been used to test, if they resulted in more and better ideas/concepts.

The business models in which these policies were presented were successful. In one overview, all elements of the policy were clear. This made the canvas a good tool not only for business propositions, but also for propositions from a policy point of view. One minor element needed to be changed to optimise the Business Model Canvas for the policies. In the policies there are not only tangible benefits, but also intangible benefits that needed to be taken into account.

The criteria that were used to evaluate the conceptual policies and business models on three levels (strategy, risk and economic value) were sufficient. If these three criteria are not broad enough to obtain a good overview of their value, a discussion can be started to address more criteria.

8.2 Workshops

As previously mentioned, the workshop took place with water management students in Bandung at the ITB and in Delft at the TU Delft. Significant differences between the two could be noted. The Indonesian students seem to have more difficulties with the idea of being creative and using alternative methodologies. In the workshop in Indonesia, the students got stuck generating solutions after they had come up with the best practices. This resulted in confusion, a slow pace and more elaborate explanation was needed. The Dutch students were quick learners and produced good results. Their ideas exceeded the traditional best practices and came to more alternative solutions.
In both groups there were start up issues, because the proper mind-set took longer to achieve. This resulted in a slow start with obvious and existing suggestions. Another factor that amplified these obvious ideas in the workshops was the lack of multiple perspectives and thus multi-disciplinary teams. Only Water Management students were present during the workshops. The presence of different perspectives in a team could lead to more alternative solutions or new combinations of existing techniques, which can generate new perspectives to solve issues in the case study. In the existing literature, Grey (2010) gives another option to develop more out-of-the-box ideas. This is done, as previously mentioned, by walking through multiple game designs in series. This can expand the pre-existing ideas into more detail and it will also place it in a new format. Due to time constraints, this was not tried in this study.

8.3 Results

Due to the fact that the preparation phase was set-up in a multi-disciplinary way, the results have an integrated character. They are not based solely on the water management practice, but also include other sciences such as social or educational aspects. These alternative concepts, which are innovative in that they bring together new combinations of techniques and practices and they can deliver value to the basin in an entirely different way. A remarkable example is the platform for residents with social and water-related initiatives, which combines different expertise and techniques.

The concepts that are presented are far from complete in that designs and specifications are missing, but due to the business model canvas overview, they have enough body to assess whether they are valuable for the case study. This ‘quick’ generation and evaluation of concepts in the Creative Policy Generation Method makes way for a broader spectrum of solutions, which otherwise would not have been considered. This can result in a more integrated way of solving issues in the future.

8.4 Conclusions

The challenge of this research was to test the applicability of the Business Model Canvas and creation tracks in Integrated Water Resources Management. The canvas and the tracks were presented in the Creative Policy Generation Method. According to the observations mentioned above, this method did prove that business models and creation tracks are applicable to policies for water management. In addition, the method stimulates a new way of solution-thinking that can offer valuable, alternative perspectives on challenges in the field of Integrated Water Resources Management. Introducing this method in a larger context will occur over time and depends on the readiness of the sector. More can only be said about the consistency of this method when it has been used more extensively. When it is used in the future, the following recommendations should be considered.
8.5 Recommendations

Process
• The preparation and elaboration of the tools in the preparation stage was extensive. In further research, other methods or a combination of this method with another study could be used to facilitate the preparation phase more quickly and save time.
• The set-up of the preparation was focused on a specific spectrum of issues. In further research, more perspectives could be considered to achieve a more complete overview of the situation.
• A construction of serial game designs could be used to come to more detailed or alternative concepts.
• More criteria could be used to evaluate the conceptual policies.

Workshops
• To test this method, more extensive workshops with real stakeholders in the case study could be of value. This could lead to answers about whether this approach is a good tool to define multi-stakeholder objectives, which could fortify the integrated approach.
• In further research, more disciplines should be invited to the workshops to test whether this could lead to more integrated policies.
• Prior to starting a workshop, an icebreaker game could be used to put the participants in the proper mind-set.
• The game design used in this research is only one way to generate ideas and concepts. Multiple designs of games are possible with the same theoretical background. In further research, these could be used to provide more variation and optimise the best path in a certain situations (people and location).

Results
• A discussion point is the explanation of the presented conceptual policies. The more detailed the concepts are, the more insights they provide and the better they can be implemented in the future. By explaining the concepts, the pace of the method is reduced and the time frame is increased, which degrades one of the advantages of this method. This is a field of tension is a point of interest for further studies.
The SWOT-analysis is a framework that is widely used in science to review strategy. Both the position and direction of an idea, the proposition or the policy can be reviewed. SWOT is an acronym for Strengths, Weaknesses, Opportunities and Threats, which refers to the 4 boxes of the tool (see figure 9.1) (Wikipedia, 2013).

The Strengths and Weaknesses are the internal factors of the proposition or policy and tend to be in the present. The Opportunities and Threats are the external factors of the proposition or policy and tend to be in the future. By assessing the policy or proposition within these boxes and predefined criteria, such as social, economic, etc., a clear idea of the state of the proposition or policy is presented.

A next possible step in the SWOT-analysis is turning the Strengths, Weaknesses, Opportunities and Threats into points of attention. By putting the Strengths and Weaknesses on the internal axis and Opportunities and Threats on the external axis, as can be seen in figure 9.2, points of attention present themselves.
By combining the two axis: Strengths and Opportunities present the obvious natural priorities.
• Strengths and Opportunities show the quick wins.
• Weaknesses and Opportunities show the potentially attractive options.
• Strengths and Threats show the options that are easy to defend and upon which a counter can be made.
• Weaknesses and Threats are points of attention that can cause potentially high risk.

The new points of attention can eventually lead to new strategies, which allows the organisation to implement the strategy in a new position.

Figure 9.2 Confrontation SWOT
9.2 Appendix – Semi-structured interviews

The semi-structured interview (West Lothian Psychological Services, 2004) is one of the most common ways to interview another person. The method attempts to make the interview more conversational by not literally asking predefined questions. In practice, the method focuses more on topics, from which information should be gathered. In this way, the interviewer can change the order of topics during the interview and formulate the questions in a way that will produce more in-depth information which is needed for the research.

A common outline for the set-up of the interview is:
- Introduction, introduce yourself and the topic of the interview.
- Warming-up, start with easy and less risky questions to get comfortable.
- Core Interview, get information which is needed for the research.
- Round-up, summarize the interview and finish with straightforward questions.
- Thank, Thank and show the interviewee appreciation for his effort and time.

Tips for conducting a good and effective interview:
- Listen
- Short, straightforward and clear questions
- Be and remain neutral
- Enjoy
- Take notes
- Be alert on where to go in-depth.

Ten interviews were conducted in this research.
1. Dr. Ir. Mohammad Hasan – Director General Water Resources Ministry of Public Works
2. Mr. Sobirin – Researcher Water Resources Research Center
3. Ir. Iwan K. Hadihardaja, MSc. PhD. – Professor Water Engineering Research Division ITB
4. Dr. Ir. William M. Putuhena – Head Experimental Station Hydrology and Watermanagement Water Research Center
5. Mr. Amiyana – Head BAPPEDA Pemerintah Kabupaten Bandung
6. Mrs. Linda – BAPPEDA West-Java
7. Mr. Suardi Natasaputra – Former Water Resources Agency DINAS West-Java
8. Dr. Hasanudin – General Manager BBWSC
9. Prof. Triweko – Rector UNPAR Bandung
10. Mr. Roestam – Former Director General Water Resources Ministry of Public Works
The analysis of economic damage in flooded areas has always been a difficult assessment. Flood damage can be divided into two types of damage: direct and indirect damage. The direct damage can be measured in the terms of economic value or currency. For example, loss of goods or real estate. More difficulties arise when assessing the indirect damage, such as nuisances and health issues. Loss of productivity is hardly measurable, especially in developing regions where there is almost no track record of production and insurance.

In this flood damage analysis (Jonkman, 2007), only the direct damage is estimated by using a so-called damage curve and the output of a hydraulic model built in the SOBEK program, a hydraulic modelling software.

The analysis consists of three stages:
1. Hydraulic Modelling in Sobek
2. Set-up Damage Curve
3. Combining the outputs of the previous steps in a Damage Map.

The hydraulic modelling is done in SOBEK. Sobek is based on the formulas of St-Vernant, which represent the movement of a long wave in a 1D environment.

In this model a Digital Elevation Map (DEM) is used to create a map of the basin and sub-basins of the area and the location of the river network in these basins. ArcGIS has a good toolset to produce these outputs. This river network and the DEM is subsequently added as layers in the SOBEK model and function as the basis for the hydraulic model. Each river segment is still dimensionless. River profiles and levels for each segment need to be added.

The next step is to insert the nodes that convert rainfall into run-off. For the rain, IDF-curves of the area were used (Mulyanto, 2009). To turn this rain into runof, the runoff-principle used is called the SCS method (Bedient, 2012), which is developed by the Soil Conversation Service and is based on a large number of unit hydrographs. The parameters that determine the dimensions of the triangular hydrograph are the average length of the basin, basin slope and curve number, which is based on land use.
These Rainfall-Runoff nodes are placed on the areas where the runoff of the sub basins enter the river. Completing these steps gives a basic hydraulic model, which can be calibrated and used.

![Simulated Storms and Rain-Runoff Nodes](image)

The model is calibrated by applying different storms with a certain return period on the model and comparing the outflow of the model with outflows that are measured with a certain return period. By adjusting the Rainfall-Runoff parameters and applying a feedback loop, the model is calibrated until realistic results are met. The hydraulic model is now ready to use for assessing the water depths in the flooded areas.

Different storms with different return periods are applied to the model. This rain is collected and transported by the river. In the locations where the river does not have enough capacity to hold the water, the water will leave the river boundaries and will drop on the DEM. In this case, a flood situation arises and the water will flow to the lowest level in the area. The water depths in these areas are those that are needed and recorded for the Damage Analysis. The result is a flood-water depth map for each storm with a different return period.

The next step in the Flood damage analysis is the set-up of the damage curves. For each land use (urban, crops, open water), different damage curves are appropriate. Much research has been conducted on the development of the damage curve. In this study, the damage curve for single story houses of the Planning and Policy Division Civil Works in the USA (Johnson, 2001) were used. The value of the houses and the crops were assessed using a survey and the market value.
The last step is to combine the damage curves, land use map and the floodwater depth map in ArcGis. By multiplying the damage curves with the water depth for each different land use with each other, a map with damage per land use is produced. Combining these different maps shows the total damage. This needs to be done for each return period. The Damage Map per return period gives an estimation of the direct damage done by the storm and which areas are very vulnerable for floods.

<table>
<thead>
<tr>
<th>Waterdepth (m)</th>
<th>Rice Damage (USD/ha)</th>
<th>Crops Damage (USD/ha)</th>
<th>Housing Damage (USD/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0,3</td>
<td>0</td>
<td>0</td>
<td>9026</td>
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<td>0</td>
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<td>48381</td>
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<td>1481</td>
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<td>1481</td>
<td>115897</td>
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<td>144781</td>
</tr>
<tr>
<td>1,8</td>
<td>2757</td>
<td>1481</td>
<td>170055</td>
</tr>
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<td>2757</td>
<td>1481</td>
<td>192079</td>
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<td>1481</td>
<td>211575</td>
</tr>
<tr>
<td>2,7</td>
<td>2757</td>
<td>1481</td>
<td>228184</td>
</tr>
<tr>
<td>3</td>
<td>2757</td>
<td>1481</td>
<td>242626</td>
</tr>
<tr>
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<td>2757</td>
<td>1481</td>
<td>254540</td>
</tr>
<tr>
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<td>2757</td>
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<td>1481</td>
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<td>1481</td>
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<tr>
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<td>2757</td>
<td>1481</td>
<td>283425</td>
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<tr>
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<td>287035</td>
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</tr>
<tr>
<td>5,4</td>
<td>2757</td>
<td>1481</td>
<td>291368</td>
</tr>
</tbody>
</table>
Figure 9.7 - 9.11 Damage Maps with return period T=2, 5, 10, 20 and 50 (from left to right)
Figure 9.12 - 9.16 Flood Maps with return period T=2, 5, 10, 20 and 50 (from left to right)
9.3.1 Considerations

Using this method to analyse the damage in a basin has some remarkable aspects:

- The pixel sizes of the different grids that are used do not have the same sizes. This makes the maps less accurate;
- The damage curves for houses are based on situations in the USA and may have a different shape in the Upper Citarum Basin;
- The average value of the houses in the basin are based on a conducted survey in the area;
- The crops and rice damage curves are based on market values and standard yields;
- The rice and crops damage curves are completely lost or not lost at the given inundation depth;
- An assumption is made about the rice and crop fields; the field are always fully cultivated;
- The time of inundation is not taken in account and can have a serious influence on the amount of damage;
- The damage to infrastructure such as roads and water structures is not taken in account;
In many projects and studies, the stakeholder analysis is needed to map the relations between parties. As a result, the literature provides numerous ways to identify and classify stakeholders in the scope of the research. The first distinction that can be made between the numerous methods with the qualitative and quantitative methods. In this study, a qualitative analysis was done, which means that the classification of the stakeholders is based on the judgement of the author and therefore can be more subjective.

To conduct a qualitative stakeholder analysis, three steps (Jepsen, 2009) should be taken in mind:
1. Stakeholder Identification
2. Stakeholder Classification
3. Stakeholder influencing strategy

**Stakeholder Identification**
The most common way to identify stakeholders is by researching literature, policies, regulations and interviewing the organisations that were proposed. Freeman (1984) referred to a stakeholder in the following way: “Any group or individual who can affect or is effected by the achievement of the organization’s objectives”

**Stakeholder Classification**
When all relevant stakeholders have been identified, the power, urgency and legitimacy are mapped (Currie, 2008). These three criteria determine the state of the stakeholder towards the project or the so-called focal organization. In figure 9.18 the possible states of the stakeholders are shown. As can be seen in the figure, three major classifications and 9 typologies were produced. These classifications and typologies are elaborated in table 9.2.

**Stakeholder Influencing Strategy**
The classifications and the typologies can provide a clearer view of which strategy should be used in the final step to influence each different stakeholder. These strategies are often based on a passive or active attitude towards the individual.
9.4.1 Considerations

- This qualitative approach provides a fairly good overview of how the powers in a complex network of stakeholders are divided. However, the relations of the stakeholders in the complex network are less clear.

<table>
<thead>
<tr>
<th>#</th>
<th>Attributes</th>
<th>Classification</th>
<th>Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power</td>
<td>Latent</td>
<td>Dormant</td>
</tr>
<tr>
<td>2</td>
<td>Legitimacy</td>
<td></td>
<td>Discretionary</td>
</tr>
<tr>
<td>3</td>
<td>Urgency</td>
<td></td>
<td>Demanding</td>
</tr>
<tr>
<td>4</td>
<td>Power and Legitimacy</td>
<td>Expectant</td>
<td>Dominant</td>
</tr>
<tr>
<td>5</td>
<td>Power and Urgency</td>
<td></td>
<td>Dangerous</td>
</tr>
<tr>
<td>6</td>
<td>Legitimacy and Urgency</td>
<td></td>
<td>Dependent</td>
</tr>
<tr>
<td>7</td>
<td>Power, Legitimacy and Urgency</td>
<td></td>
<td>Definitive</td>
</tr>
</tbody>
</table>
The qualitative stakeholder analysis is a good way to obtain an idea of how stakeholders are related to a project. However, it is less clear how the parties are related and how they depend on each other (by the exchange of goods, services, policies and financial resources). In a quantitative stakeholder analysis, these dependencies and relations are the basis for the Stakeholder Value Network (SVN) (Cameron, 2008).

**Mapping**

The SVN is a network in which all of the identified stakeholders in the system are linked by value flows. This first step in the progress is called ‘mapping’. These value flows represent goods, services, financial resources, policies or information and have a certain value based on their need importance and source importance.

**Quantify**

The need is explained by how much the flow is needed in the organisation and the source is explained by how important the source is. To quantify the source and the need importance, the multi-attribute utility theory is used (Keeney, 1984). The need intensity and the source importance is given a score between 1 and 5, based on interviews and literature research. The table gives a a final score back for the evaluated value flow between 0.01 and 0.98.

**Searching**

By linking the focal stakeholder, which represents for example the project leader, with other parties and back to the focal stakeholders, value paths or chains arise. The value paths can be evaluated by ranking their score. This score is the multiplication of each value flow in the path.

<table>
<thead>
<tr>
<th>Need Intensity Score</th>
<th>A = 0.11</th>
<th>B = 0.19</th>
<th>C = 0.33</th>
<th>D = 0.57</th>
<th>E = 0.98</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score Importance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.01</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>0.11</td>
</tr>
<tr>
<td>2</td>
<td>0.04</td>
<td>0.06</td>
<td>0.11</td>
<td>0.19</td>
<td>0.32</td>
</tr>
<tr>
<td>3</td>
<td>0.06</td>
<td>0.10</td>
<td>0.18</td>
<td>0.31</td>
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</tr>
<tr>
<td>4</td>
<td>0.09</td>
<td>0.15</td>
<td>0.26</td>
<td>0.44</td>
<td>0.76</td>
</tr>
<tr>
<td>5</td>
<td>0.11</td>
<td>0.19</td>
<td>0.32</td>
<td>0.56</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Table 9.3 Mult-attribute table (Fu, 2011)
To search all of the value paths in the network, a software tool called MatrixPath (Cameron, 2008) is used. This tool is based on dependency matrix multiplication and gives as output all of the value paths based on the focal organisation and their score.

![Figure 9.19 Path Score Calculation (Fu, 2011)](image)

**Analysing**

To analyse the outcome of the MatrixPath software, two statistical indicators are introduced. The Weighted Stakeholder Occurrence (WSO) and the Weighted Value Flow Occurrence (WFVO).

\[
WSO = \frac{\text{Score sum of value paths containing a specific stakeholder}}{\text{Score sum of all the value paths}}
\]

\[
WFVO = \frac{\text{Score sum of value paths containing a specific value flow}}{\text{Score sum of all the value paths}}
\]

The WSO indicates the relative importance for each different stakeholder in the network in relation to the focal organisation. The WVFO does the same for all of the different value flows in the network. Analysing these indicators can give an alternative view of the stakeholder involvement strategy.

**9.5.1 Eleboration**

The results of mapping and identifying the stakeholders are presented in figure 9.20 where the links or value flows are quantified. The results are in table 9.4. Using the Matrixpath software, the stakeholder map and quantified value flows as input gives all of the value paths possible. The top ten value paths are shown in table 9.5. These value paths can be turned into the statistics using the WSO and WVFO for each stakeholder and value flow. The MatrixPath software has a built in function to retrieve these results. These value paths can be turned into the statistics using the WSO and WVFO for each stakeholder and value flow. The MatrixPath software has a built in function to retrieve these results (figure 9.21 and 9.22)

These statistical indicators are the final result of the SVN and are the basis for the review of the stakeholder system.
9.5.2 Considerations

Some considerations have been considered when introducing this analysis:

- The stakeholder system boundaries and limits. What are the limits of stakeholder involvement and to what level is disintegration of the stakeholders needed?
- The need and source importance is based on interviews and literature research. How quantitative is this?
Table 9.4 Value Flow Score

<table>
<thead>
<tr>
<th>To</th>
<th>From</th>
<th>Value Flow</th>
<th>Flow Category</th>
<th>Source</th>
<th>Need Intensity</th>
<th>Importance</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provincial</td>
<td>BBWS</td>
<td>Policy</td>
<td>Political</td>
<td>0.33</td>
<td>0.98</td>
<td>0.96</td>
<td>0.32</td>
</tr>
<tr>
<td>Central</td>
<td>BBWS</td>
<td>Policy</td>
<td>Political</td>
<td>0.98</td>
<td>0.98</td>
<td>0.96</td>
<td>0.98</td>
</tr>
<tr>
<td>Cultivation</td>
<td>BBWS</td>
<td>Safety</td>
<td>Goods &amp; Services</td>
<td>0.98</td>
<td>0.19</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td>Residents</td>
<td>BBWS</td>
<td>Safety</td>
<td>Goods &amp; Services</td>
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<td>0.19</td>
<td>0.19</td>
<td>0.19</td>
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<tr>
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<td>BBWS</td>
<td>Safety</td>
<td>Goods &amp; Services</td>
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<td>0.19</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td>Business</td>
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<td>Safety</td>
<td>Goods &amp; Services</td>
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<td>0.19</td>
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<td>0.11</td>
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Table 9.5 10 Highest Scoring Value Paths

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<tr>
<th>Length/Score</th>
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<th>Source</th>
<th>Need Intensity</th>
<th>Importance</th>
<th>Score</th>
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<td>0.33</td>
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</tr>
<tr>
<td>3 0.30</td>
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<td>Regulations(Central,BBWS)</td>
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<td>0.55</td>
</tr>
<tr>
<td>4 0.29</td>
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<td>Regulations(Central,Provincial)</td>
<td>Opinion(Provincial,TKPSDA)</td>
<td>Advice(TKPSDA,BBWS)</td>
<td>0.98</td>
</tr>
<tr>
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<td>Policy(Central,Provincial)</td>
<td>Opinion(Provincial,TKPSDA)</td>
<td>Advice(TKPSDA,BBWS)</td>
<td>0.98</td>
</tr>
<tr>
<td>4 0.29</td>
<td>Policy(BBWS,Central)</td>
<td>Regulations(Central,District)</td>
<td>Opinion(District,TKPSDA)</td>
<td>Advice(TKPSDA,BBWS)</td>
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<td>4 0.28</td>
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<td>Regulations(Central,District)</td>
<td>TaxCollection(District,Provincial)</td>
<td>Advice(TKPSDA,BBWS)</td>
<td>Opinion(Provincial,TKPSDA)</td>
</tr>
<tr>
<td>4 0.17</td>
<td>Policy(BBWS,Central)</td>
<td>Regulations(Central,Provincial)</td>
<td>Coordination(Provincial,TKPSDA)</td>
<td>Advice(TKPSDA,BBWS)</td>
<td>0.98</td>
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<tr>
<td>4 0.17</td>
<td>Policy(BBWS,Central)</td>
<td>Policy(Central,Provincial)</td>
<td>Coordination(Provincial,TKPSDA)</td>
<td>Advice(TKPSDA,BBWS)</td>
<td>0.98</td>
</tr>
</tbody>
</table>
Figure 9.21 WSO Scores

Figure 9.22 WVFO Scores
The Q-Methodology (Brown, 1993), is a method that is used in surveys to extract individual perspectives and turn them into shared perspectives. The method is widely used in social sciences, to uncover patterns that can be found in peoples' subjectivity. The advantages of the method are (Cuppen, 2010; Raadgever 2011):

- The Q-method can uncover perspectives or points of view in a discussion without using predefined categories.
- It assesses every individual respondent as a whole and does not use objective attributes from the respondent.
- The method analyses the variety of perspectives in a debate rather than the level of support for each perspective.
- Q methodology intends to analyse the perspectives in valuation of the context (the other perspectives).
- The method can be used in a small sample of respondents; the fact that there is another perspective on the matter is enough to include this perspective.

The execution of the method consists of five succeeding steps.

1. Collection, Collecting all of the possible statements about the topic.
2. Statement Selection, Selection of the most relevant statements, the so called Q-set.
3. Respondent Selection, Selection of the respondents, the P-set.
4. Sorting and Interview, The sorting of the statements by the respondents, while interviewing them about their choices at the same time.
5. Analysis and Interpretation, Analysis of the results by using the PQ method software and interpretations of the results.

9.6.1 Elaboration

Collection
During the interviews and in reviewing the literature, approximately 60 statements were collected. These statements were distributed over a large spectrum of opinions and priorities. The statements were categorised based on the following categories: living, active, health, help, relocation, finance and education.

Statement Selection
To create an understandable Q-set for the residents of the Upper Citarum Basin, who have no experience with large and deliberated questionnaires, only 18 statements could be selected. This was done by trying to include each category in an even way. The following statements were included (see table 9.7).
Respondent Selection

The respondents were selected (the P-set) from two different areas. The first area is an area where floods are a daily problem, Dayeuhkolot, and the second area is an area where floods used to be a daily problem, Tegalluar. In this second area the government normalised the river and thus created safer living conditions. In these areas approximately 30 families were asked to contribute to the research, which finally became a final count of 58 respondents.

Sorting and Interviewing

The families that wanted to contribute to the research, were asked to prioritise the statements using the Q-sort (see figure 9.23). In this way, the top and bottom statements receive more relevance and subjectivity is filtered out. The values that could be given to each statement was between 3 and -3. After ranking, the families were asked to give arguments for the top and bottom statements. These arguments helped to analyse the results of the Q-method.

Analysis and Interpretation

To analyse the outcome of the 58 Q-sorts, the PQmethod software was used. This method uses a factor analysis and a varimax rotation to filter out different factors or perspectives. The number of factors chosen to use in the analysis was an iterative process.

First, each including factor needed to be given an eigenvalue of 1 or higher (Brown, 1993). To create better results and to see difference between the perspectives, each perspective had to have at least 5 significant loadings. A significant loading was in this case a significant factor loading of 0.5 and a 0.1 difference with other loadings (Raadgever, 1993). The next step was to select which Q-sorts define each factor. This is the input for the further analysis of the PQmethod software, which calculates the ultimate factor scores. The output produced by the software can be used to define the different perspectives on content and meaning. In addition, it gives the correlation between the different perspectives. In tables 9.7 – 9.12 the correlation factor can be found and the results of the final analysis of the perspectives and their significant loadings per respondent group are shown.
9.6.2 Considerations

While conducting this survey some considerations came to mind, which should be taken into account:

- The residents of the two survey areas sometimes had difficulties understanding the overall survey. Results of this analysis could be affected by this.
- The selection of the statements was done by hand categorising and selecting. This is subjective and could therefore have influenced the results.

<table>
<thead>
<tr>
<th>#</th>
<th>Statements</th>
<th>Category</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>If I could change my living conditions, I would not change a thing.</td>
<td>Living</td>
</tr>
<tr>
<td>2</td>
<td>I want better living conditions and I like to contribute financially.</td>
<td>Active</td>
</tr>
<tr>
<td>3</td>
<td>I want better health protection against pollutants and garbage in the water during flooding.</td>
<td>Health</td>
</tr>
<tr>
<td>4</td>
<td>I want no more damage to my house because of flooding.</td>
<td>Living</td>
</tr>
<tr>
<td>5</td>
<td>I want to be warned before flooding, so I can prepare myself.</td>
<td>Help</td>
</tr>
<tr>
<td>6</td>
<td>I am more productive when there is no flooding</td>
<td>Living</td>
</tr>
<tr>
<td>7</td>
<td>I want the government to protect me from these flooding</td>
<td>Help</td>
</tr>
<tr>
<td>8</td>
<td>I want to help creating better living conditions in my neighbourhood.</td>
<td>Active</td>
</tr>
<tr>
<td>9</td>
<td>I want to get relocated to a flood-free location under the condition of financial support.</td>
<td>Relocation</td>
</tr>
<tr>
<td>10</td>
<td>I want the government to pay for the damage created by flooding.</td>
<td>Finance</td>
</tr>
<tr>
<td>11</td>
<td>I want financial support, so I can protect my house from flooding.</td>
<td>Finance</td>
</tr>
<tr>
<td>12</td>
<td>I want to give my opinion in creating better water resources policies.</td>
<td>Active</td>
</tr>
<tr>
<td>13</td>
<td>I have learned to protect myself from the flooding.</td>
<td>Education</td>
</tr>
<tr>
<td>14</td>
<td>I want better rescue teams during flooding.</td>
<td>Help</td>
</tr>
<tr>
<td>15</td>
<td>I want more help in recovering and cleaning-up from the flooding.</td>
<td>Help</td>
</tr>
<tr>
<td>16</td>
<td>I want to learn how to protect myself from flooding.</td>
<td>Education</td>
</tr>
<tr>
<td>17</td>
<td>I would like to move to a safer, flood-free place.</td>
<td>Relocation</td>
</tr>
<tr>
<td>18</td>
<td>I am scared of floods and this is giving me a lot of stress</td>
<td>Health</td>
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</table>

<table>
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<th>1</th>
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<td>Dayehkolot</td>
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<td>6</td>
<td>1</td>
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<tr>
<td>Tegalluar</td>
<td>5</td>
<td>2</td>
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<td>Total</td>
<td>16</td>
<td>8</td>
<td>12</td>
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Table 9.8 Significant Loadings per area

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<td>1</td>
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<tr>
<td>3</td>
<td>0.477</td>
<td>0.3132</td>
<td>1</td>
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<td>4</td>
<td>-0.1847</td>
<td>0.0138</td>
<td>-0.108</td>
<td>1</td>
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</table>

Table 9.6 Correlation Perspectives
I want to get relocated to a flood-free location under the condition of financial support.
I want the government to pay for the damage created by flooding.
If I could change my living conditions, I would not change a thing.
I want to help creating better living conditions in my neighbourhood.
I want better living conditions and I like to contribute financially.
No point in spending more money the results will be the same
Want to move to a safer place
It is the government’s duty

Statement Agree
I want no more damage to my house because of flooding.
I want better health protection against pollutants and garbage in the water during flooding.
I want to get relocated to a flood-free location under the condition of financial support.
I want better living conditions and I like to contribute financially.
If I could change my living conditions, I would not change a thing.

Distinguishing Statements Agree
I am more productive when there is no flooding
I want to get relocated to a flood-free location under the condition of financial support.

Distinguishing Statements Disagree
I want no more damage to my house because of flooding.
I want to get relocated to a flood-free location under the condition of financial support.

Relevant Reasons
1. Low financial resources
2. God’s will
3. People do not have any resources to overcome the flood,
4. Why do we not change while we can, we have to be a better human
5. Health is the most important
6. Health is No. 1
7. It brings difficulties to others
8. If the government gives guarantees it feels safe
9. Stress as a relation to the floods

Table 9.9 – 9.12 Q Factors or Perspectives
To structure the creative sessions, tools or games were used. Using these tools facilitated the proper mind-set for generating ideas and forced a creative output. The sequencing of these tools is a called a creation track and follows the ‘diamond’ theory. (Tassoul, 2009) A theory which is commonly used in design thinking.

The ‘diamond’-theory describes three stages: Opening (Diverging), Exploring and Closing (Converging). For each stage, different kinds of tools are in place, which give the output that is needed. Many tools are developed for each stage, as can be seen for example, in game storming from David Gray (2010) and Creative Facilitation from Marc Tassoul (2009). In this research, only one specific track was used and tested.

Running through creation tracks is a team activity, because interaction is needed. In the opening stage, the purpose of this team is to generate as many ideas as possible to the problem that is introduced. By envisioning the problem and mapping opportunities, the first directions of solutions or ‘fuzzy goals’ present itself.

The first tool that was used by the team and took place is called ‘Mission Impossible’. The set, fuzzy goals are used in this tool and reframed into an extreme mission. This empowers the group to think in a more extreme way and bring up out-of-the-ordinary ideas.

Once the ‘Mission Impossible’ is set, the ‘Brainwriting’ tool is used. This tool is a specific ‘diverging’ tool, because it’s output is ideas. In the ‘Brainwriting’ process, the idea is to build upon previous ideas from the team members.

Figure 9.24 Diamond Theory, which represents the divergence and convergence of ideas in a creation track
After generating numerous ideas in the first stage, the next stage (the Exploring stage) is introduced. This stage is characterized by combining and discussing the ideas on the table. In this case, the Concept-Cluster Map tool is used, which motivates the team to cluster the ideas into concepts that represent possible solutions.

In the last stage, the concepts are ranked by using the SMART-tool, which is a converging tool. Each concept is evaluated on the SMART-criteria: Specific (does it solve the problem?), Measurable (can we measure its effectiveness?), Acceptable (is it an ethical solution?), Realistic (can we implement it?) and Time bounded (can we implement it in a certain time period)? The evaluation brings forward the best concepts, which are explained by a visual model or storyline. These concepts are the basis for setting the new business model in the business model canvas.

9.7.1 Games

Mission Impossible
Time: 15 minutes

Reframe your solution direction or problem into a mission that seems impossible. For example: “When I grow old I want a Ferrari” into “Tomorrow I want to have 100 Ferrari’s”.

Brainwriting
Time: 15 minutes

Brainwriting is a dynamic activity that is done in silence. The game starts by dividing a large surface (for example a large sheet of paper) into multiple sections. Each team member starts by writing his first idea in one of the sections. Now each team member moves to another section and reads the other idea, ads his version of the idea and moves to the next section. In this way a rotation between the different sections is constructed. By continuing this process, numerous ideas are generated.

Concept-Cluster Map
Time: 25 minutes

Ideas are generally part of a larger concept. When putting ideas side-by-side in a discussion, concepts arise. To facilitate this progress, the ideas can be written down on a sticky note. All of the sticky notes with ideas can be clustered and the cluster is given a name. In this way multiple concepts are being created.
The SMART analysis is a converging or closing tool. By using the SMART-criteria (Specific, Measurable, Acceptable, Realistic and Time bounded) the best ideas or concepts arises. This is done by marking each concept with a grade from 1 to 10 for each criteria. The sum of these marks provides an idea of which concept is the best and worthy of elaborating on.
In 2010, Alexander Osterwalder published the theory of the Business Model Canvas in the book Business Model Generation. This book is based on thousands of business cases and is presenting the Business Model Canvas. The Business Model Canvas is a strategic tool that is used to see how a business concept catches, creates and delivers value. All of the facets of what is needed and what needs to be done to run a business comes forward. An important note must be made about the Business Model: A Business Model is not a process, but a representation of a state (Shafer, 2005; Lambert, 2012). This means that a complete canvas needs to be seen as a balance between the different business elements.

To create, catch and deliver value in a business concept, different elements in a business model need to be fulfilled. The Business Model Canvas contains these elements in the following shape (see figure 9.26).

Figure 9.26
Business Model Canvas
(Osterwalder, 2011)
As the figure shows, the Business Model Canvas consists of 9 elements which can be divided into cost and revenue sides of the model.

**Value Proposition (VP)**
The VP is the most important aspect of the Business Model. This aspect contains the product or service that is offered, but more importantly, the value the product or service provides.

**Customer Segments (CS)**
In the customer segments, the target group is presented to which value must be delivered. This can be customers with a certain age, job, lifestyle, etc.

**Channels (CH)**
To bring the value in the shape of a product or service to the customer, a channel needs to be created. This channel makes the value available for the selected customer segments.

**Customer Relations (CR)**
To keep the customers up-to-date about what is happening within the business concept, a customer relation department should be established. In this way the customer knows where and how they can obtain the product or service and what the new developments are in the concept.

**Revenue (REV)**
When the value is delivered to the customer, at a certain cost, a revenue is obtained. The revenue can be obtained through different channels, products or services. The combination of the CS, CH and CR is called the revenue side of the Business Model Canvas, because this side is delivering the value.

**Key Activities (KA)**
To create value for the product or service, certain activities must be completed. In the Key Activities aspect, these activities arise because they are essential for producing the needed value for the business concept. Less obvious, but even important are the activities that are needed to run a business (Administration, Finance, etc.) These activities also need to be mentioned in the KA aspect.

**Key Resources (KR)**
To fulfil the activities and achieve the value proposition, resources are often needed. These resources emerge in the KR aspect of the canvas. Resources can be anything from expertise and labour to patents and material.
Key Partners (KP)
If one of the resources or activities cannot be produced or achieved inside the organisation, a business partner should come forward. This partner can, for example, provide expertise and resources, that are essential for creating the needed value.

Costs
The KR, KA and KP are often referred to as the cost-side of the canvas. In the cost aspect, these are the costs that make the value proposition become clear.

In the next section, the Business Model Canvas is briefly explained by the Nespresso business model and gives a clearer view of how the Canvas works in reality.
9.8.1 Example

The VP must first be set, because this is the foundation on which the concept is built. The VP in the Nespresso Business Model is to have a delicious coffee without needing an expensive coffee machines. The customer segments that Nespresso focuses on are the people who drink coffee at home or during their work hours.

To bring this delicious coffee to their customers, they use multiple channels such as the large Nespresso brand stores, the internet and deliveries. To keep their regular customers updated on their new coffee and the Nespresso lifestyle, an exclusive community was started. By delivering the coffee, their value proposition is fulfilled and they earn an income by selling coffee cups and coffee machines. This can be found in the REV aspect.

On the cost-side of the Canvas, the activities and resources become clear. The activities in the Nespresso example are the development of the patent for the concept, the Nespresso community and the production of the coffee. To fulfill these activities and ultimately the VP, a factory, marketing and transportation are needed. Because Nespresso has no ambitions to produce coffee machines, they have involved a partner, who produces the Nespresso coffee machines. All of these aspects, KA,KR and KP, are costs and can be found in the cost-aspect.

The Business Model Canvas is a well-established tool in business science and in practice. In this research, the applicability of the tool in Integrated Water Resources Management policies was tested.
9.9 Appendix – Policies and regulations

List of presidential and governmental laws, decrees and acts.

- The Constitution of 1945
- Law No. 7/2004 regarding Water Resources
- Law No. 32/2004 regarding Local Governance
- Law No. 26/2007 regarding Spatial Planning
- Law No. 24/2007 regarding Disaster Relief
- Law No. 32/2009 regarding Protection and Environmental Management
- Government Act No. 38/2011 regarding River
- Government Act No. 16/2006 regarding Development of Drinking Water Supply System
- Government Act No. 20/2006 regarding Irrigation
- Government Act No. 42/2008 regarding Water Resources Management
- Government Act No. 43/2008 regarding Groundwater
- Government Act No. 37/2010 regarding Dam
- Government Act No. 12/2008 regarding National Water Resources Council
- The Establishment of Water Resources Management Coordination Board in Provincial, District and River Basin Territory Level.
9.10 Appendix – Literature


Natasaputra, M. S. (2013, January 28). Interview Mr. Suardi Natasaputra. (A. M. Schlochtern, Interviewer)


9.11 Appendix – Acknowledgements

The final paragraph of this Master Thesis Report I would like to use to thank people who have helped me accomplish and compile the research within this report.

I would like to thank my graduation committee, Olivier, Nick, Reza and Robert in the Netherlands for their critical opinions and giving me the opportunity to go to Bandung, Java, Indonesia to collect the data there myself.

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I would like to thank the students of HMS at ITB for helping me conducting the surveys and showing me the way in the Upper Citarum Basin and Bandung.

I would like to thank the interviewees for their time and patience to answers my questions.

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