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Simulation Tool for River Management

STORM - Rhine

Main report
User Manual for the Roleplay

July 2002

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STORM Report Series:

1. STORM – BETUWE, Final Report, Design of the Roleplay
Schmidt, A.L., October 1998

2. STORM – BETUWE, User Manual, Design of the Roleplay
Schmidt, A.L., October 1998

3. STORM – DELTA, Definitiestudie: demonstratiemodel voor Rivierinrichting

4. STORM – DELTA, Main Report, Design of the Model
De Graaff, B.J., December 1999

De Graaff, B.J., December 1999

6. STORM – RHINE, Main Report, Executive Summary

7. STORM – RHINE, Main Report, Design of the Roleplay

7A. STORM – RHINE, Main Report, Annex A, Documentation on Models on Water
Werner, M., March 2002


9. STORM – RHINE Supporting Document 1: Dutch-German Water Management of the
River Rhine, MSc. thesis
Bijman, S., January 2002

10. STORM – RHINE Supporting Document 2: Deciding about Safety; Flood Protection &
Decision-Making Processes in Germany at the local level; M.Sc.thesis
Leene, T.A., August 2002
The IRMA-SPONGE Umbrella Program

In recent years, several developments have contributed not only to an increased public interest in flood risk management issues, but also to a greater awareness of the need for improved knowledge supporting flood risk management. Important factors are:

- Recent flooding events and the subsequently developed national action plans.
- Socio-economic developments such as the increasing urbanisation of flood-prone areas.
- Increased awareness of ecological and socio-economic effects of measures along rivers.
- Increased likelihood of future changes in flood risks due to land use and climate changes.

The study leading to this report aimed to fill one of the identified knowledge gaps with respect to flood risk management, and was therefore incorporated in the IRMA-SPONGE Umbrella Program. This program is financed partly by the European INTERREG Rhine-Meuse Activities (IRMA), and managed by the Netherlands Centre for River Studies (NCR). It is the largest and most comprehensive effort of its kind in Europe, bringing together more than 30 European scientific and management organisations in 13 scientific projects researching a wide range of flood risk management issues along the Rivers Rhine and Meuse.

The main aim of IRMA-SPONGE is defined as: "The development of methodologies and tools to assess the impact of flood risk reduction measures and scenarios. This to support the spatial planning process in establishing alternative strategies for an optimal realisation of the hydraulic, economical and ecological functions of the Rhine and Meuse River Basins." A further important objective is to promote transboundary co-operation in flood risk management. Specific fields of interest are:

- Flood risk assessment.
- Efficiency of flood risk reduction measures.
- Sustainable flood risk management.
- Public participation in flood management issues.

More detailed information on the IRMA-SPONGE Umbrella Program can be found on our website: www.irma-sponge.org.

We would like to thank the authors of this report for their contribution to the program, and sincerely hope that the information presented here will help the reader to contribute to further developments in sustainable flood risk management.

Ad van Os and Aljosja Hooijer
(NCR Secretary and IRMA-SPONGE project manager)
Report Title:
STORM-Rhine
Main Report – User manual for the Roleplay

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<td>32</td>
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</tbody>
</table>
1 Introduction STORM Rhine

1.1 STORM Rhine Objectives

STORM stands for Simulation TOol for River Management. It is a role play which allows the participants to gain insight in river and floodplain management issues, using the example of the Rhine river in Western Europe. The main objective of the role play STORM Rhine is to demonstrate the need for coherent interaction between the different stakeholders in river management. A simplified hydraulical model underlies the simulation and allows for the visualization of effects of measures taken by the various actors during the role play.

It should be noted however, that the purpose of the role play is not to come up with technical solutions for practical problems, as would a Decision Support System. The interaction between stakeholders and the gaining of insight into the different roles is the main issue. The system model underlying the simulation is too much of a simplification of the complex interaction of river functions and performance to serve as a practical decision-making tool.

1.2 Players

The role play is intended for all with responsibilities and / or interests relating to river and floodplain management. It can be used by government departments at the local, regional, national and international levels, but also by interest groups and students. A mix of different stakeholders participating in the simulation exercise together may lead to greater insight in the interests of the other parties. It is not necessary for the participants to play only their own professional roles. One may even gain a better idea of what drives the other stakeholders by trying on such an alternative role.

There are 8 roles defined in the role play:

1. The national government of Germany
2. The regional government responsible for the Left River Bank (Germany)
3. The regional government responsible for the Right River Bank (Germany)
4. The local government Urban Municipalities (Germany)
5. The local government Rural Districts (Germany)
6. The national government of the Netherlands
7. The local government Rural & Urban (Netherlands)
8. An international environmental lobby group
Each role has its own responsibilities and sphere of influence, based on a very broad generalization of actual actors in river management. In most cases it is not possible to implement a desired measure without the consent of other stakeholders, since the effects of the action of one player may infringe on the rights or responsibilities of other players. For each role information is provided concerning objectives, mandates, locations and measures to be taken. The available measures per role are also described and provided with an indication of the expected output.

1.3 Setting

The simulation is distilled from a part of the Rhine river, from Maxau, near Karlsruhe in southern Germany to the three Dutch river branches: Waal, Lek and IJssel. The participants are assigned to small groups (preferably consisting of 2 to 3 people) to best represent the objectives and interests of one of the roles within a given flow regime. Three flow levels are considered normative:

- The maximum flow requires careful consideration, since a main problem to be dealt with by most roles is the minimization of flood risks.
- The nominal flow represents the flow level important for river bed erosion and sedimentation, which in turn strongly affects river morphology and water levels.
- The critical flow is a level below which river transport is significantly hindered, with subsequent negative effects for the economy.

An additionally important criteria for most roles is the effect of measures on the natural environment of the floodplains.

Within a timeframe of 1 to 1½ hours each role is given time to select, obtain the necessary permits, and implement selected measures (within their mandate) to seek to achieve the best results for the river and floodplains over a 20 year period. The cumulative effect of the measures are then calculated by the system model and the results presented and visualized with respect to selected performance indicators. The game leader will evaluate the model output with the participants. After a break a second round can be played, taking into account the lessons learned from the first round.

1.4 Makers

The role play STORM Rhine is a cooperative effort of IHE Delft, Resource Analysis and Delft Hydraulics. The project was sponsored by IRMA - Sponge and Delft Cluster. Two other simulations were developed by IHE with its partners on the same theme: STORM Betuwe (1998), which deals specifically with the physical planning process in the floodplains of a hypothetical stretch of the river Rhine in the Netherlands. STORM Delta (1999) is a one-player simulation dealing with the management of the lower Rhine branches and floodplains in the Netherlands: Lek, Waal and IJssel.
2 Installing STORM Rhine

2.1 System Requirements

Software:
- Windows 98 SE or Windows NT 4 with service pack 6 or Windows 2000 or Windows XP
- Internet Explorer 5 or 6
- Map Objects Lite V2.0

Hardware
- Pentium, 200 Mhz
- 64 Mb internal memory
- 100 Mb hard disk space
- Screen resolution of 1024x768 using small font

2.2 CD-Contents

<table>
<thead>
<tr>
<th>CD:</th>
<th>File</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>/readme.rtf</td>
<td>This file.</td>
<td></td>
</tr>
<tr>
<td>/readme.exe</td>
<td>Application to view this file.</td>
<td></td>
</tr>
<tr>
<td>/CDShell.exe</td>
<td>Installation starter</td>
<td></td>
</tr>
<tr>
<td>/setup</td>
<td>contains setup for the Storm program.</td>
<td></td>
</tr>
<tr>
<td>/IE5</td>
<td>contains setup for Internet Explorer 5.</td>
<td></td>
</tr>
<tr>
<td>\NETFRAMEWORK</td>
<td>contains setup for NET Framework</td>
<td></td>
</tr>
<tr>
<td>\NETFRAMEWORKSP1</td>
<td>contains setup for NET Framework SP1</td>
<td></td>
</tr>
</tbody>
</table>
2.3 Installation Process

1. Remove any previous installations of Storm.
2. Close all applications and disable anti-virus software.
3. In case of a Windows NT or Windows 2000 system make sure you have (local) administrator rights.
4. Insert the CD-ROM in the CD-ROM drive. Depending on the configuration of your system the CDSHELL program will be automatically launched. If the program is not automatically started, start the CDSHELL program manually.
5. Install IE5 by selecting Install Internet Explorer 5 from the menu. The install program for IE5 will be started. Follow the instructions on the screen. (If IE5 is already installed on your system you can skip this step).
6. Install NET Framework by selecting Install NET Framework from the menu. The install program for NET Framework will be started. Follow the instructions on the screen. (If NET Framework is already installed on your system you can skip this step).
7. Install NET Framework Service Pack 1 by selecting Install NET Framework Service Pack 1 from the menu. The install program for NET Framework Service Pack 1 will be started. Follow the instructions on the screen. (If NET Framework Service Pack 1 is already installed on your system you can skip this step).
8. Install Storm by selecting Install Storm from the menu. The install program for Storm will be started. Follow the instructions on the screen.

2.4 Starting the Programme

From the start menu select Programs, Resource Analysis, Storm.

If no shortcut is available, go to the installation directory and select appstart.exe.
3 Working with STORM Rhine

3.1 The STORM Role Play Context

The STORM Role Play requires a group of people to take on the roles of 8 generalised stakeholder institutions / organisations involved in river management. Each institution may consist of one to approximately 5 members. The number of participants in the role play may therefore vary between 8 and 40, excluding a game leader and possible assistants.

Per role a specific set of objectives and conditions are given, as is described in the Annex of this manual. These objectives and conditions may be adapted to suit the specific situation of the Role Play session. However, it is best to agree on changes to the original setting with the all the players, only after the original settings have been used in one or more sessions, or under the leadership of an experienced game leader. Whatever the setting, the participants should take some time at the start of the Role Play to read through, discuss and agree on their role’s overall vision, specific objectives, conditions and parameters and the best approach to reach their desired results. It is essential to remember that in practically all cases it will be impossible to reach your objectives without the support, permission or agreement of the other stakeholders!

Each role has specific jurisdiction over a certain area of the river and/or its banks. This has been grossly simplified from the very complex real situation in which government departments at many levels and from many sectors have jurisdiction over a specific element of river management.

The Role Play is supported by the STORM software, which needs to be installed as described in the previous chapter. The software may be installed on one stand-alone computer, with data inserted by the game leader (or an assistant) and projected on a screen for the participants. The Role Play is also suited for playing over a Local-Area Network, with each of the 8 roles having their own computer to enter data. The game leader will also need a computer to facilitate the exchange. In general he/she will provide for the synchronous projection of information on an overhead screen. The Network Setting is still under development at this time (STORM Version 1.0.0.3). The information provided in this manual refers to the stand-alone setting.
General information on STORM is provided by clicking the Intro button.

**Introduction STORM Rhine**

**STORM Rhine Objectives**

STORM stands for Simulation Tool for River Management. It is a role play which allows the participants to gain insight into river and floodplain management issues, using the example of the Rhine river in Western Europe. The main objective of the role play STORM Rhine is to demonstrate the need for coherent interaction between the different stakeholders in river management. A simplified hydraulic model underlies the simulation and allows for the visualization of effects of measures taken by the various actors during the role play.

It should be noted however, that the purpose of the role play is not to come up with technical solutions for practical problems, as would a Decision Support System. The interaction between stakeholders and the gaining of insight into the different roles is the main issue. The system model underlying the simulation is too much of a simplification of the complex interaction of river functions and performance to serve as a practical decision-making tool.

**Players**

The role play is intended for all with responsibilities and/or interests relating to river and floodplain management. It can be used by government departments at the local, regional, national and international levels, but also by interest groups and students. A mix of different stakeholders participating in the simulation exercise together may lead to greater insight in the interests of the other parties. It is not necessary for the participants to play only their own professional roles. One may even gain a better idea of what serves the other stakeholders by trying on such an alternative role.
3.2 Setting up a River Management Case

Step 1 Logon as Operator

To change from the default Administrator setting and start the session, click on Logon under File in the Menu bar. Then type Operator in the Logon dialog box. At the top of the blue bar the User: Administrator is now replaced to User: Operator.

Step 2 Start a new case: Select New from the Storm menu.

Step 3 Set the parameters for your case:

- Click on Operator in the blue vertical bar on the left side of the screen.
- Click on Cases in the list box.
- Click on New at the bottom of the Case list box and add a new name in the dialog window for the case to start with and click OK (once a case has been defined and saved, it may be chosen again in a next role play session; you do not necessarily have to name a new case every session).
Step 4  Skip the Scenario option for now to name a Strategy:

- Click on Strategies in the Project list box.

- Click on New at the bottom of the Strategy list box and add a new name in the dialog window for the case to start with and click OK (once a strategy has been defined, it may be chosen again in a next role play session; you do not necessarily have to select a new case every session).
Step 5 Calculate basic hydraulic conditions before measures are implemented:

- Return the to Cases in the Project list box.
- Click on the Case name in the Cases list box you entered in Step 2.
- For the Previous Case select None from the new pull-down list box.
- Select a Scenario from the Scenario pull-down list (See also Table 1 on STORM Scenario’s)
- And select your strategy in the Strategy pull-down menu.
- Then press Calculate

### Table 1: STORM Scenarios

<table>
<thead>
<tr>
<th>Scenario 1: 1993 Flood Event</th>
<th>The first two scenarios consider two recent major flood events, December 1993 and January 1995, which both lead to extensive flooding and damage. The genesis of both events was relatively similar with the Mosel tributary being one of the major contributors.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 2: 1995 Flood Event</td>
<td>Similar to Scenario 2 except that the contributing hydrographs have been shifted in time to result in maximum accumulation and least attenuation of the flood wave.</td>
</tr>
<tr>
<td>Scenario 3: 1995 Flood Synchronised</td>
<td>Design discharge equivalent to a return period of 1 in 1250 years at the Dutch-German border. Relative contribution of upstream tributaries estimated based on the 1993 and 1995 flood events.</td>
</tr>
<tr>
<td>Scenario 4: 16000 m³/s at Lobith</td>
<td>Same basis as Scenario 4, however with a 10% increase in design (maximum) floods and a 10% decrease in critical (minimum) flows due to projected structural precipitation and temperature changes.</td>
</tr>
<tr>
<td>Scenario 5: Climate Change</td>
<td>Same basis as Scenario 4, however with a 10% increase in design (maximum) floods and a 10% decrease in critical (minimum) flows due to projected structural precipitation and temperature changes.</td>
</tr>
</tbody>
</table>
Step 6  Finalize the setting up of the case:

In the same view…

- Do not select a Base Case yet (this may be done when comparing different cases, after a first Role Play session has been completed and the case has been saved).
- After the calculation is finished, select your case in the Current Case pull-down box and press Apply.

Note that the blue bar buttons (Input: Branches, Players; and Output: Branches, Criteria, Reports) are now activated and measures can be taken for different river branches by the different actors.
3.3 Taking River Management Measures

The input into STORM consists of measures to be taken by the different actors or players in the Role Play. The river management objectives and tools for each of the players are described in an information box per player. Information is also provided about the area of responsibility and on the (hierarchical) relationships between players. This information can be accessed as soon as a Case has been set up and calculated as described in Part 2.

All the buttons in the left-hand blue bar are now active and in order to view the information for the different roles, click on the Input Players button. Clicking on the small plus in front of Players in the Players field to fold out the list of players. Clicking on one of the roles and the Description button on the right hand side of the screen provides the detailed background information on each of the roles.

Information is provided on:

- The name of the role / player
- The country in which the role is active
- The area of interest, this is the geographical area for which the role has the authority to take measures or to give permissions, agreement or advice on measures to be taken by other players
- Overall objectives for the role are suggested, as well as
- Specific objectives and tools by which to reach those objectives.
- Decision parameters show the mandate the role has in terms of actions it is allowed to take in its area of interest
- Financial parameters suggest available funds for implementing measures and supporting other roles.

An overview of the Roles, Objectives, Criteria and Areas of Interest is provided in Table 2.
<table>
<thead>
<tr>
<th>Code</th>
<th>Organization</th>
<th>Objectives</th>
<th>Criteria</th>
<th>Area of Interest</th>
</tr>
</thead>
</table>
| G1   | Federal Government Upstream | • Guarantee safety from flooding for residential and commercial interests  
• Maximize navigation on river  
• Ensure renaturalization of floodplains | • Maximum water level in river  
• Unsafe dike length  
• Tonnage shipped  
• Shipping constraints | U 1-3, L&R  
M 1-3, L&R  
L 1-3, L&R |
| G2   | Regional Government Left Bank Upstream | • Guarantee safety from flooding for residential and commercial interests  
• Develop river-based recreational facilities  
• Income from excavation  
• Reduce Agriculture in favour of Nature development | • Maximum water level in river  
• Unsafe dike length  
• Tonnage shipped, Shipping constraints  
• Area under cultivation  
• Area for recreation  
• Area for nature | U1L – L3L |
| G3   | Regional Government Right Bank Upstream | • Guarantee safety from flooding for residential and commercial interests  
• Maximize navigation on the river  
• Maximize agricultural output together with retention and recreation | • Maximum water level in river  
• Unsafe dike length  
• Tonnage shipped  
• Area for construction  
• Area returned to nature | U1R – L3R |
| G4   | Urban Municipalities Upstream | • Maximize navigation on the river  
• Optimize commercial and residential construction in floodplains  
• Protect against flooding | • Tonnage shipped  
• Shipping constraints  
• Area for construction  
• Unsafe dike length | U1R, U3L  
M3L, M3R  
L1L, L1R, L2R |
| G5   | Rural Districts Upstream | • Maintain agricultural activities in floodplains  
• Maintain function of summer dikes  
• Financial compensation for renaturalization | • Area under cultivation  
• Length & height of summer embankments  
• Subsidy from higher government | U1L, U2L, U2R, U3R  
M1L, M1R, M2L, M2R  
L2L, L3L, L3R |
| N1   | National Government Downstream | • Guarantee safety from flooding for residential and commercial interests (without heightening dikes)  
• Maximize navigation on river  
• Safeguard increase navigational capacity  
• Renaturalization of floodplains | • Maximum water level in river  
• Unsafe dike lengths  
• Tonnage shipped  
• Shipping Constraints  
• Area under cultivation  
• Area returned to nature | R1 – R4, L&R  
W1 – W2, L&R  
Y1 – Y2, L&R |
| N2   | Municipalities Downstream | • Guarantee safety from flooding for residential and commercial interests  
• Maintain agricultural activities  
• Maintain function of summer dikes  
• Financial compensation for renaturalization and removal of buildings from floodplains  
• Oppose new retention and emergency flooding areas within dike-rings | • Maximum water level in river  
• Unsafe dike lengths  
• Area under cultivation  
• Area for construction  
• Length & height of summer dikes  
• Area of retention areas | R1 – R4, L&R  
W1 – W2, L&R  
Y1 – Y2, L&R |
| E1   | Environmental Interest Groups | • Renaturalization of river  
• Removal of summer embankments  
• No growth of navigation industry  
• Oppose construction in floodplains  
• Promote shift from intensive agriculture to extensive meadow and range-lands  
• Promote eco-tourism instead of mass recreation | • Area returned to nature  
• Length of summer dikes removed  
• Area removed from construction purposes  
• Area under cultivation  
• Area for recreation | Whole area |
The Status button allows for the setting of a budget for each of the roles. A budget should be assigned by the game leader to each role at the start of the simulation. This may be the same as is shown at the bottom of the Description field for each role or may be decided by the game leader at the start of the session. The programme will automatically tabulate the cost of measures taken to show the remaining budget available in a second field and make sure the player does not exceed his/her budget for the session. The figures are in Euro.

After the Operator (Game Leader) has entered the budgets for each of the roles and provided the background information to the different groups of participants representing each of the roles. Each group can start to implement measures under their jurisdiction. In a stand-alone setting, the game leader may copy the background information for each role as found under the Description button and in the Annex in the back of this manual.

A detailed list of all the available measures is given in Table 3. This also shows which roles are allowed to propose, agree to, advise on and finally permit the implementation for each of the measures. Table 4 provides an overview of the locations where the different measures may be implemented.

Table 3 Measures versus Roles

<table>
<thead>
<tr>
<th>Measure Nr</th>
<th>Measure Description</th>
<th>Actors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Hydraulic Measures</strong></td>
<td></td>
</tr>
<tr>
<td>HM01</td>
<td>(Construction of) stone river bank</td>
<td>G1, N1</td>
</tr>
<tr>
<td>HM02</td>
<td>(Construction of) natural river bank</td>
<td>G1, N1</td>
</tr>
<tr>
<td>HM03</td>
<td>Increase/decrease length of groynes</td>
<td>G1, N1</td>
</tr>
<tr>
<td>HM04</td>
<td>Increase/decrease height of groynes</td>
<td>G1, N1</td>
</tr>
<tr>
<td>HM05</td>
<td>Increase/decrease height of summer dike</td>
<td>G2, G3, N1, G1, N2</td>
</tr>
<tr>
<td>HM06</td>
<td>Increase/decrease height of winter dike</td>
<td>G2, G3, N1, G1, N2</td>
</tr>
<tr>
<td>HM07</td>
<td>Increase/decrease distance of winter dike from river axis</td>
<td>G2, G3, G1, G4, G5</td>
</tr>
<tr>
<td>HM08</td>
<td>Increase/decrease depth of river</td>
<td>G1, N1</td>
</tr>
<tr>
<td>HM09</td>
<td>Increase/decrease height of floodplains</td>
<td>G2, G3, G1, G4, G5</td>
</tr>
<tr>
<td>HM10</td>
<td>(Construct/remove) side channel</td>
<td>G2, G3, N1, G1, N2</td>
</tr>
<tr>
<td>HM11</td>
<td>(Construct/remove) bridge ramps, elevations and other bottlenecks</td>
<td>G2, G3, N1, G1, N2</td>
</tr>
<tr>
<td></td>
<td><strong>Environmental Management Measures</strong></td>
<td></td>
</tr>
<tr>
<td>EMM01</td>
<td>Spontaneous succession</td>
<td>G4, G5, N2, N1</td>
</tr>
<tr>
<td>EMM02</td>
<td>Extensive natural grazing</td>
<td>G4, G5, N2, N1</td>
</tr>
<tr>
<td>EMM03</td>
<td>Meadow land management</td>
<td>G4, G5, N2, N1</td>
</tr>
<tr>
<td>EMM04</td>
<td>Wetland management</td>
<td>G4, G5, N2, G2, G3, N1</td>
</tr>
<tr>
<td>EMM05</td>
<td>Forest development</td>
<td>G4, G5, N2, G2, G3, N1</td>
</tr>
<tr>
<td>EMM06</td>
<td>Agricultural pasture management</td>
<td>G4, G5, N2, N1</td>
</tr>
<tr>
<td>EMM07</td>
<td>Agricultural crop management</td>
<td>G4, G5, N2, N1</td>
</tr>
<tr>
<td></td>
<td><strong>Physical Planning Measures</strong></td>
<td></td>
</tr>
<tr>
<td>PPM01</td>
<td>Residential construction in floodplain</td>
<td>G4, G5, N2, G2, G3, N1</td>
</tr>
<tr>
<td>PPM02</td>
<td>Commercial/Industrial construction in floodplain</td>
<td>G4, G5, N2, G2, G3, N1</td>
</tr>
<tr>
<td>PPM03</td>
<td>Construction of retention areas (outside floodplain)</td>
<td>G2, G3, N1, G4, G5, N2</td>
</tr>
<tr>
<td>PPM04</td>
<td>Construction of inland harbour</td>
<td>G2, G3, N2, G4, G5, N1</td>
</tr>
<tr>
<td>PPM05</td>
<td>Construction of recreational harbour</td>
<td>G4, G5, N2, G2, G3, N1</td>
</tr>
<tr>
<td>PPM06</td>
<td>Construction of camping grounds</td>
<td>G4, G5, N2, G2, G3, N1</td>
</tr>
<tr>
<td>PPM07</td>
<td>Construction of a &quot;green&quot; river (outside of floodplain)</td>
<td>G2, G3, N1, G4, G5, N2</td>
</tr>
<tr>
<td>PPM08</td>
<td>Gravel, sand &amp; clay excavation</td>
<td>G4, G5, N2, G2, G3, N1</td>
</tr>
</tbody>
</table>
Table 4 Measures versus Branches

| Nr   | Measure Description | River Kilometers > 362 - 428 | U1 | U2 | U3 | M1 | M2 | M3 | L1 | L2 | L3 | R1 | R2 | R3 | R4 | W1 | W2 | Y1 | Y2 |
|------|---------------------|-------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| HM01 | (Construction of) stone river bank | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| HM02 | (Construction of) natural river bank | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| HM03 | Increase/decrease length of groynes | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| HM04 | Increase/decrease height of groynes | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| HM05 | Increase/decrease height of summer dike | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| HM06 | Increase/decrease height of winter dike | 2 | 2 | 2 | (2) | 2 | (1) | | | | | | | | | | | | |
| HM07 | Increase/decrease distance of winter dike from river axis | 1 | 1 | 1 | 0 | 0 | (1) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| HM08 | Increase/decrease depth of river | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| HM09 | Increase/decrease height of floodplains | 1 | 1 | 1 | 0 | 0 | (1) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| HM10 | (Construct/remove) side channel | (1) | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| HM11 | (Construct/remove) bridge ramps, elevations and other bottlenecks, | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Environmental Management Measures

| Nr   | Measure Description | River Kilometers > 362 - 428 | U1 | U2 | U3 | M1 | M2 | M3 | L1 | L2 | L3 | R1 | R2 | R3 | R4 | W1 | W2 | Y1 | Y2 |
|------|---------------------|-------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| EMM01 | Spontaneous succession | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| EMM02 | Extensive natural grazing | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| EMM03 | Meadow land management | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| EMM04 | Wetland management | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| EMM05 | Forest development | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| EMM06 | Agricultural pasture management | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| EMM07 | Agricultural crop management | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Physical Planning Measures

| Nr   | Measure Description | River Kilometers > 362 - 428 | U1 | U2 | U3 | M1 | M2 | M3 | L1 | L2 | L3 | R1 | R2 | R3 | R4 | W1 | W2 | Y1 | Y2 |
|------|---------------------|-------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| PPM01 | Residential construction in floodplain | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| PPM02 | Commercial/Industrial construction in floodplain | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| PPM03 | Construction of retention areas (outside floodplain) | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| PPM04 | Construction of inland harbour | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| PPM05 | Construction of recreational harbour | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| PPM06 | Construction of camping grounds | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| PPM07 | Construction of a "green" river (outside of floodplain)* | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| PPM08 | Gravel, sand & clay excavation | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Measures are divided into three categories:

- Hydraulic / River Training Measures
- Environmental / Vegetation Management Measures
- Physical Planning Measures

The STORM programme automatically differentiates between the action to be undertaken by the different roles, as well as where certain measures may or may not be taken. Occasionally there may be a discrepancy between what the model allows and what is suggested by the description for a role. This will be adjusted in future versions of the model.
The hydraulic or river training measures primarily relate to the dimensions of the various aspects of the cross profile of the river as shown in the next figure.

![Figure 1 STORM Rhine schematic dimensions of the river cross profile](image)

Below an example is presented of a role player seeking to implement a hydraulic measure. The procedure is demonstrated for the game leader to enter the necessary data into the STORM Rhine programme concerning the procedures relating to the proposal, agreement, advise on and permission for this measure. Subsequently the effect of the measure is computed by STORM Rhine.
3.4 Role Play Example

Raising of the winter dykes on the right bank in the lower Rhine

From Table 3 it is clear that the authority who has the right to propose the raising of the main embankment (winter dike) is the regional authority. For the right bank of the river this is G3, the Upstream (German) regional government authority.

Step 1 Logon as a specific Role

Select Logon under File in the menu bar and type the required role from the following possibilities (accepted values: G1, G2, G3, G4, G4, N1, N2, E1, Operator or Administrator). In this example type G3 and click OK (password not yet active). For the procedure, see also Part 2, Step 1.

Step 2 Select Branch and Bank

Click on Branches, expand under Tree the Rhine by clicking on the plus box, then go to Lower Rhine 3, expand the tree by clicking on the plus box and select the right bank. The selection will be highlighted (white letters in a blue field).

Step 3 Select a Measure for implementation

In the Measures box select HM06, Raising of winter dikes. With this measure highlighted a description area is activated in the right lower corner. For each of the measures a short description is provided. A blue bar above the Description button shows several buttons, which become active (showing white letters), if the present role is entitled to take a certain action. In our example, the G3 regional government agency is allowed to propose a measure. As is shown in Table 3 above, the permit and agreement are necessary from other actors / roles, before the measure can be implemented. Advice may also be requested from the Environmental Group, but this is not essential for the implementation of a measure. The advice function is not yet active in this version of STORM Rhine.
Step 4 Proposing a measure for implementation

Next to the Description button are three more buttons referring to Settings, Status and Permissions for the Project.

The Settings button provides allows for specific parameters to be added for the measure to be implemented. In our example, for the raising of the winter dike in the selected river branch by 1.5 meters.

Once the necessary settings have been filled in the Propose button may be pushed, to enter the proposal into the system. Before it can be submitted, however, a dialog box appears, asking the actor to write a motivation for the proposed measure. On the basis of this motivation the other relevant roles will reflect on whether they will agree to it, give a positive advice and issue a permit.

The Status button shows the status of the proposed measure, whether it has been proposed, agreed to, advised on and given a permit. In our example the status “proposed” will be entered as soon as we have clicked the Propose button in the blue bar above.
The Permissions button provides additional information on which actors / roles have a function in the implementation of this measure. The relevant actors are listed in the top field, with their related role checked in the bottom field. For example, G1 the Federal Government, is the authority to grant the permit to raise the dikes on the right bank of the Lower Rhine branch.

The positive agreement for implementation of our measure is necessary from G4, the Urban Municipalities.
Step 5 Obtain the required agreement and permit

The Operator will logoff as G3 and subsequently logon as G4 and G1, following the same procedure as under Step 1. Then for each of the roles, Steps 2 – 4 are taken to respectively give advice and issue the permit. Each role will need to fill in a motivation for the action they are taking. After clicking on the OK button of the dialog box, the motivation can be seen under the Status button by clicking on a specific element listed in the box.
Step 6 Calculate the effect of the measures

The game leader / operator needs to logon and press the operator button at the bottom of the left vertical blue bar, as described in Part 2 Step 1 and successively click on Cases in the Project box, the Case name ("Example1") in the Case box and then on the Calculate button, with other elements set as below.

Step 7 Visualize the effects of the measures taken

The operator can then click on the Branches button under Output in the vertical blue bar to see the output of the calculation for all the available evaluation criteria at the specific location / branch where the measures were taken, or effect expected (for example downstream of implemented measures).
It is also possible to select the area of interest for the evaluation based on the Map tab, next to the Tree tab. Clicking on the particular branch and bank of interest will produce the similar overview of the results per criteria. In a next version a colour code will be added to show the level of effect per criteria on the map as well.

Alternatively, it is also possible to focus on a specific criteria and compare its value for the various river branches and or banks.
Step 8  Save the Case

To save the session / case, select Save As under File from the Menu Bar and preferably create a dedicated directory for the STORM Rhine sessions.

In order to be able to compare the outcome of various role play sessions, each session should be saved. Sessions may subsequently be compared by entering a previous session in the Previous Case list box in the Project Cases window.
Note:

In the case of our example it is clear that the raising of the winter dikes on one bank of the river will have very little effect on the overall hydraulic performance of the river flow.

It should be clear that the STORM Rhine role play is about concerted action by all stakeholders involved in river management to reach an acceptable effect of interventions in the hydraulic, environmental and planning parameters in and around the river.

This requires communication between the different roles of the role play and – in as much as possible – cooperation on the measures to be taken, if effects are to be measurable.
Annex  Suggested Role Descriptions for STORM Rhine
N1 National Government (the Netherlands)

Area of Interest:
- Dutch Rhine River R1 - R4 (left and right bank)
- Waal River W1 - W2 (left and right bank)
- IJssel River Y1 - Y2 (left and right bank)

Overall Objectives:
Implement measures and promote the implementation of measures by others through negotiation, subsidies and regulations to:
- Accommodate a peak flow of 18,000 m³/s at Lobith
- Avoid dike heightening and strengthening in favour of measures which create more space for river discharge within and where necessary outside of the current winterbed
- Promote upstream (i.e. German) floodwave attenuation and retention
- Double shipping capacity between the Netherlands and Germany (compared to the year 2000)
- Return 50% of floodplains to natural functions in the year 2020.

Specific Objectives & Tools
- Subsidize the construction of retention areas in Germany to a capacity of \(10^9\) m³
- Promote & if necessary subsidize water conservation activities in the German and Dutch Rhine river catchment
- Construct retention areas in the Netherlands to a capacity of \(10^9\) m³
- Allocate and construct emergency inundation areas in the Netherlands to a capacity of \(10^9\) m³
- Promote and subsidize the enlargement of the hydraulic profile of the Dutch rivers winterbeds by the municipalities
- Promote and subsidize the removal of hydraulic bottlenecks and obstacles in the winterbeds of the Dutch rivers by the municipalities (e.g. Railroad bridge Oosterbeek, Ferry Zetten, Waalsprong Nijmegen)
- Reconsider and if necessary reallocate the distribution of the peakflow through the Delta branches
- Maintain the required minimum flow and minimum width of the rivers in light of the desired doubling in tonnage by 2020
- Subsidize the municipalities to allow farmers to convert floodplains to nature areas
- Subsidize the Environmental Lobby Groups to promote nature friendly projects in and around the river
- Negotiate, persuade and if necessary take legal action to oppose unfavourable actions by Dutch Municipalities and even German partners
- Hire consultants to produce report on likely hydraulic impact assessment of desired measures

Decision Parameters (Mandates):
- No authority outside of Dutch borders
- Implementation of activities in the winterbed requires permits by Municipalities (municipal veto holds up project and adds to project cost through legal procedures)
- Implementation of decisions prefers support from Environmental Lobby Groups (their disagreement may hold up implementation and adds to project costs through legal procedures)

Financial Parameters:
- Budget € 1,000 \(10^6\)
- Overruling Municipal permits or Environmental objections costs 20% of project
- Subsidies can be made available at multiples of € \(10^6\)
- Hydraulic Impact Modelling Report by Consultant € 5,000,000 per run
N2 Municipal (Local) Government(s) (the Netherlands)

Area of Interest:
- Dutch Rhine River R1 - R4 (left and right bank)
- Waal River W1 - W2 (left and right bank)
- IJssel River Y1 - Y2 (left and right bank)

Overall Objectives:
- Maximize agricultural production from the floodplains or obtain sufficient and sustained subsidies from National Government to convert to natural uses
- Promote residential, recreational and commercial construction projects in floodplains in places where the hydraulic profile is not significantly affected
- Oppose removal of current buildings and other hydraulic bottlenecks from floodplains, unless removal is 100% covered and compensated by the National Government
- Maintain and improve flood defense structures rather than removing buildings from floodplains or moving back the winter dikes
- Oppose new retention and emergency inundation areas near heavily populated areas. Full compensation for relocation of inhabitants of retention and inundation areas by National Government.

Specific Objectives & Tools:
- Invest in maintenance and improvement of flood defense structures (obtaining partial subsidies from National Government)
- Use permits to National Government projects as lever to promote favourable measures in floodplains
- Construct recreational facilities in conjunction with nature areas in floodplain
- Promote, support and - where possible - subsidize hydraulically significant retention projects by municipalities in Germany

Decision Parameters (Mandates)
- Implementation of measures in floodplains requires support from National Government (a National Government veto cannot be overruled)
- Implementation of measures prefers support from the Environmental Lobby Groups (their obstruction through legal proceedings will create delays and higher project costs)

Financial Parameters:
- Budget € 100,000,000
- Implementing contrary to the Environmental Lobby Groups’ advice will add 20% to project cost
- Subsidies to other parties or joint ventures are available in multiples of € 10,000,000
- Hydraulic Impact Modelling Report by Consultant costs € 5,000,000 per run
G1 Federal Government (Germany)

Area of Interest:

- Upper Rhine U1 – Lower Rhine L3 (left & right bank)

Overall Objectives:

By means of negotiation, subsidies and regulations to promote the implementation of measures by States and Municipalities which will:

- Reduce flood damage in riparian areas by 90% within 20 years (to avoid negative effects on economy and having to pay out damage compensation)
- Ensure doubling of transport over water within 20 years (to relieve / reduce projected growth in transport by rail and road)
- Return 50% of current agricultural land in floodplains to nature areas within 20 years (in light of international agreements on the reduction of subsidies for agricultural production and on the re-naturalization of international rivers)

Specific Objectives & Tools:

- Enforce the construction of sufficient capacity of flood wave retention in the Regions (by providing quota on the retention capacity per state and provide subsidies to the Regions for their construction);
- Developing a green river / linear retention area on the left bank of the Lower Rhine 2 & 3;
- Developing a green river between the Rhine (Emmerich) and IJssel (Doesburg)
- Enforce the removal of (hydraulic) shipping bottlenecks (by earmarking sufficient subsidies to Regions for this purpose);
- Promote the construction of a minimum of two and preferably three new inland harbours with participation of Regions & Urban Municipalities;
- Support the conversion of agricultural land to nature areas by providing subsidies to Regional and Municipal nature projects
- Legal right to overrule municiple veto’s, if negotiation and subsidies cannot convince Municipalities to cooperate with Federal objectives;
- Hiring of consultants to produce likely hydraulic impact assessments of desired measures

Decision Parameters (Mandates):

- Implementation of decisions requires support from relevant Regions (in extreme cases, under International Agreements & Regulations, Regions veto’s may be overruled);
- Implementation of decisions prefers support from relevant Municipalities (Municipal disapproval or veto may hold up implementation through judicial proceedings);
- Implementation of decisions prefers support from Environmental Lobby Groups (it may otherwise hold up implementation through judicial proceedings);
- Implementation is always at Regional or Municipal level;

Financial Parameters:

- Budget: € 2,000,000,000
- Overruling Region’s veto, add 20% to project cost (expense of Federal government)
- Overruling Municipal veto, add 20% to project cost (at request of Regional Government, 10% at expense of Fed. Gov't and 10% at expense of Regional Gov't);
- Subsidies available in multiples of € 10,000,000;
- Hydraulic Impact Modelling Report by Consultant € 5,000,000 per run.
G2  Left Bank Regional Government (Germany)

Area of Interest:

- Upper Rhine U1l – Lower Rhine L3l

Overall Objectives:

- Safety from flooding for its citizens and economy through improved flood protection (reduction of occurrence of floods by 50% every 5 years);
- Expanding the river-based transport sector to ______ MT/yr within 20 years;
- Ensuring continuity in output from the industrial excavation of gravel, sand and clay;
- Doubling river and nature-based tourism and recreation within 20 years;
- Reduction of agricultural land-use in favour of stimulating nature and the excavation industry

Specific Objectives & Tools:

- Improving flood retention structures and river training measures, creating additional retention capacity (also if requested to (partially) cover quota’s from other Regions);
- Construct a new inland harbour in Urban Municipalities;
- Replacing depleted excavation pits by new sites of sufficient capacity to maintain 100% of current output in next 20 years;
- Conversion of old excavation areas to nature resorts and recreation areas and the construction of camp sites and recreation harbours;
- Stimulating tourism and recreation in wine-growing areas of the middle Rhine through issuing permits to Municipalities for the construction of recreation harbours and camp sites;
- Hiring of consultants to produce likely hydraulic impact assessments of desired measures

Decision Parameters (Mandates):

- Implementation of measures in river branches adjacent to other Regions requires the support of the neighbouring Region or Municipality (a veto at the same level of government can only be overruled at a higher level);
- Implementation of decisions requires support from relevant Municipalities (Municipal disapproval or veto may hold up implementation through judicial proceedings; in extreme cases, only with Federal support, Municipal veto’s may be overruled);
- Implementation of decisions prefers support (positive advice) from Environmental Lobby Group (it may otherwise hold up implementation through judicial proceedings);
- Implementation may be at Regional or Municipal level, in a few cases the Environmental Lobby Group may implement measures (construction of camp sites);

Financial Parameters:

- Budget: € 1,000,000,000
- Overruling neighbouring Region’s veto, add 20% to project cost (at request of Regional Government: 10% at expense of Fed. Gov’t and 10% at expense of requesting Regional Gov’t)
- Overruling Municipal veto, add 20% to project cost (at request of Region’s Government: 10% at expense of Fed. Gov’t and 10% at expense of Regional Gov’t);
- Subsidies available in multiples of € 10,000,000;
- Hydraulic Impact Modelling Report by Consultant € 5,000,000 per run.
G3 Right Bank Regional Government (Germany)

Area of Interest:
- Upper Rhine U1r – Lower Rhine L3r

Overall Objectives:
- Safety from flooding for its citizens and economy through improved flood protection (reduction of occurrence of floods by 50% every 5 years);
- Expanding the river-based transport sector to ______ MT/yr within 20 years, but in favour of Mannheim;
- Ensuring continuity in output from the industrial excavation of gravel, sand and clay;
- Maintaining agricultural output from floodplains at current levels;
- Promotion of nature primarily in combination with retention areas and recreation

Specific Objectives & Tools:
- Improving flood retention structures and river training measures, creating additional retention capacity (also if requested to (partially) cover quota’s from other States);
- Expanding harbour facilities at Mannheim;
- Replacing depleted excavation pits by new sites of sufficient capacity to maintain 100% of current output in next 20 years;
- Conversion of old excavation areas to nature resorts and recreation areas and issuing permits to Municipalities for the construction of camp sites and recreation harbours;
- Hiring of consultants to produce likely hydraulic impact assessments of desired measures

Decision Parameters (Mandates):
- Implementation of measures in river branches adjacent to other states requires the support of the neighbouring Region or Government (a veto at the same level of government can only be overruled at a higher level);
- Implementation of decisions requires support from relevant Municipalities (Municipal disapproval or veto may hold up implementation through judicial proceedings; in extreme cases, only with Federal support, Municipal veto’s may be overruled);
- Implementation of decisions prefers support from Environmental Lobby Group (it may otherwise hold up implementation through judicial proceedings);
- Implementation may be at Regional or Municipal level, in a few cases the Environmental Lobby Group may implement measures (construction of camp sites);

Financial Parameters:
- Budget: € 1,000,000,000
- Overruling neighbouring Region’s veto, add 20% to project cost (at request of Region’s Government: 10% at expense of Fed. Gov’t and 10% at expense of requesting Region’s Gov’t)
- Overruling Municipal veto, add 20% to project cost (at request of Region’s Government: 10% at expense of Fed. Gov’t and 10% at expense of Region’s Gov’t);
- Subsidies available in multiples of € 10,000,000;
- Hydraulic Impact Modelling Report by Consultant € 5,000,000 per run.
G4 Urban Municipalities (Germany)

Area of Interest:

- Upper Rhine U1r, U3l
- Middle Rhine M3l, M3r
- Lower Rhine L1l, L1r, L2r

Overall Objectives:

- Expand river transport to Duisburg and Düsseldorf by 200% in 20 years, preferably no new harbour at Köln;
- Oppose removal of housing from floodplains and floodprone areas and where possible selectively increase use of floodplains for housing (where it does not significantly affect hydraulic profile): expand housing, industry and commerce area in floodplain by approx. 15 – 20% in 20 years;
- Maintain and improve flood defense structures as an alternative to removing physical structures from the floodplains
- Retention and re-naturization of river only in rural districts;

Specific Objectives & Tools:

- Invest in maintenance and improvement of flood defense structures (20% subsidy from federal and 30% subsidy from state government);
- Expand harbours of Duisburg and Düsseldorf by investing (with 50% subsidy from the state and 20% from the federal government) in purchase of land, excavation of harbour and development of infrastructure;
- Select and buy land of little hydraulic significance, fill it up and protect it from flooding, add infrastructure and sell it to project developers (income generating);
- Provide subsidies for retention and re-naturization in up- and downstream rural areas;
- Judicial delaying tactics for unwanted measures in floodplain;
- Outright veto right on land-use changes (from commercial/housing to other uses) in floodplains (up to state level – can be overruled by Federal government);
- Hiring of consultants to produce likely hydraulic impact assessments of desired measures.

Decision Parameters (Mandates):

- Implementation of measures in river branches requires support from Regional gov’t (a Regional veto can only be overruled by the Federal gov’t in extreme cases and at great expense);
- Implementation of decisions requires support from adjacent Municipalities (disapproval or veto’s from other Municipalities may hold up implementation through judicial proceedings; a Municipal against a neighbouring Municipality may be overruled by the Region; this again may be appealed at the Federal gov’t level, resulting in further delays and expense);
- Implementation of decisions prefers support from Environmental Lobby Groups (it may otherwise hold up implementation through judicial proceedings);

Financial Parameters:

- Budget: € 200,000,000
- Overruling a neighbouring Municipal/District veto, add 20% to project cost (at Municipal request: 10% at expense of the Municipality and 10% at expense of the Regional Gov’t);
- Overruling Regional veto, add 20% to project cost (at request of the Municipality: 10% at the expense of the Municipality, 5% at expense of Fed. Gov’t and 5% at expense of Regional Gov’t);
- Subsidies available in multiples of € 10,000,000;
- Hydraulic Impact Modelling Report by Consultant € 5,000,000 per run.
G5  Rural Districts (Germany)

Area of Interest:
- Upper Rhine U1l, U2l, U2r, U3r
- Middle Rhine M1l, M1r, M2l, M2r
- Lower Rhine L2l, L3l, L3r

Overall Objectives:
- Maintain agricultural activities in floodplains
- Insist on maintenance and improvement of summer dikes
- Compensation for taking land out of production, when unavoidable
- First right and guaranteed income for management of nature areas
- Improve revenue from tourist and recreational attractions.

Specific Objectives & Tools:
- Judicial delaying tactics for river training and physical planning measures in floodplain;
- Outright veto right on land-use changes (from agriculture to other uses) in floodplains (up to state level – can be overruled by Federal government)
- Change (when subsidized) from intensive cropping to extensive meadow and grazing management;
- Develop abandoned gravel, sand and clay pits into recreational sites, with access roads, parking space and catering facilities;
- Develop river-side hotels, camp sites and recreation harbours at strategic locations in the floodplains;
- Hiring of consultants to produce likely hydraulic impact assessments of desired measures

Decision Parameters (Mandates):
- Implementation of measures in river branches requires support from State gov’t (a Region’s veto can only be overruled by the Federal gov’t in extreme cases and at great expense);
- Implementation of decisions requires support from adjacent Municipalities (disapproval or veto’s from other Municipalities may hold up implementation through judicial proceedings; a Municipal against a neighbouring Municipality may be overruled by the Region; this again may be appealed at the Federal gov’t level, resulting in further delays and expense);
- Implementation of decisions prefers support from Environmental Lobby Group (it may otherwise hold up implementation through judicial proceedings);

Financial Parameters:
- Budget: € 100,000,000
- Overruling a neighbouring Municipal veto, add 20% to project cost (at request Municipal request, 10% at expense of the Municipality and 10% at expense of the Regional Gov’t);
- Overruling Region’s veto, add 20% to project cost (at request of the Municipality: 10% at the expense of the Municipality, 5% at expense of Fed. Gov’t and 5% at expense of the Regional Gov’t);
- Subsidies available in multiples of € 10,000,000
- Hydraulic Impact Modelling Report by Consultant € 5,000,000 per run.
E1 Environmental Lobby Groups

Area of Interest:
- Upper Rhine 1 – Dutch Rhine Delta (left & right banks)

Overall Objectives:
- Re-naturalization of the Rhine, allowing the river within the next 20 years to evolve from a highly restricted river to a freely meandering river with very limited constraints within a wide floodplain of high ecological value.
- To stabilize river-based transport for the next 20 years at current levels and promote the reduction in size of the river barges.
- To remove the excavation industry within the next 20 years completely from the floodplains and allow pits to evolve to wetland areas;
- To oppose any further construction and to remove all artificial heights in the floodplains;
- To promote the shift from intensive agriculture to extensive meadow and rangeland management in the floodplains;
- To promote small-scale eco-tourism rather than mass recreation;

Specific Objectives & Tools:
- High profile participation in public debates and hearings at the various government levels concerning river management and physical planning;
- Close cooperation with various levels of government to plan and implement desired objectives;
- Judicial delaying tactics, when necessary, to obstruct decision-making;
- Non-violent public disobedience campaigns to obstruct unfavourable implementations of decisions;
- Planning and implementation of eco-tourism sites in floodplain;
- Hiring of consultants to produce likely hydraulic impact assessments of desired measures;

Decision Parameters (Mandates):
- Implementation of measures in river branches requires support from Regional gov’t (a Region’s veto can only be overruled by the Federal gov’t in extreme cases and at great expense);
- Implementation of decisions requires support from adjacent Municipalities (disapproval or veto’s from other Municipalities may hold up implementation through judicial proceedings; a Municipal against a neighbouring Municipality may be overruled by the Region; this again may be appealed at the Federal gov’t level, resulting in further delays and expense).

Financial Parameters:
- Budget: € 50,000,000
- Opposing a Municipal project, expense to ELG at 5% of project cost; (extra) expense to Municipality 10% of project cost;
- Opposing a Regional project, expense to ELG at 10% of project cost; (extra) expense to Regional Gov’t 15% of project cost;
- Opposing a Federal project, expense to ELG at 15% of project cost; (extra) expense to Federal Gov’t 20% of project cost;
- Subsidies available in multiples of € 10,000,000
- Hydraulic Impact Modelling Report by Consultant € 5,000,000 per run.