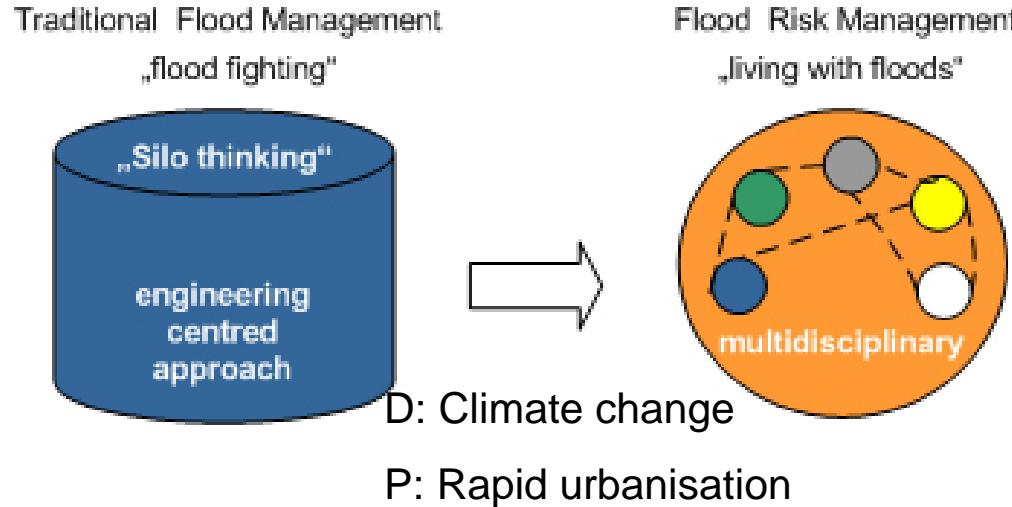




Supporting Multi Stakeholder Involvement for Flood Risk Management Planning

Natasa Manojlovic, Niloufar Behzadnia, Sandra Hellmers, Dmitrijs Barbarins, Erik Paschet,
Hamburg University of Technology-TUHH

- Introduction
- SAWA-HH Governance Approach
 - DSS for FRMP
- Implementation
- Lessons learned and conclusions



(Flood Directive, EC 2007/60)

1. *preliminary risk assessment*

2. *flood hazard and risk map*

3. *flood risk management plan (FRMP)*

Due – end of 2015

What says the Flood Directive EC 2007/60

(Article 10 (1)) : Member States shall **make available** to the public the preliminary flood risk assessment, the flood hazard maps, the flood risk maps and the **flood risk management plans**.

(Article 10 (2)) : Member States shall encourage **active involvement** of interested parties in the production, review and updating of the flood risk management.

Open Question in the context of FRMP

What are efficient ways of public and stakeholder participation in the planning procedure?

What is the appropriate method to quantify the efficiency and effectiveness of the developed strategies for FRMP?

Governance is a process

Definition: *the process of **decision-making** and the process by which decisions are implemented (UN – Economic and social commission of Asia and the Pacific)*

- It is about how authorities, institutions and social organizations interact with citizens when making decisions

Good Governance

stands for

- *multifaceted decision making process where the societal goals are pursued with the interactions of all the interested actors in all specific fields of development*
- *and in which ethical and democratic issues are respected, such as responsibility, accountability, transparency, equity, and fairness*

Bottom up governance strategy for development of a Flood Risk Management Plan:



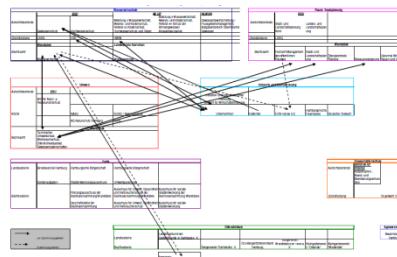
(Adapted from Ashley et al, 2008)

SAWA-HH Governance Approach

1. Scoping



Social Competences



Stakeholder Analysis

2. Understanding & Envisioning



Development of shared vision of where to get to

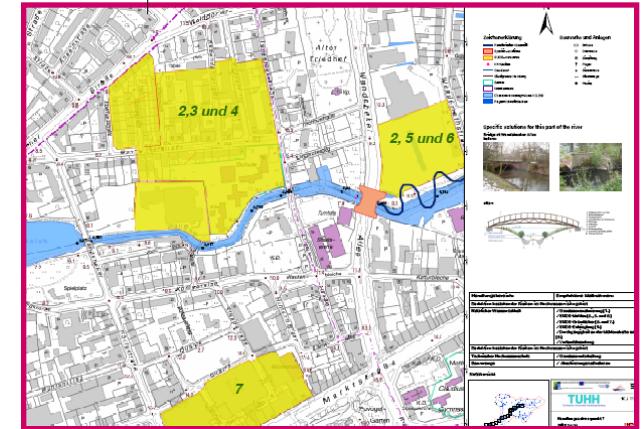
3. Experimenting



Generating different planning options

4. Evaluation

Sn, Sg	Beschreibung	...	Sn, kw, ss	Beschreibung	...
Maßnahmen	HWRMP- M1	...	Maßnahmen	HWRMP- M1	...
Maßnahmen	Beschreibung	...	Maßnahmen	Beschreibung	...
HWRMP- M1	HWRMP- M1	...	HWRMP- M1	HWRMP- M1	...
Maßnahmen	Beschreibung	...	Maßnahmen	Beschreibung	...
HWRMP- M1	HWRMP- M1	...	HWRMP- M2	HWRMP- M2	...
HWRMP- M2	HWRMP- M2	...	HWRMP- M3	HWRMP- M3	...
HWRMP- M3	HWRMP- M3	...	HWRMP- M4	HWRMP- M4	...
HWRMP- M4	HWRMP- M4
...



Flood Risk Management Plan

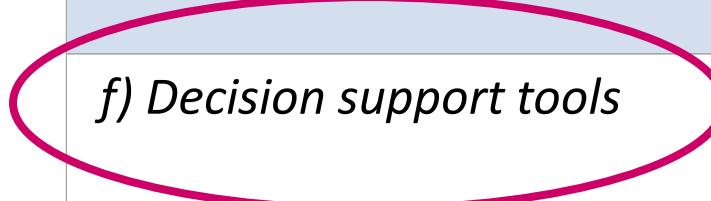
SAWA-HH Governance Approach

→ Models are required to support the planning process

For both decision making and capacity building of stakeholders

<i>Methods and tools supporting the planning process</i>	
<i>Social</i>	<i>a) Guidance for role assignment (stakeholder analysis)</i> <i>b) Conflict analysis</i> <i>c) Social learning methods</i>
<i>Technical</i>	<i>d) Raising risk awareness</i> <i>e) Capacity building</i>
	<i>f) Decision support tools</i>

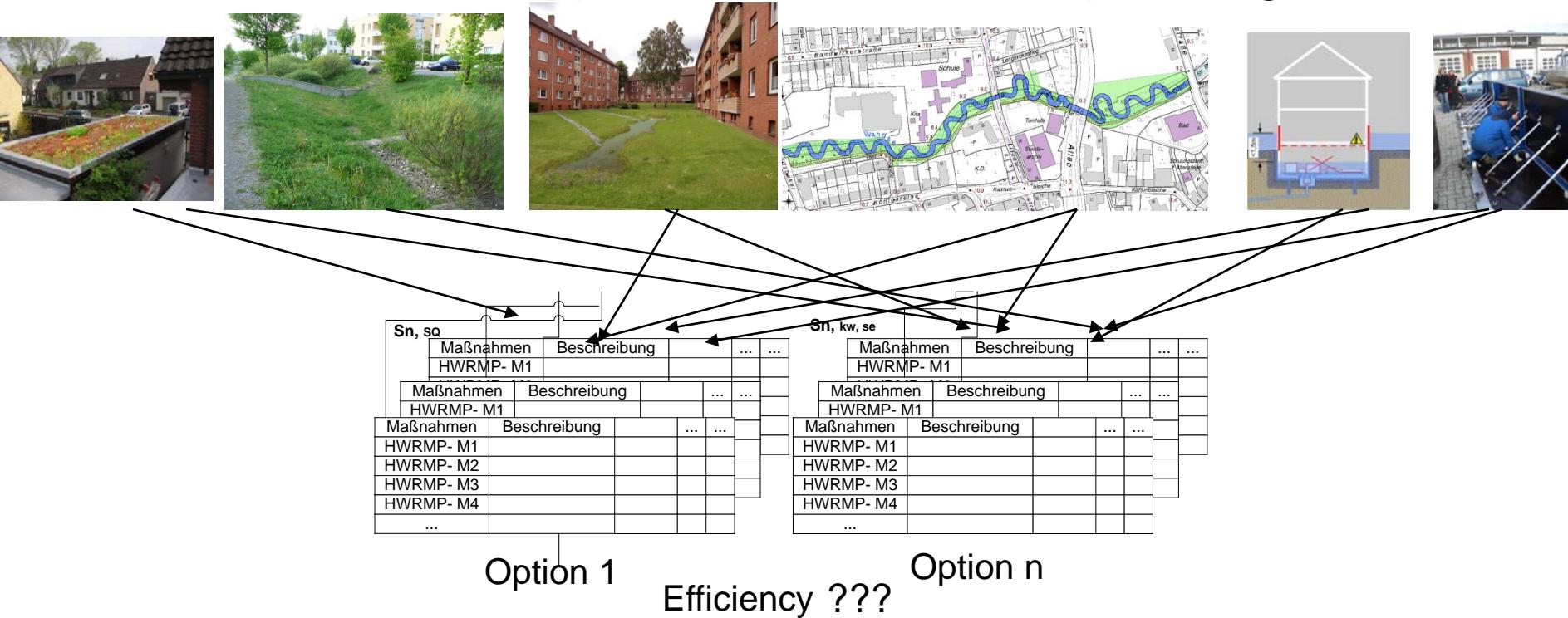
Manojlovic et al (2011, 2012)
Pasche et al (2010)



SAWA-HH Governance Approach

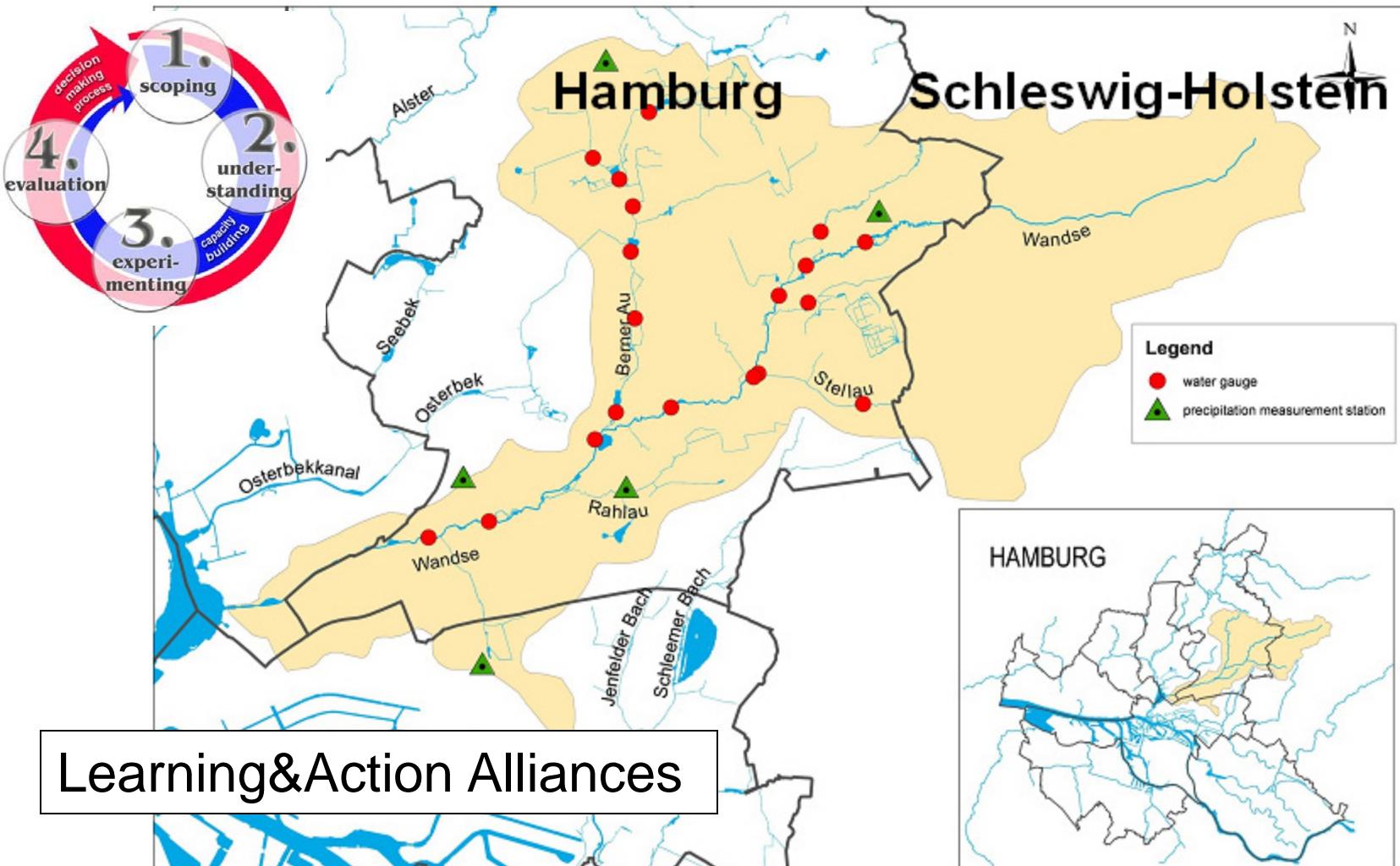
How to assess the efficiency of different options of flood risk management planning?

How to support multistakeholder planning?



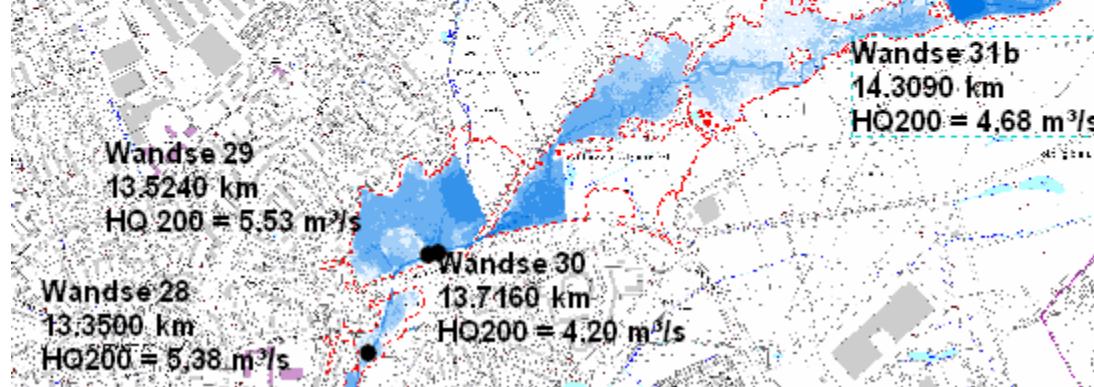
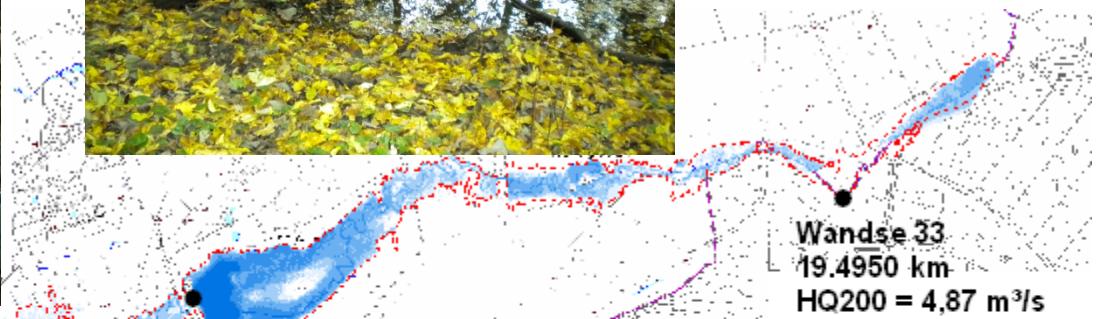
→ Decision support systems are required

Wandse Catchment Area- Hamburg (~88 km², 21,5 km)

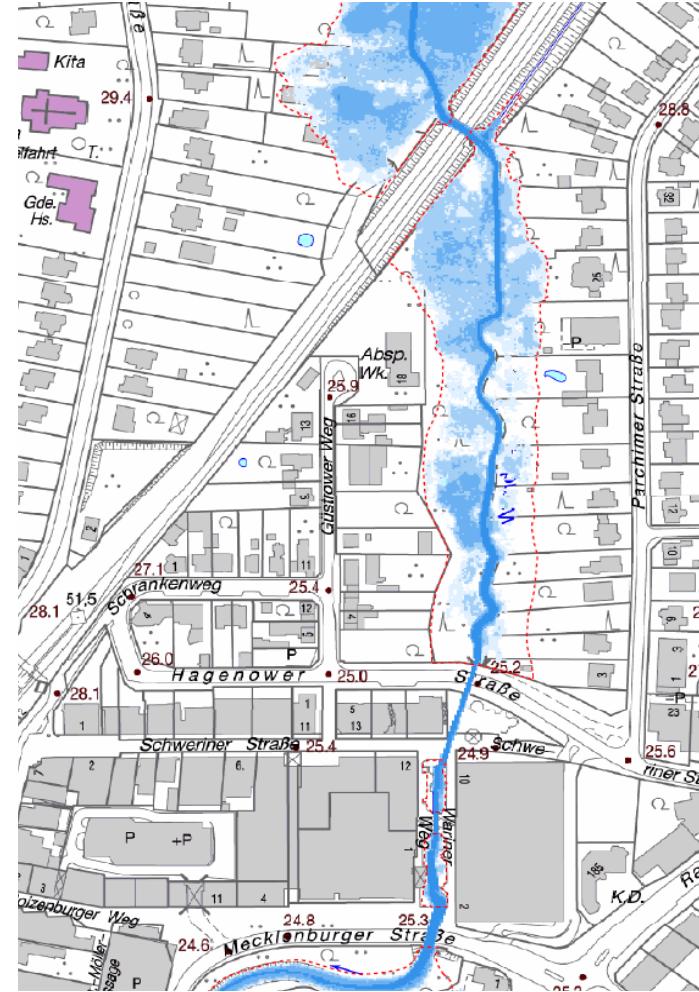


→ Objective: development of a **flood risk management plan** (EU Flood Directive, 2007)

Upper catchment- nature protection area



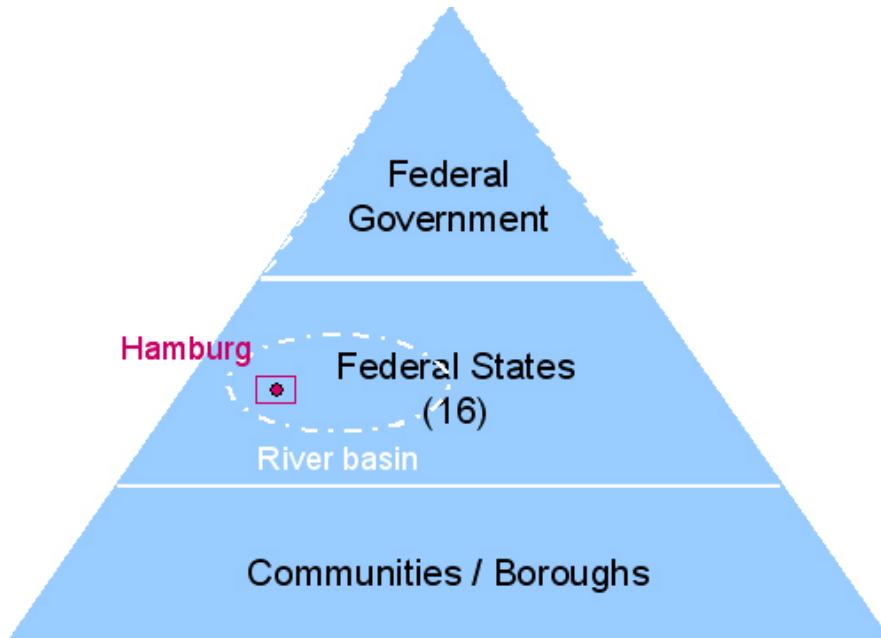
mid&low catchment- mixed urban typology



(here: highly urbanised area of Rahlstedt centre)



→ Institutional/Legislative context



Water Management

- Passing national laws and regulations

- Implementation of 2007/60/EC incl. Development of FRMP
- Coordinated activities within major river basins (e.g. Elbe)

- Management of local watercourses
- Implementation of measures at the local scale

- Formal leader: responsible authority LSBG

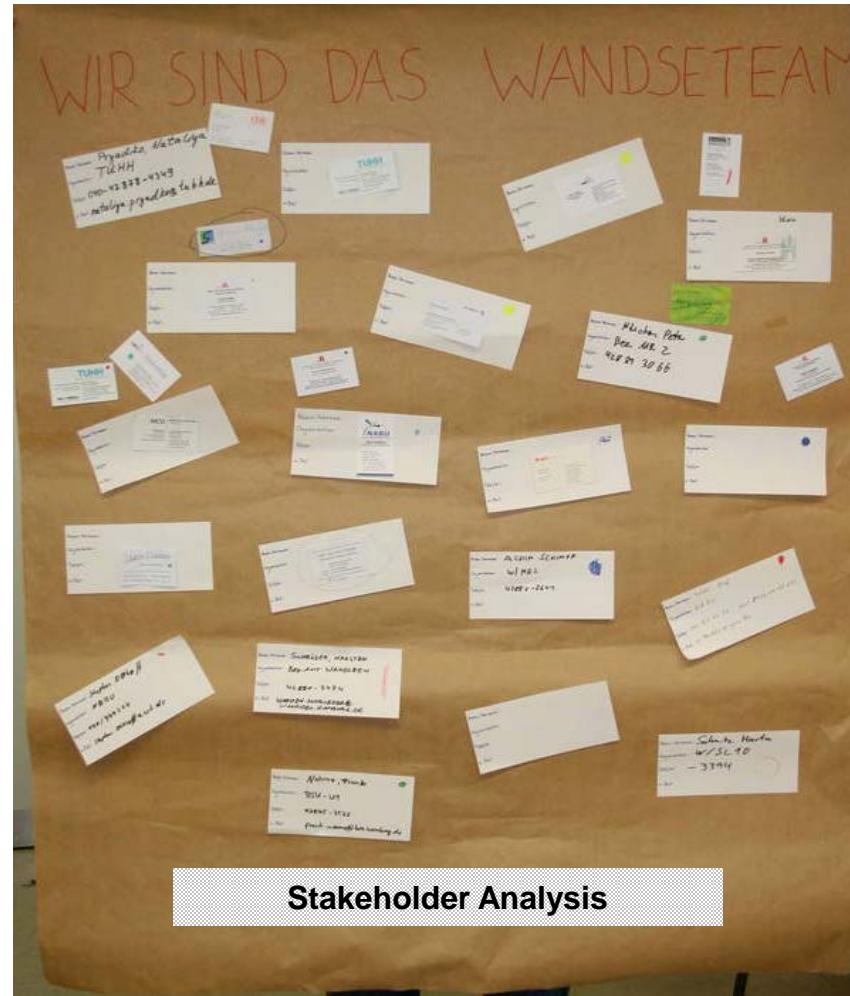
Structure:

→ Formal leader: responsible authority LSBG (legitimacy- high)

- **Kick of meeting (constitution)**
 - Increasing profile of the LAAs
 - Raising awareness among decision makers/ politicians
- **Series of workshops** (14 Working sessions), once a month/ 2months, 2 h each
 - Working sessions following the phases of the governance approach
 - Core part of the LAAs
- **One site visits**
 - Assessing the criticality of the system on site
 - Embedded into the phases of the governance approach
- **Online participation**
 - Scoping the expertise of the participants
 - Consensus finding process

→ Development of shared vision of the problem (Flood Risk)

1

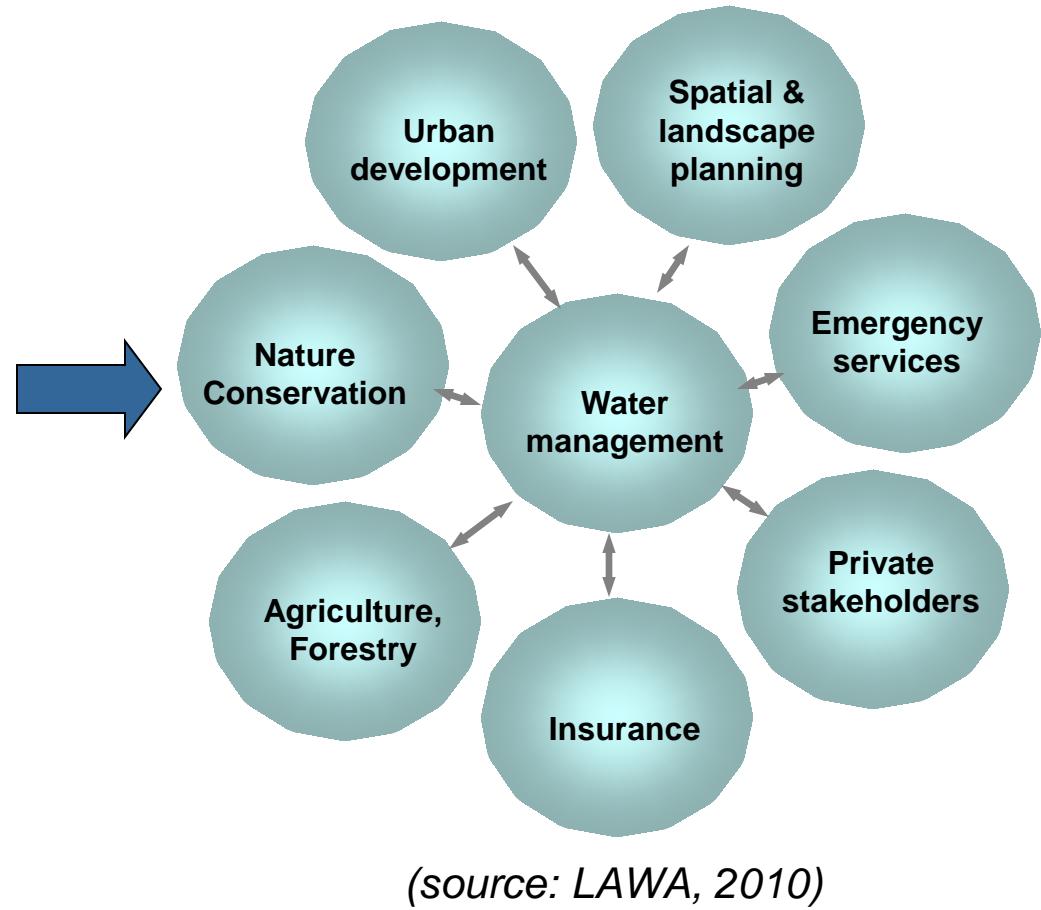


→Stakeholder analysis

Method: snowballing, direct contacts

→LAA configuration /per numbers of stakeholder groups (in total 25)

Categories of Stakeholders	Nr of partic
Strategic flood and drainage management	4
Implementation and maintenance	3
Urban development	2
Agriculture	0
Urban and landscape design	1
Environmental protection & nature conservation	3
Emergency services	1
Politicians	2
NGOs	2
Public interest groups	2
Economy and Industry	1
Research	4



Phase 1: Scoping

3
2
1



Building Social Competences and mutual trust



Confronting with flood risk and raising awareness



Flood Maps

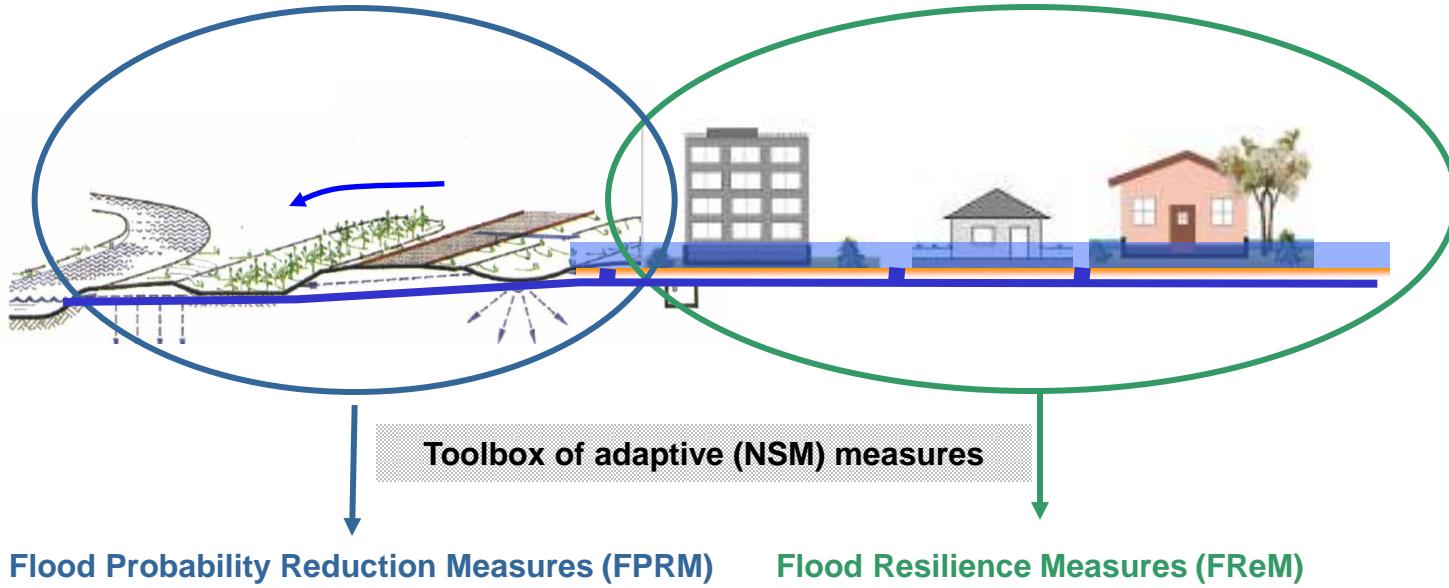


Understanding the system drivers and pressures, sensitivity, response

Phase 2: Understanding & Envisioning

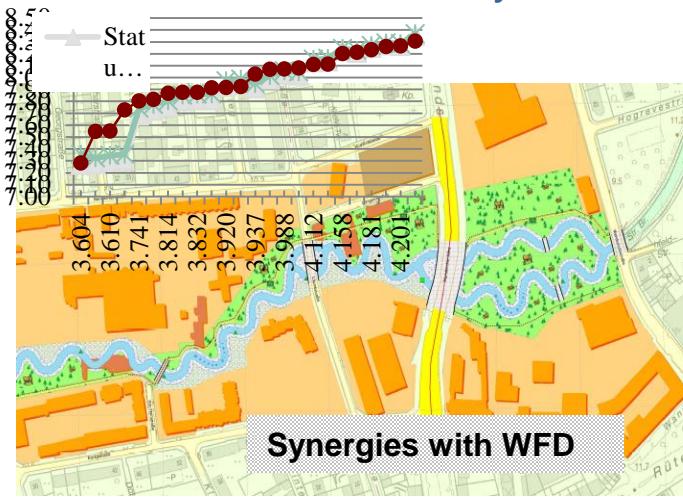
→ Development of shared vision of where to get to

2
1



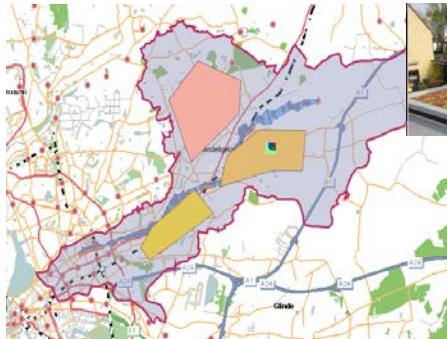
Flood Probability Reduction Measures (FPRM)

Flood Resilience Measures (FReM)



Phase 3: Experimenting

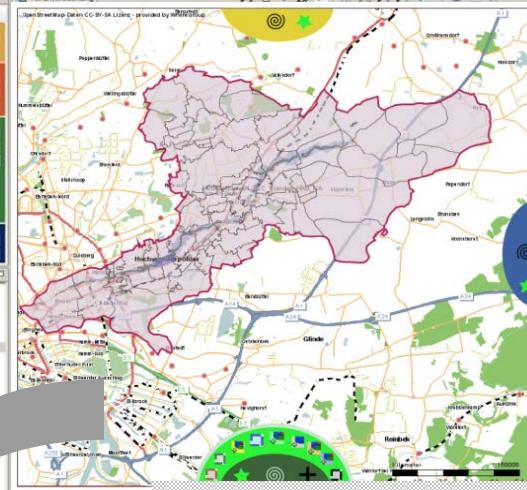
→ Formulate options of adaptive flood risk management by NSM



Development of planning options



Screenshot of a software interface titled "Wasserplanung". The left sidebar includes sections for "Wasserplanung", "Projekt", "VORUNTERSUCHUNG", "INTERAKTIVE PLANUNG", "AWI-PLANUNG (Szenarien)", "EVALUATION / RECHNITE", and "Gesamtbilanz". The main area displays a map of a region with various land use categories and infrastructure. A legend on the right defines symbols for "Binnengrenze und Bebauungsgrenze" (red), "Objektkarten" (green), "Betroffenscheitzanalyse" (yellow), "AWI-Maßnahmen" (blue), and "einfügung (Einfügung)" (green).



Multi touch interactive planning



Discussions

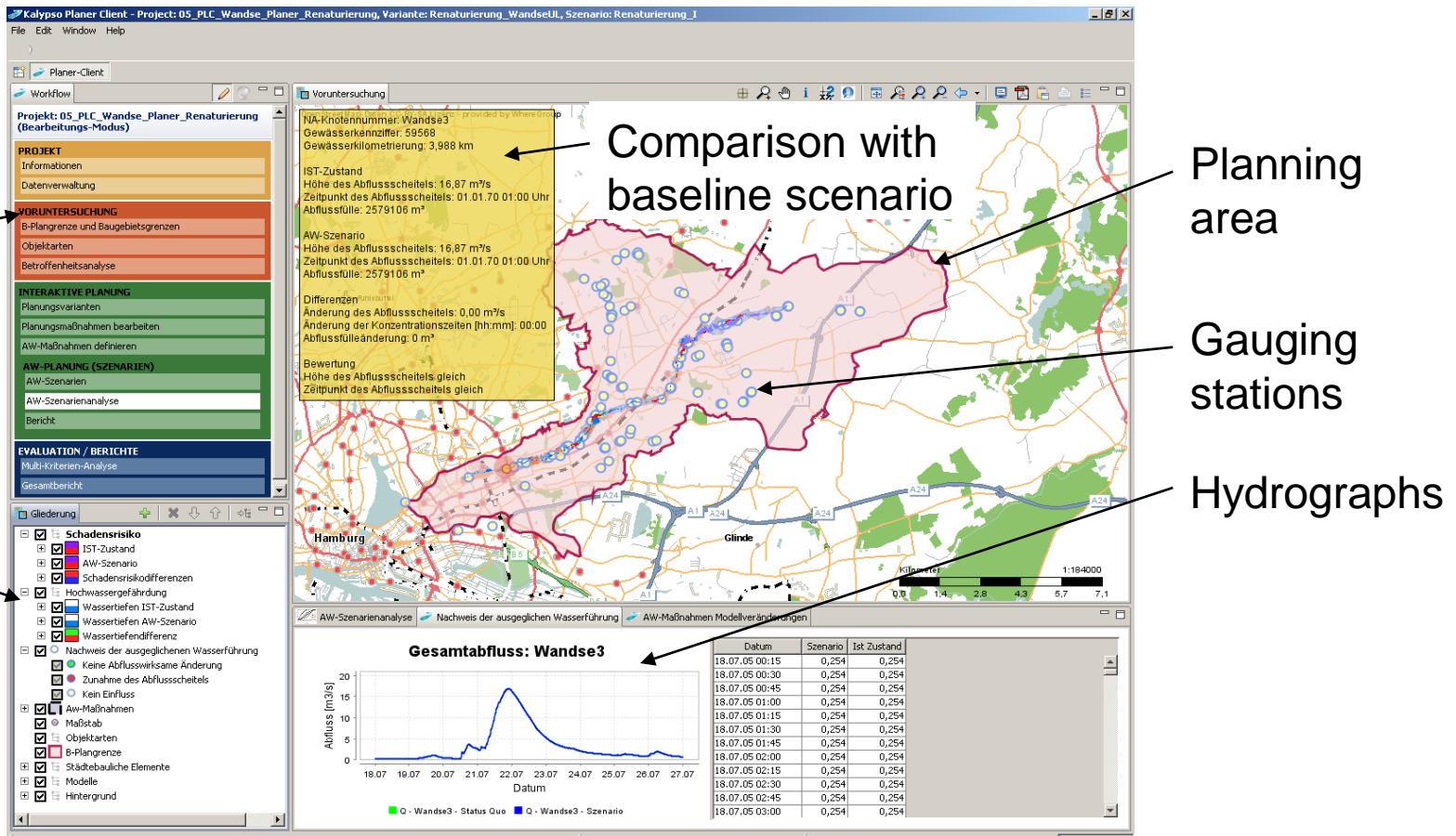


3
2
1

Phase 3: Experimenting

3
2
1

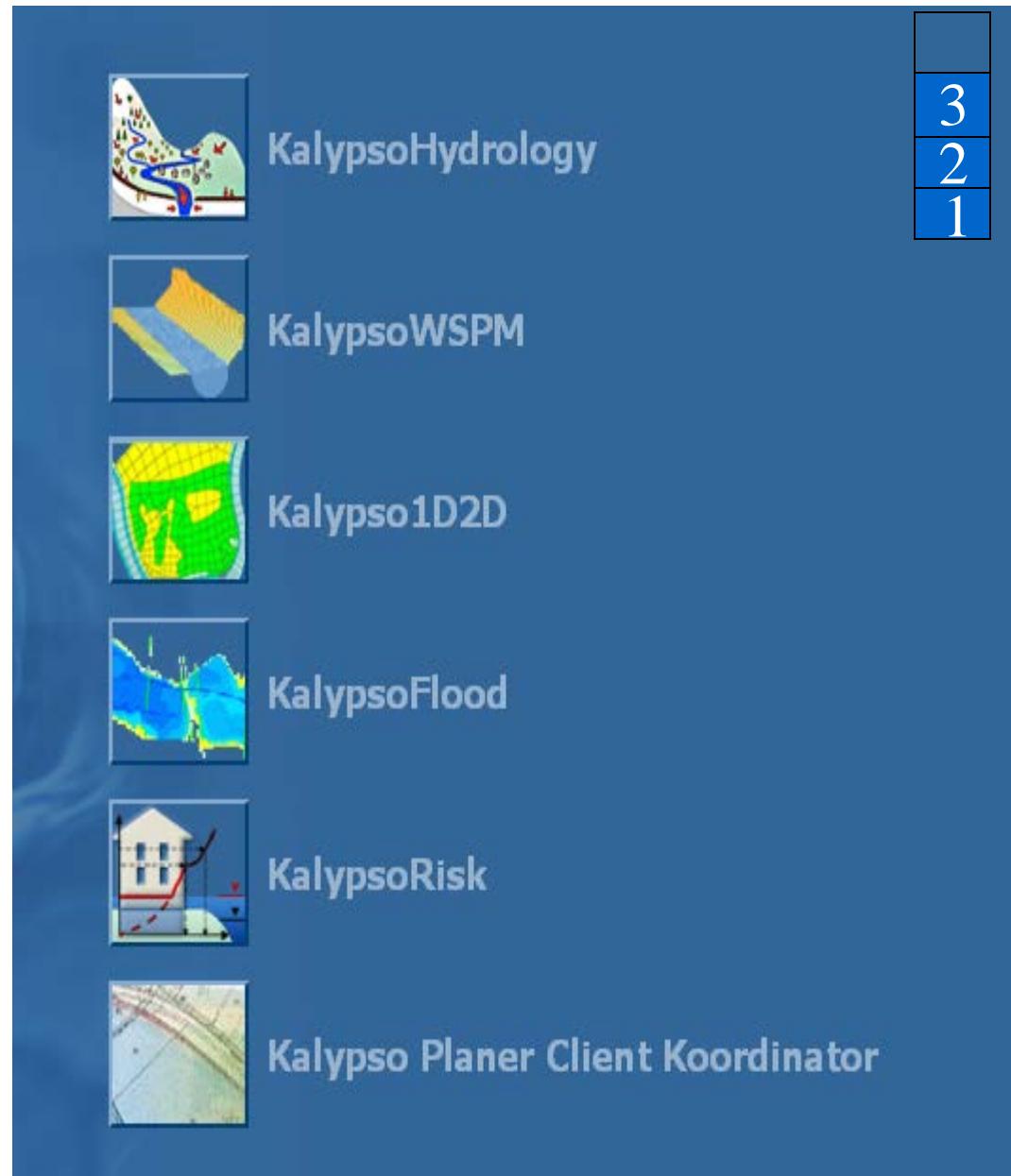
Decision support tool
Kalypso Planner Client
- Open source modelling platform



Phase 3: Experimenting

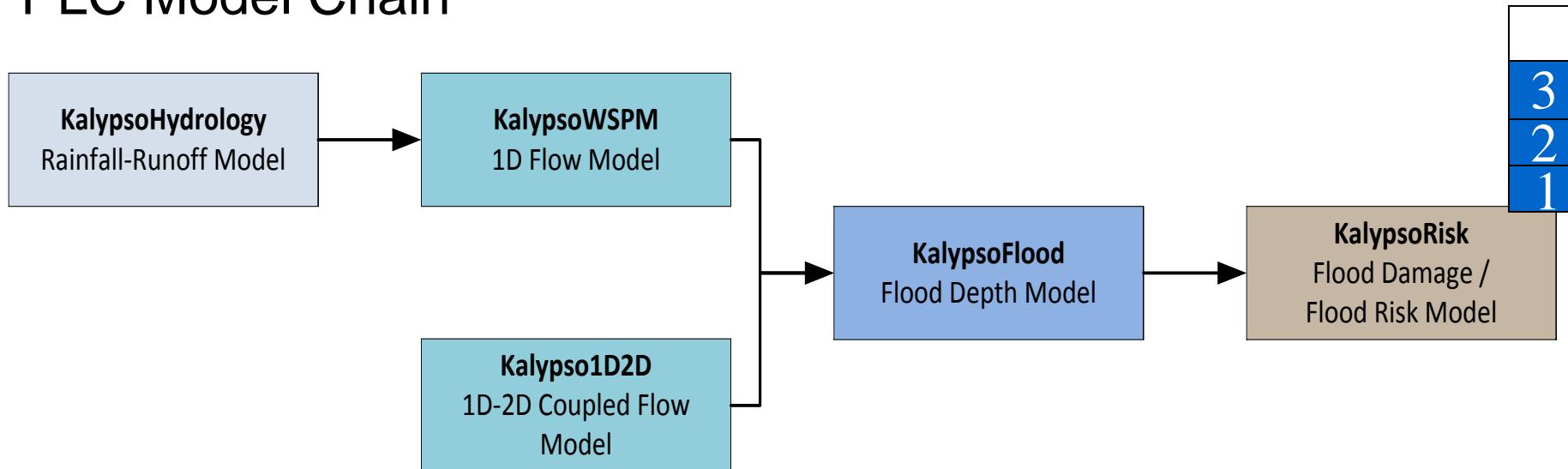
3
2
1

- Kalypso baseline models
 - Rainfall-runoff
 - 1D steady flow
 - 1D/2D unsteady flow
 - Flooded areas
 - Flood risk
- Planner Client Coordinator
 - Baseline model database
 - Define model chain



PLC Model Chain

Phase 3: Experimenting

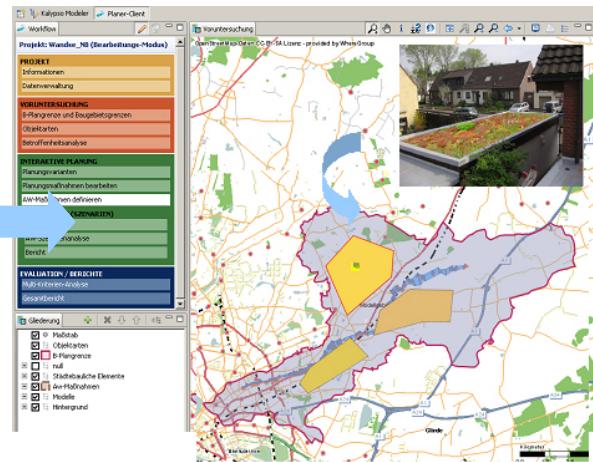
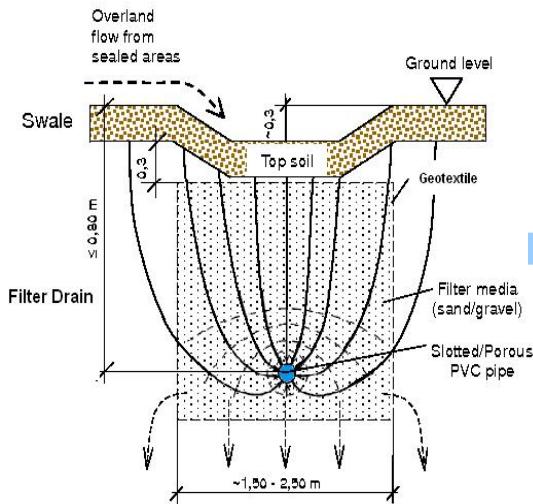


- Can disable parts of the chain
- Start with either rainfall-runoff or flow model
- Terminate with either flood depth maps or risk map
- Prepare events of different annuality for risk calculation

Phase 3: Experimenting

Role of PLC in FRMP

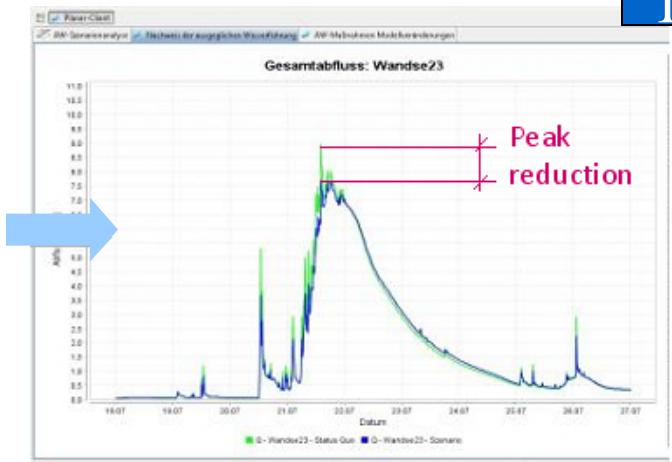
3
2
1



Physically based

Web based GUI

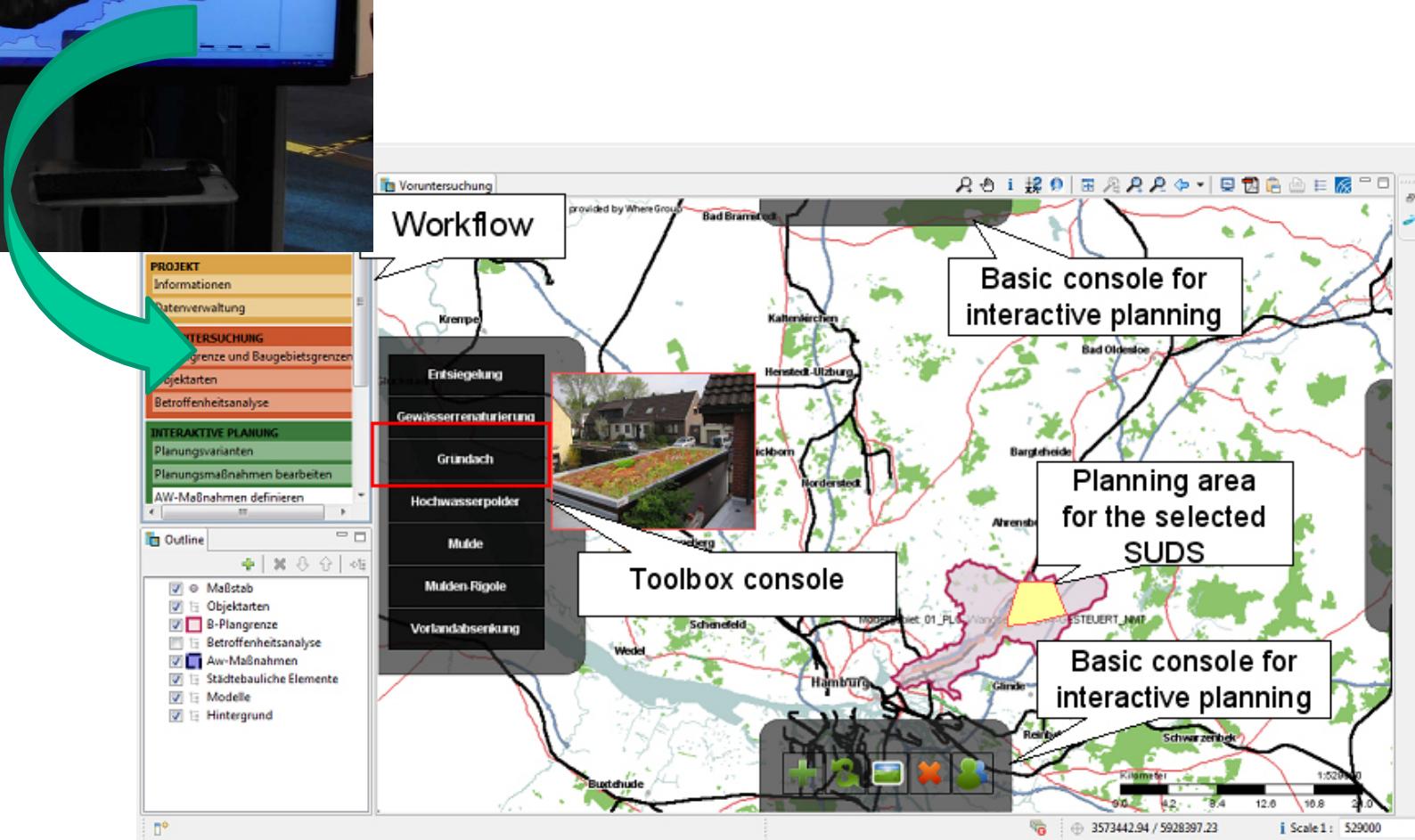
Assessment of the efficiency of the measures



Phase 3: Experimenting

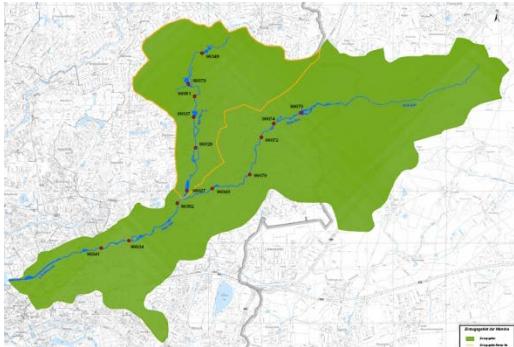
3
2
1

Multi touch technology for GUI



Phase 3: Experimenting

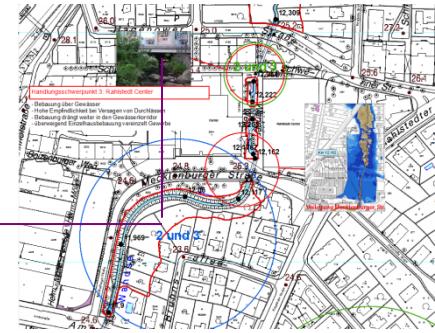
Catchment



Water course



Local “Hotspots”



3
2
1

Not quantifiable

→ Consideration of SUDS in urban development plans

Quantifiable

→ SUDS
→ Polders

→ Maintenance
→ „Hitchhiking“ on WFD

→ Restoraiton of rivers

→ Capacity building of stakeholders

→ „Local“ measures

BERNER AU-WANDSE		OSTERDORFER TEICH	
2. Natürlicher Wasserschutz		Var 1: Kleinflut aus Überschwemmungsgebiet Var 2: Kleinflut an der Grünanlage	Dauerhafte Regenwasserableitungsmethoden (Grund- und Versickerung - Schule Eichpark)
3. Technischer Hochwasserschutz		Var 1: Kleiner Wall zwischen Berner Au und Wandse Var 2: Kleiner Wall zwischen Osterdorfer Teich und Wandse	Trockenlegung an der Brücke „Bei den Hopfenkäse“ Gewässerunterhaltung
		Var 1: Durchgängigkeit des Hochwasserschutzes herstellen Var 2: Optimalisierung der Steuerung	Var 1: Durchgängigkeit des Hochwasserschutzes herstellen Var 2: Optimalisierung der Steuerung
NORDMARKTEICH		Var 1: Ausbau des RHBs Holzmühlenbach Var 2: Optimalisierung der Steuerung des RHBs	Dauerhafte Regenwasserableitungsmethoden (Grund- und Versickerung - Mühlenstraße)
2. Natürlicher Wasserschutz		Var 1: Weitgestaltete Rahaue, Abfluss und Nutzung der Rahaue Var 2: Strukturverbesserung und Umbau des AB-Umlaufgewässer	Trockenlegung an der Brücke „Nordmarkt“ Gewässerunterhaltung
3. Technischer Hochwasserschutz		Var 1: Tiefholzung an der Brücke „Nordmarktstraße“ Var 2: Ausbau des RHBs Nordmarktbeek und Orlmhenteich (als ein Objekt schützen)	Var 1: Ausbau RHB Nordmarktbeek und Orlmhenteich (als ein Objekt schützen) Var 2: Verbesserung der Steuerung des RHBs

Phase 4: Evaluation & Decision

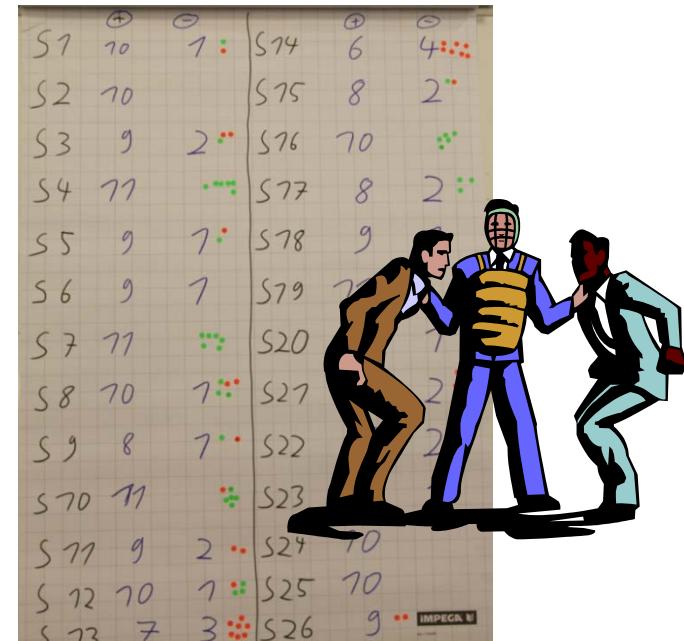
→ Adopt the final FRMP



Evaluate effectiveness of adaptive measures

- Hydrologic efficiency
- Implementation potential
- Cost efficiency
- Harmonisation with WFD

4
3
2
1



Evaluate conflicts and find ways of minimizing them

SAWA- Flood Risk Management Plan

Lessons learned & Conclusions

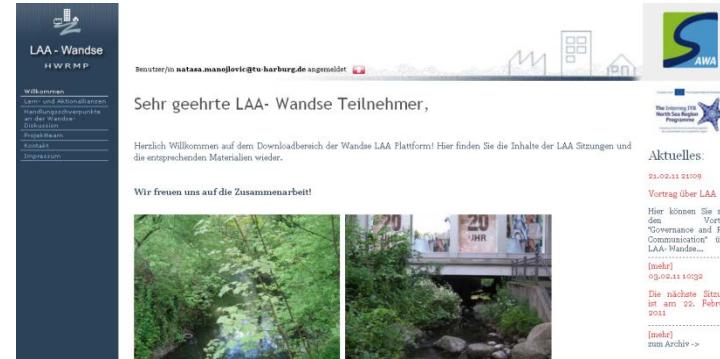
- Flood Risk Management Planning involves a range of tools and methods (social, hydrodynamic, learning) and needs interdisciplinary teams
 - *Application of DSS time and resources is intensive but necessary! It is important to deliver facts and figures*
 - *Good understanding of the system and delivering facts are the key to keep the interest (flood maps, drivers&pressures assessed, quantification of the effect of WFD measures and NSM...)*
- The sessions have to be inviting for participants especially in the initial phase
 - *Social games can improve the mutual trust*
 - *Dare to try something new ☺*
- Optimisation of the process duration and resources (2 years too long)
 - *Workshops vs. Online participation (tools)*
 - Further development of the calculation chaining (CORFU Project)

Acknowledgement:

is co-funded by the European Union  through the European Regional Development Fund



Strategic Alliance for integrated Water Management Actions



LAA - Wandse
H W R M P

Benutzer/in nataša.manglović@tu-harburg.de angemeldet

Sehr geehrte LAA- Wandse Teilnehmer,

Herrlich Willkommen auf dem Downloadbereich der Wandse LAA Plattform! Hier finden Sie die Inhalte der LAA Sitzungen und die entsprechenden Materialien wieder.

Wir freuen uns auf die Zusammenarbeit!

21.02.21 21:09

Vortrag über LAA

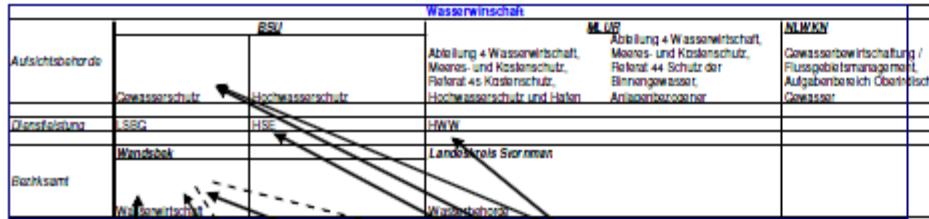
Hier können Sie sich den Vortrag "Governance and Risk Communication" über LAA-Wandse.....
[mehr] 03.02.21 10:38

Die nächste Sitzung am 22. Februar 2021
[mehr] zum Archiv ->

<http://laa-wandse.wb.tu-harburg.de/>

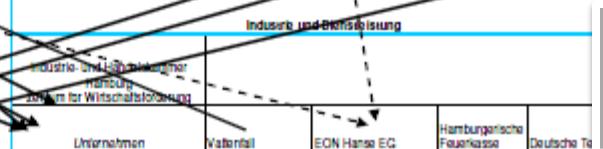
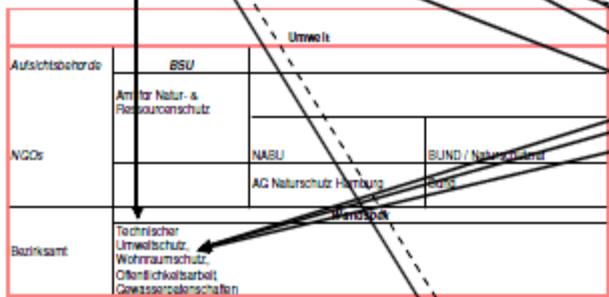
Implementation of the concept

- Existing Links and Ties of LAA-members: Informing

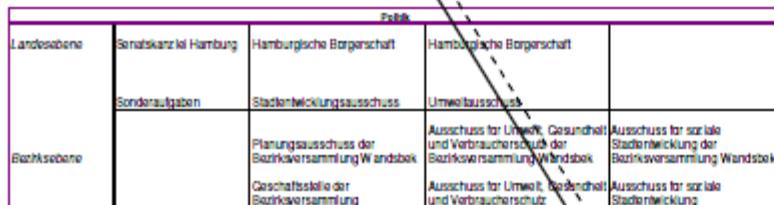


State authority

1



District Authorities



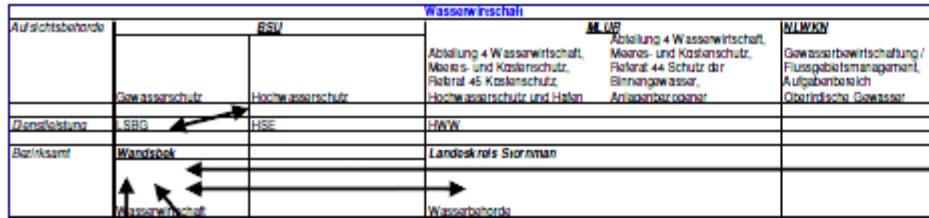
Policy



Public

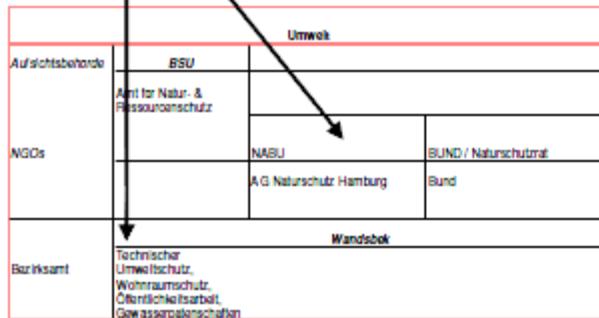
Implementation of the concept

- Existing Links and Ties of LAA-members: Participatory Planning

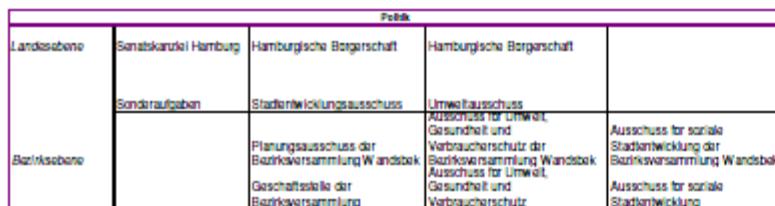


State authority

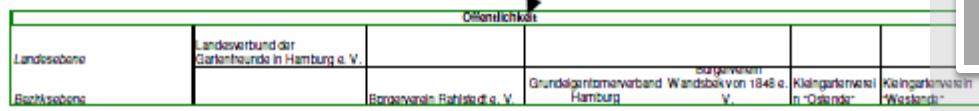
1



District Authorities

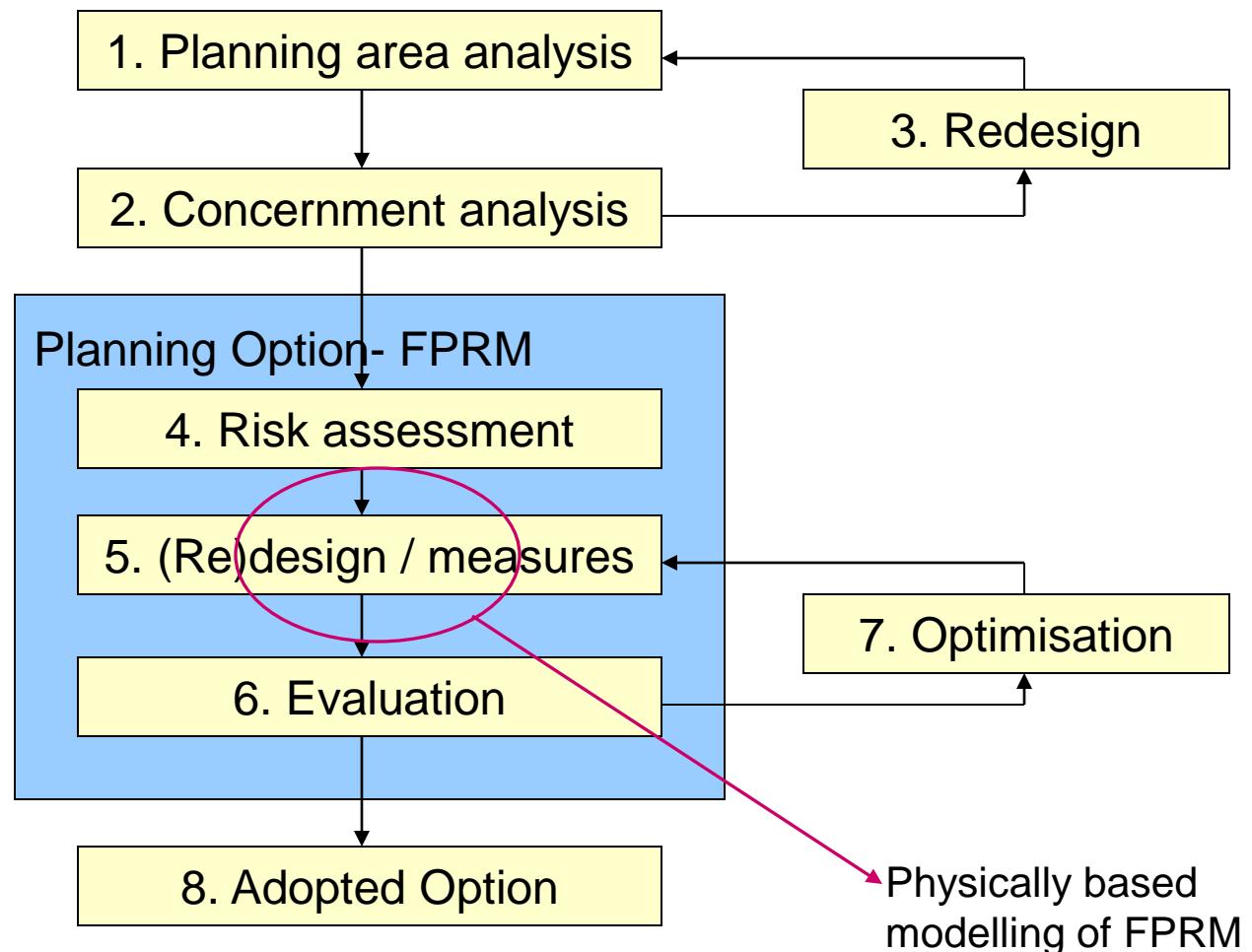


Policy



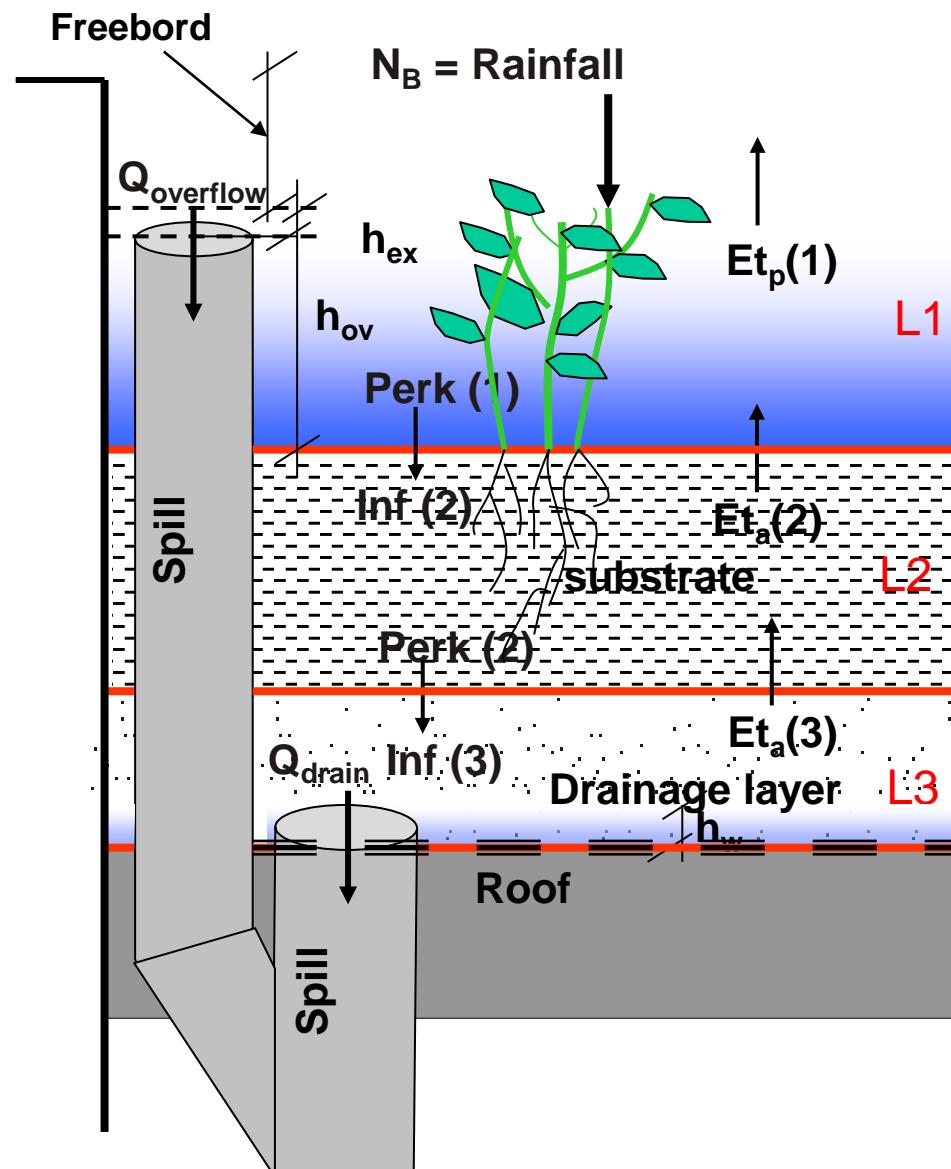
→ Still underdeveloped

Decision making process for selection on appropriate FPRM:



Physically based approach for modelling of FPRM:

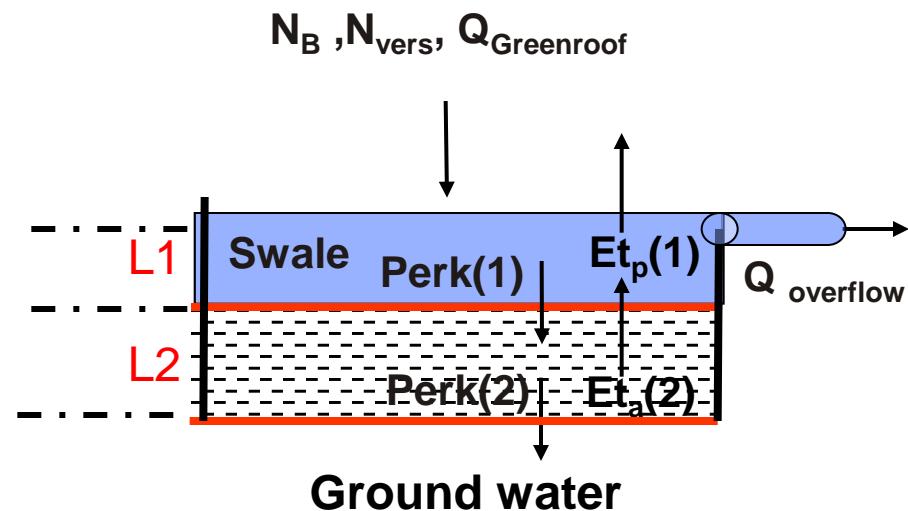
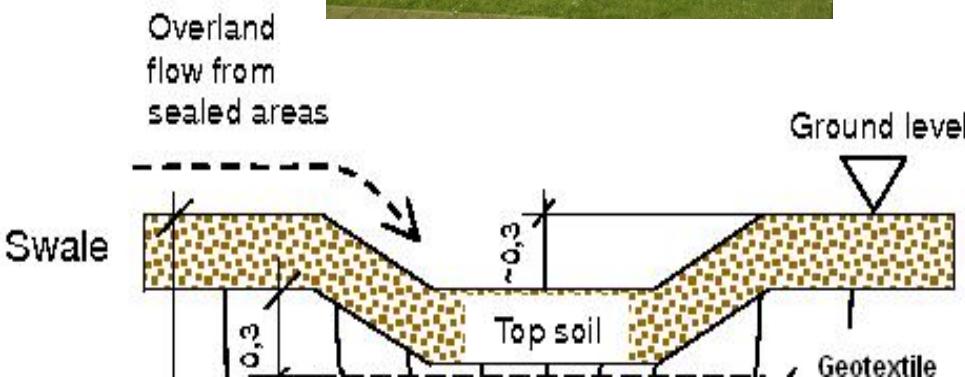
Green roof:



DSS-FPRM

Physically based approach for modelling of FPRM:

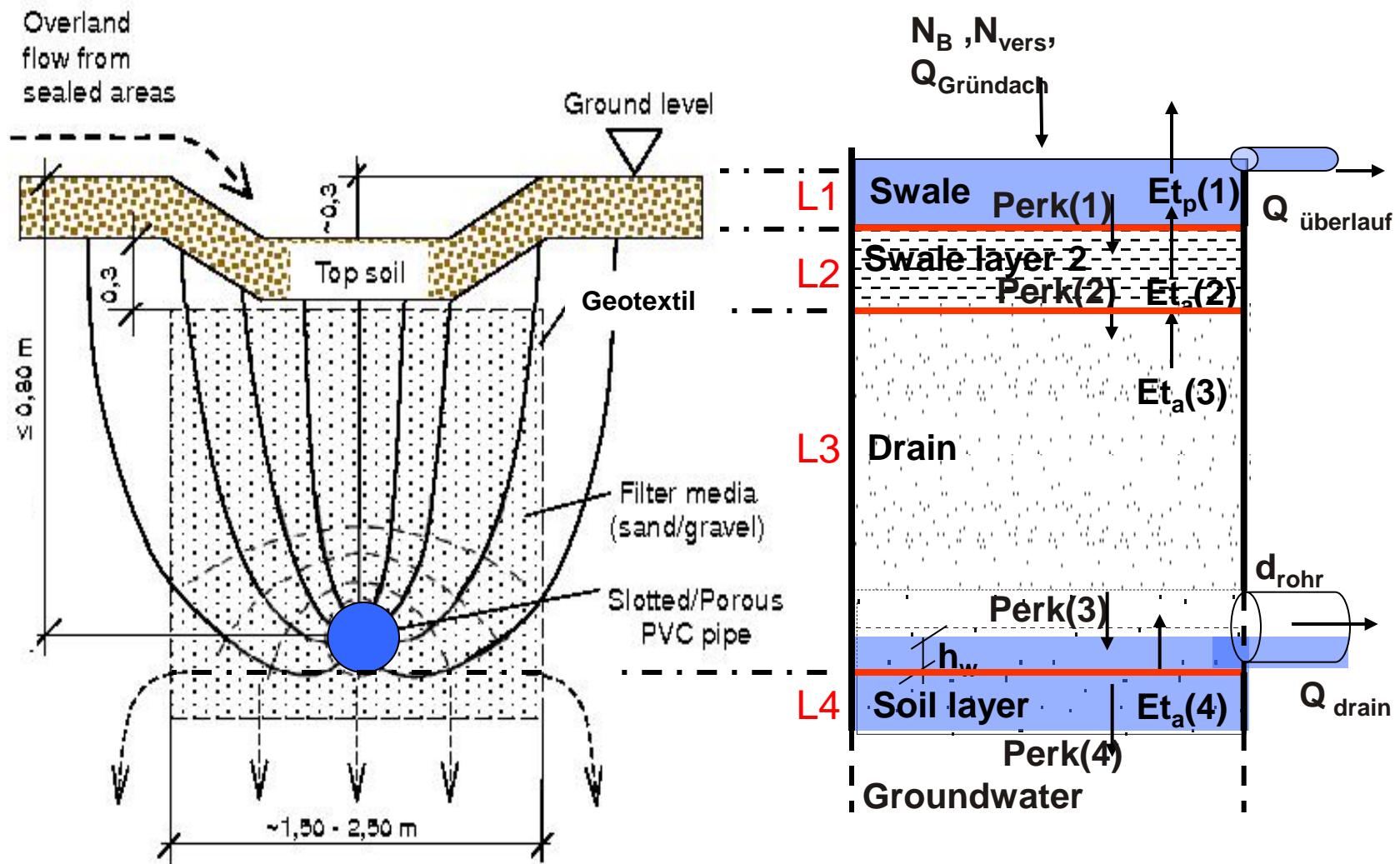
Swale:



DSS-FPRM

Physically based approach for modelling of FPRM:

Swale with filter drain:



Integration of single SUDS elements:

District level:

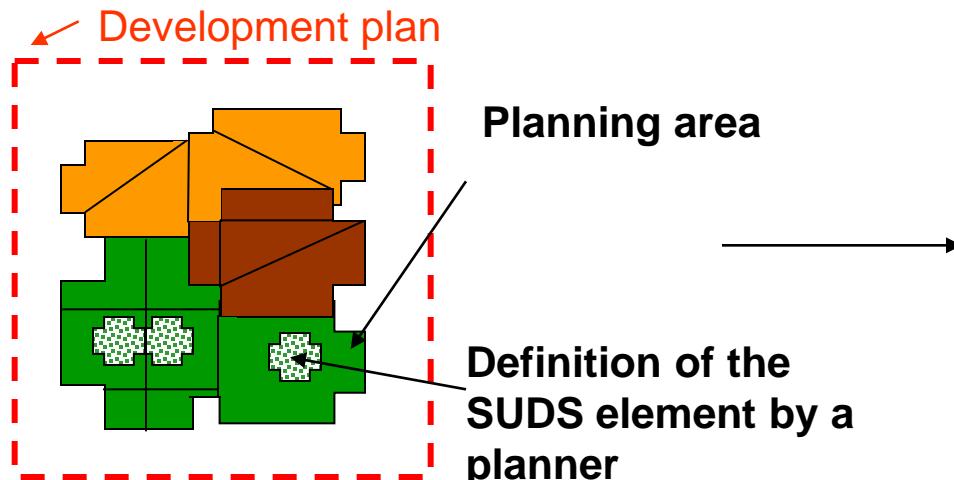
**Legend**

lückenhafte Pflasterung	Grünrächer	Rinne	Muldenrigolenversickerung
entsiegelte Parkplätze	Überschussrinne	Muldenversickerung	Überschussflächen

Modelling of SUDS elements as a basis for DSS

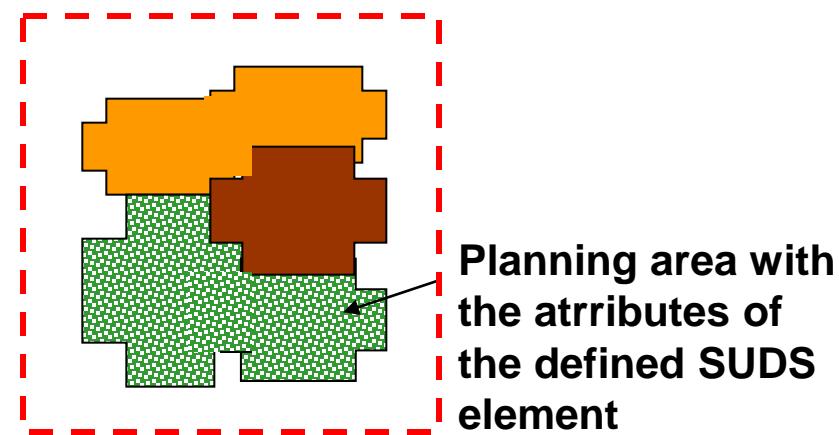
Planning level:

Definition of SUDS in the planning area



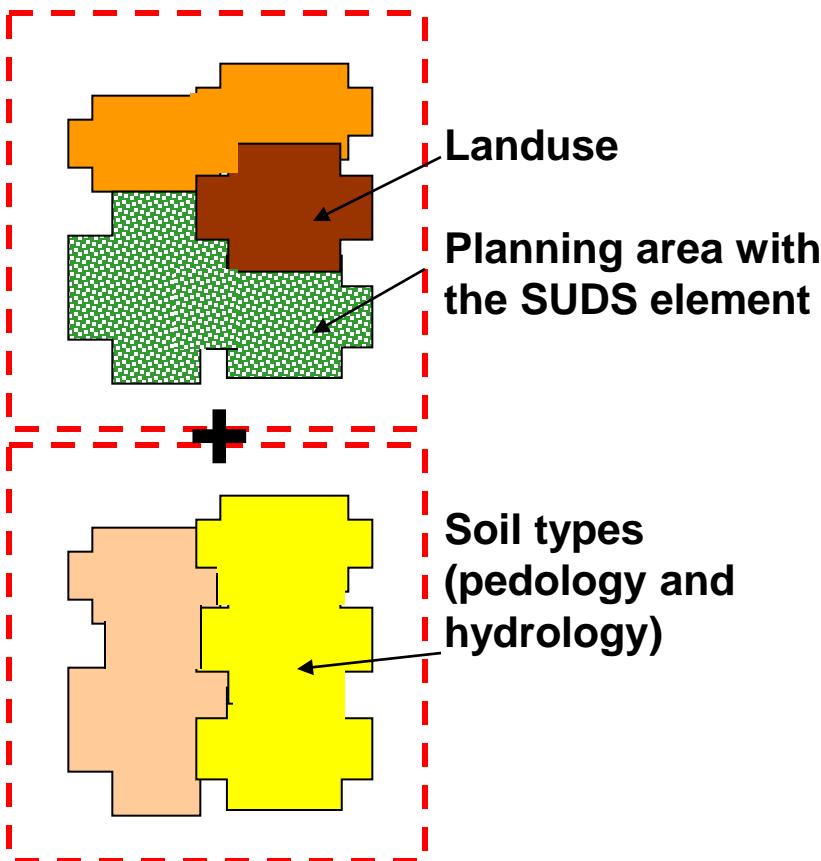
Model level

Representation of the SUDS element in the model



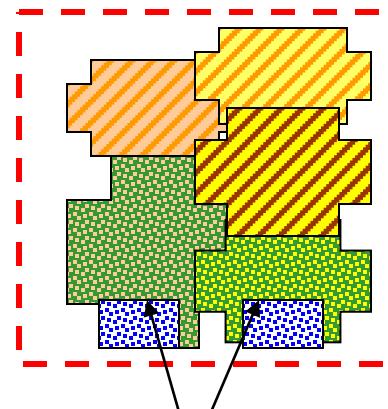
Modelling Concept: SUDS element as a hydrootope (HRU)

Verschneidung



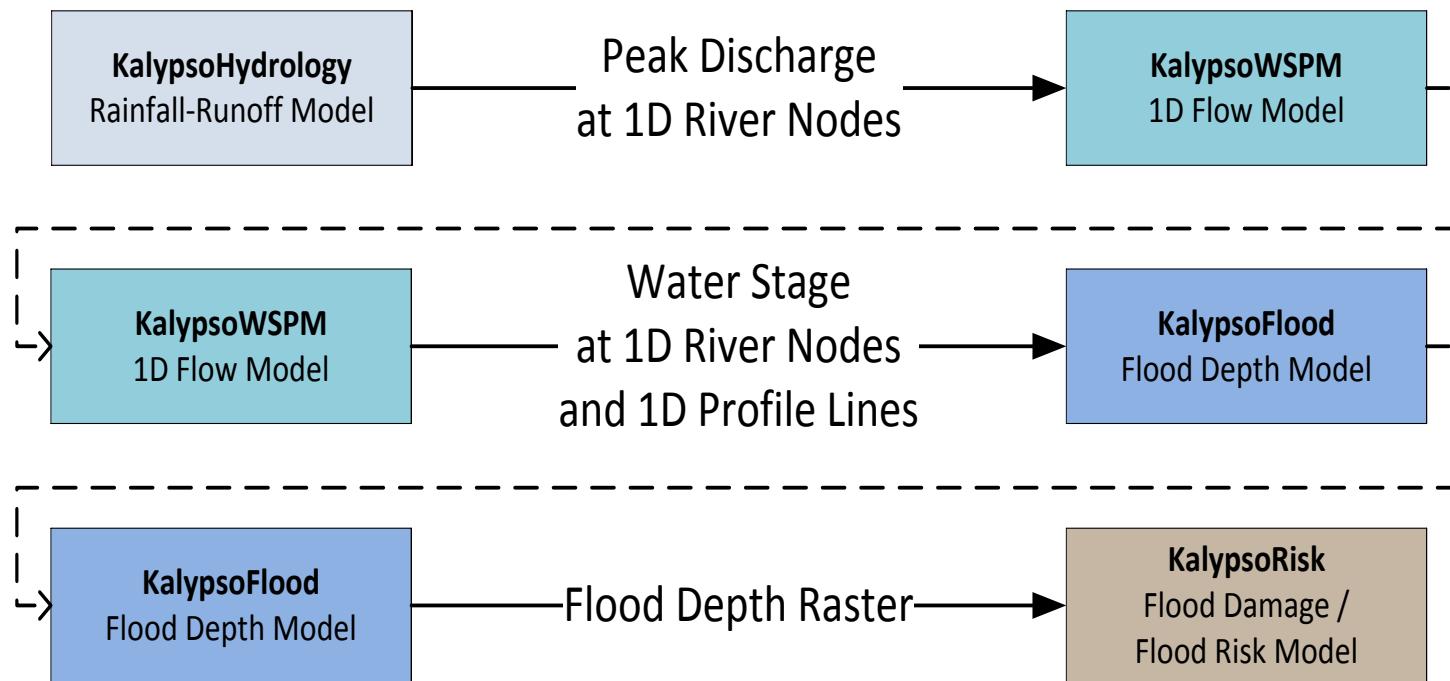
Hydrotopes (HRU) are the areas with the same hydrologic characteristics.

Hydrotope



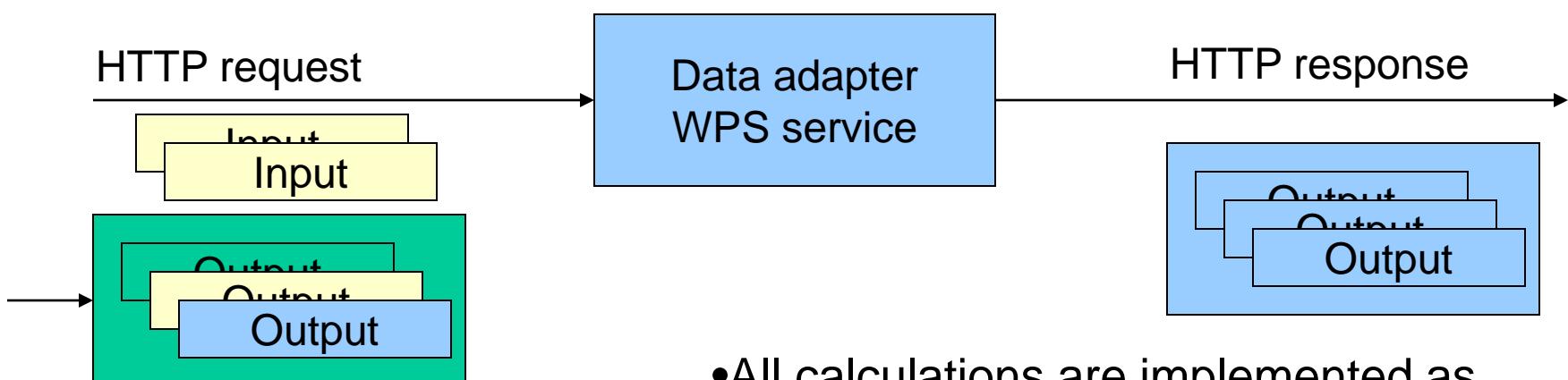
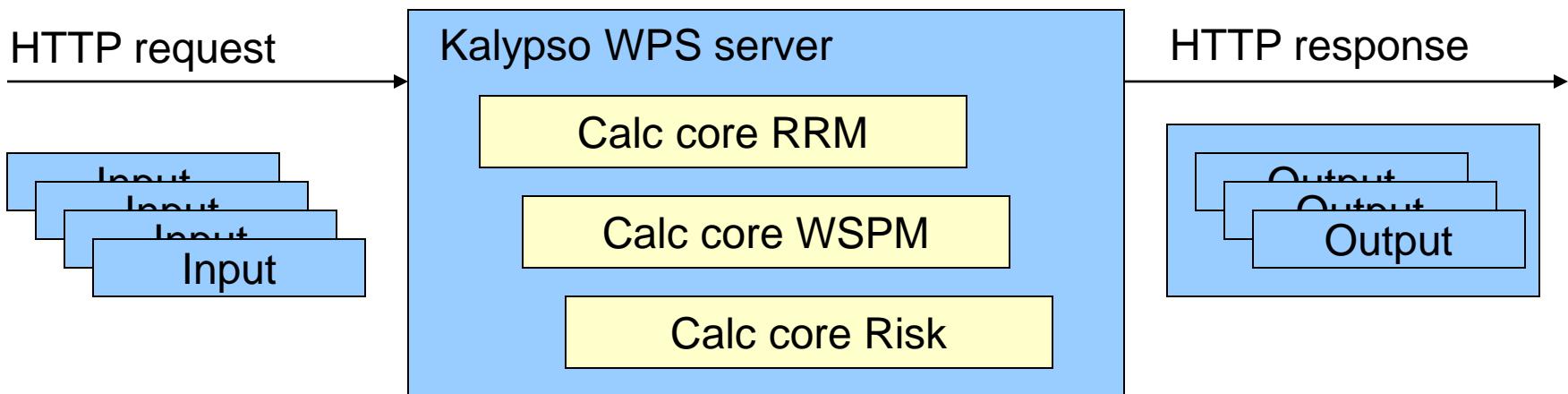
SUDS are additional hydrotope areas in the model

PLC „Travel Adaptors“



- Adaptors between models transfer relevant results
- Only one kind of each model implemented so far

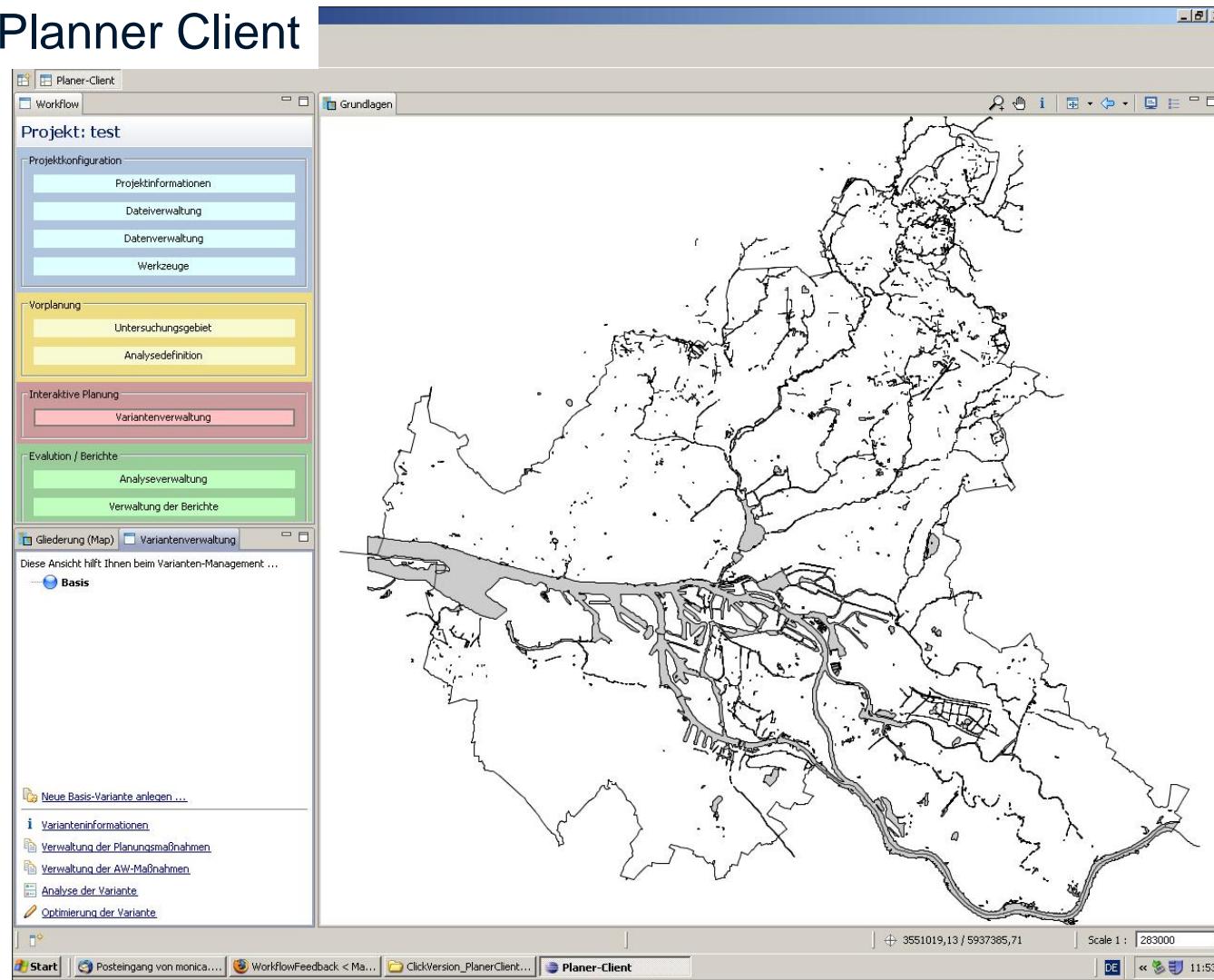
Implementation- FPRM



- All calculations are implemented as remote services
- Automatic calculation chaining

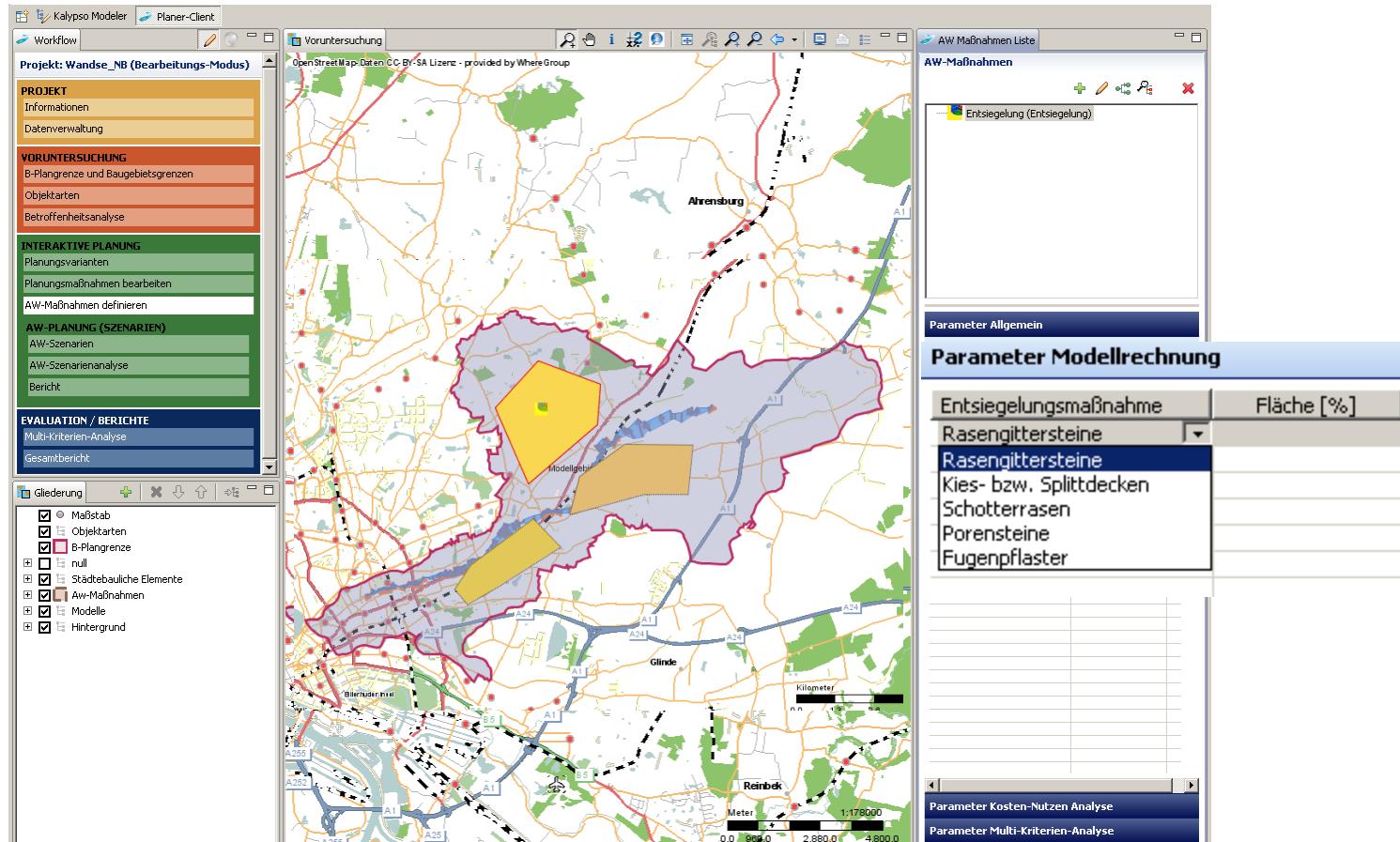
Implementation-FPRM

Kalypso- Planner Client



Implementation- FPRM

Pervious pavements:



Green Roofs:

Kalypso Modeler Planer-Client

Voruntersuchung

AW-Maßnahmen Liste

Parameter Allgemein

Parameter Modellrechnung

Evaluation / Berichte

Gliederung

The screenshot displays the Kalypso Modeler software interface for urban planning. On the left, there's a vertical navigation bar with sections like 'Projekt', 'Voruntersuchung', 'INTERAKTIVE PLANUNG', 'AW-PLANUNG (Szenarien)', and 'Evaluation / Berichte'. The main area shows a map of the Hamburg region with various land use and infrastructure layers. A specific area is highlighted in red and blue, representing a planning model. To the right, a detailed window titled 'AW-Maßnahmen Liste' lists measures like 'Entsiegelung (Entsiegelung)' and 'Gründach (Gründach)'. Below it, the 'Parameter Allgemein' and 'Parameter Modellrechnung' tabs are active, showing input fields for parameters such as 'Fläche [%]', 'Gründachnutzung' (with dropdown options 'Extensive' and 'Intensive'), 'Durchmesser Grundablass [mm]', 'Porosität der Drainageschicht', 'Durchmesser Rohrüberlauf [mm]', and 'Überlauf Höhe [mm]'. At the bottom, there are additional tabs for 'Parameter Kosten-Nutzen Analyse' and 'Parameter Multi-Kriterien-Analyse'.

Swales:

The screenshot displays the Kalypso Modeler software interface, specifically the 'Voruntersuchung' (Pre-investigation) module for the project 'Wandse_NB (Bearbeitungs-Modus)'.

Left Panel (Navigation and Project Overview):

- Projekt:** Wandse_NB (Bearbeitungs-Modus)
- WORUNTERsuchUNG:**
 - B-Plangrenze und Baugebietsgrenzen
 - Objektkarten
 - Betroffenheitsanalyse
- INTERAKTIVE PLANUNG:**
 - Planungsvarianten
 - Planungsmaßnahmen bearbeiten
 - AW-Maßnahmen definieren
- AW-PLANUNG (Szenarien):**
 - AW-Szenarien
 - AW-Szenarienanalyse
 - Bericht
- EVALUATION / BERICHTE:**
 - Multi-Kriterien-Analyse
 - Gesamtbereicht

Bottom Left (Layer Legend):

- Maßstab
- Objektkarten
- B-Plangrenze
- null
- Städtebauliche Elemente
- Aw-Maßnahmen
- Modelle
- Hintergrund

Map View (Top Left):

The map shows the Wandse river area in Ahrensburg, Germany, with various planning layers overlaid. A large blue shaded area represents a catchment or study area. Several orange and yellow polygons highlight specific areas of interest. A dashed black line indicates a route or boundary across the map. The map includes street names like Middelmoor, Wellingmoor, and Reinbek, and major roads like A1 and A256.

Right Panel (Parameter Configuration):

AW-Maßnahmen List:

- Entsiegelung (Entsiegelung)
- Gründach (Gründach)
- Mulden-Rigole (Mulden-Rigole)
- Mulde (Mulde)

Parameter Allgemein:

Muldenfläche [%]: [Input field]

Angeschlossene Fläche [%]: [Input field]

Muldentiefe [m]: [Input field]

Parameter Modellrechnung:

Parameter Kosten-Nutzen Analyse:

Parameter Multi-Kriterien-Analyse:

Swales with filter drains:

Kalypso Modeler Planer-Client

Voruntersuchung

OpenStreetMap-Daten CC-BY-SA Lizenz - provided by WhereGroup

Ahrensburg

AW-Maßnahmen Liste

AW-Maßnahmen

- Entsiegelung (Entsiegelung)
- Gründach (Gründach)
- Mulden-Rigole (Mulden-Rigole)

Parameter Allgemein

Parameter Modellrechnung

Mulden-Rigolen Fläche [%]

Angeschlossene Fläche [%]

Durchmesser Dränrohr [mm]

200 mm

Muldentiefe [m]

Parameter Kosten-Nutzen Analyse

Parameter Multi-Kriterien-Analyse

Evaluation / Berichte

Multi-Kriterien-Analyse

Gesamtbericht

Gliederung

- Maßstab
- Objektkarten
- B-Pflanzen
- null
- Städtebauliche Elemente
- Aw-Maßnahmen
- Modelle
- Hintergrund

Projekt: Wandse_NB (Bearbeitungs-Modus)

INTERAKTIVE PLANUNG

Planungsvarianten

Planungsmaßnahmen bearbeiten

AW-Maßnahmen definieren

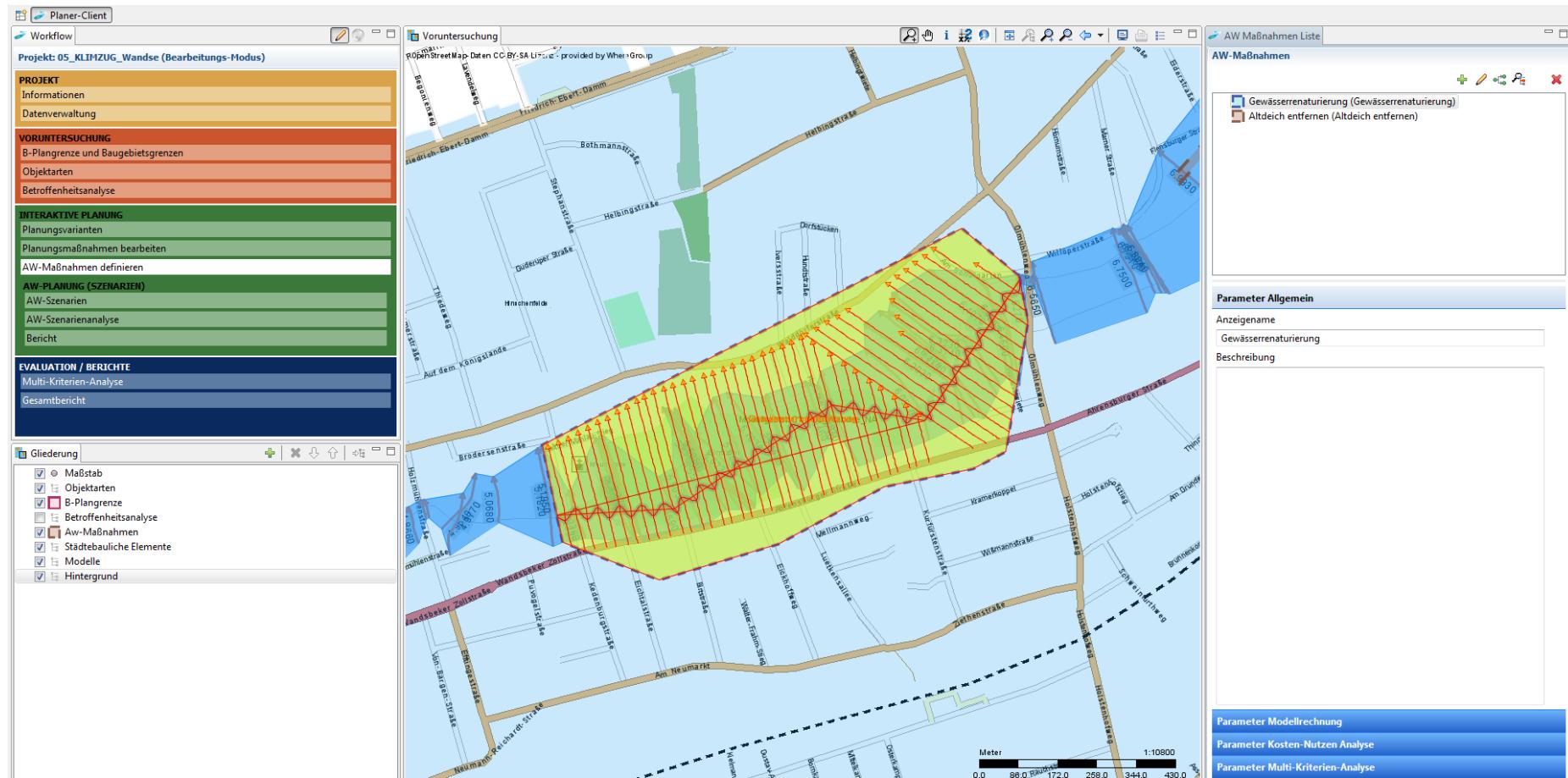
AW-PLANUNG (Szenarien)

AW-Szenarien

AW-Szenarienanalyse

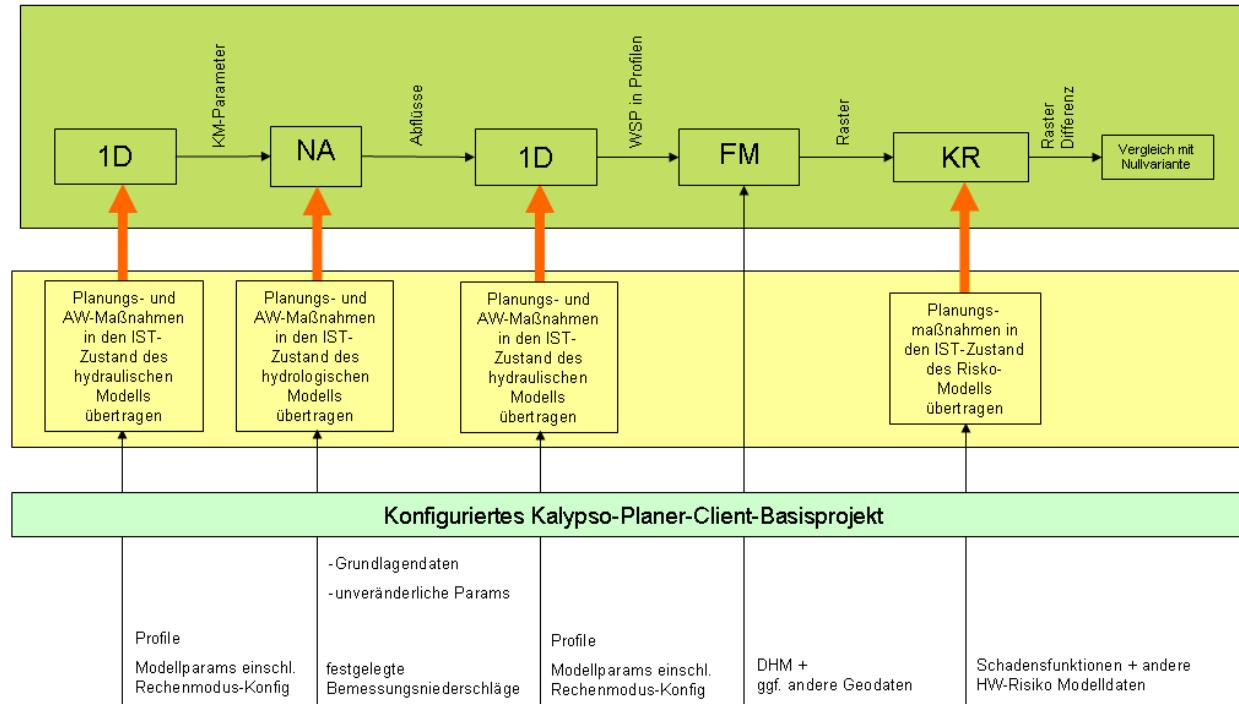
Bericht

Natural restoration of rivers:



Implementation-FPRM

Calculation chaining



→ Single models from RR, 1D, 2D, risk assessment are automatically connected and executed

Legende
Planer
Modellierer

Planer-Client (Stadt- bzw. wasserwirtschaftlicher Planer)

Koordinator Planer-Modellierer (Admin)

Wasserwirtschaftlicher Experte (Modellierer)

Komponenten

Kalypso-Server (Rechendienste)

Modelle

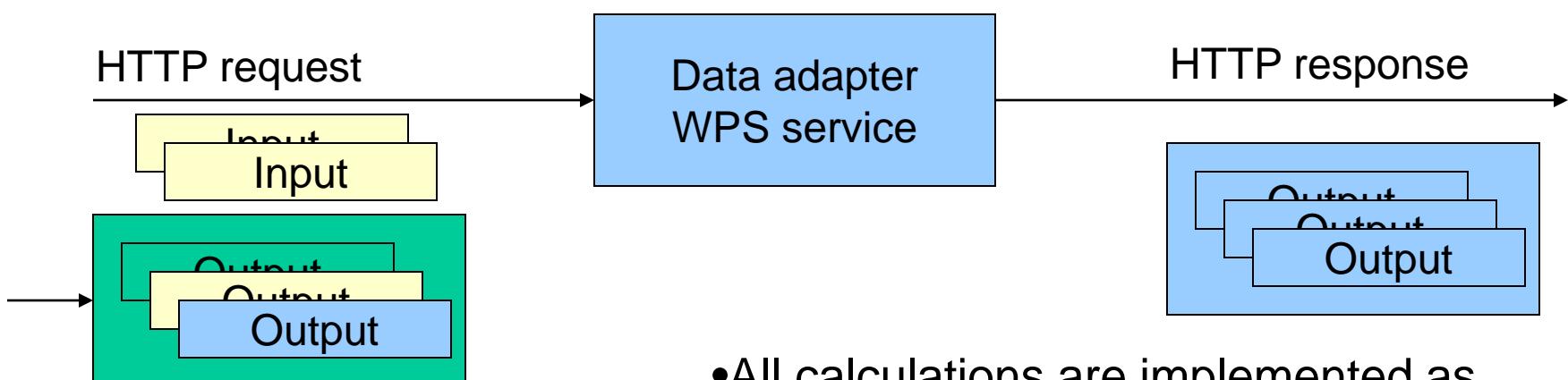
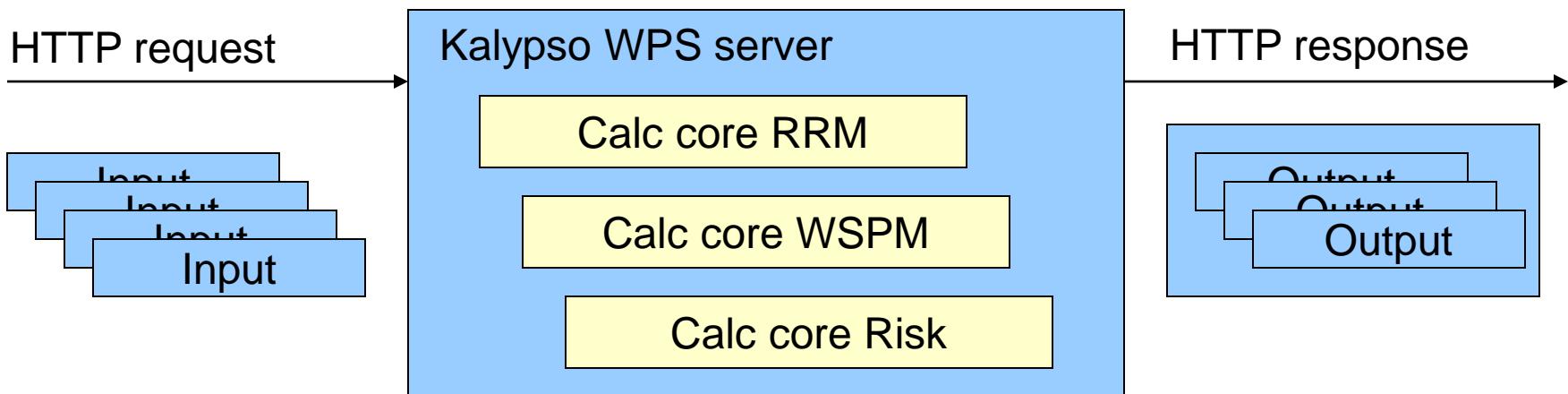
NA Kalypso Niederschlags-Abfluss-Modell

1D Kalypso WSPM (stationär)

FM Kalypso Flood-Modeler

KR Kalypso Risiko-Modell

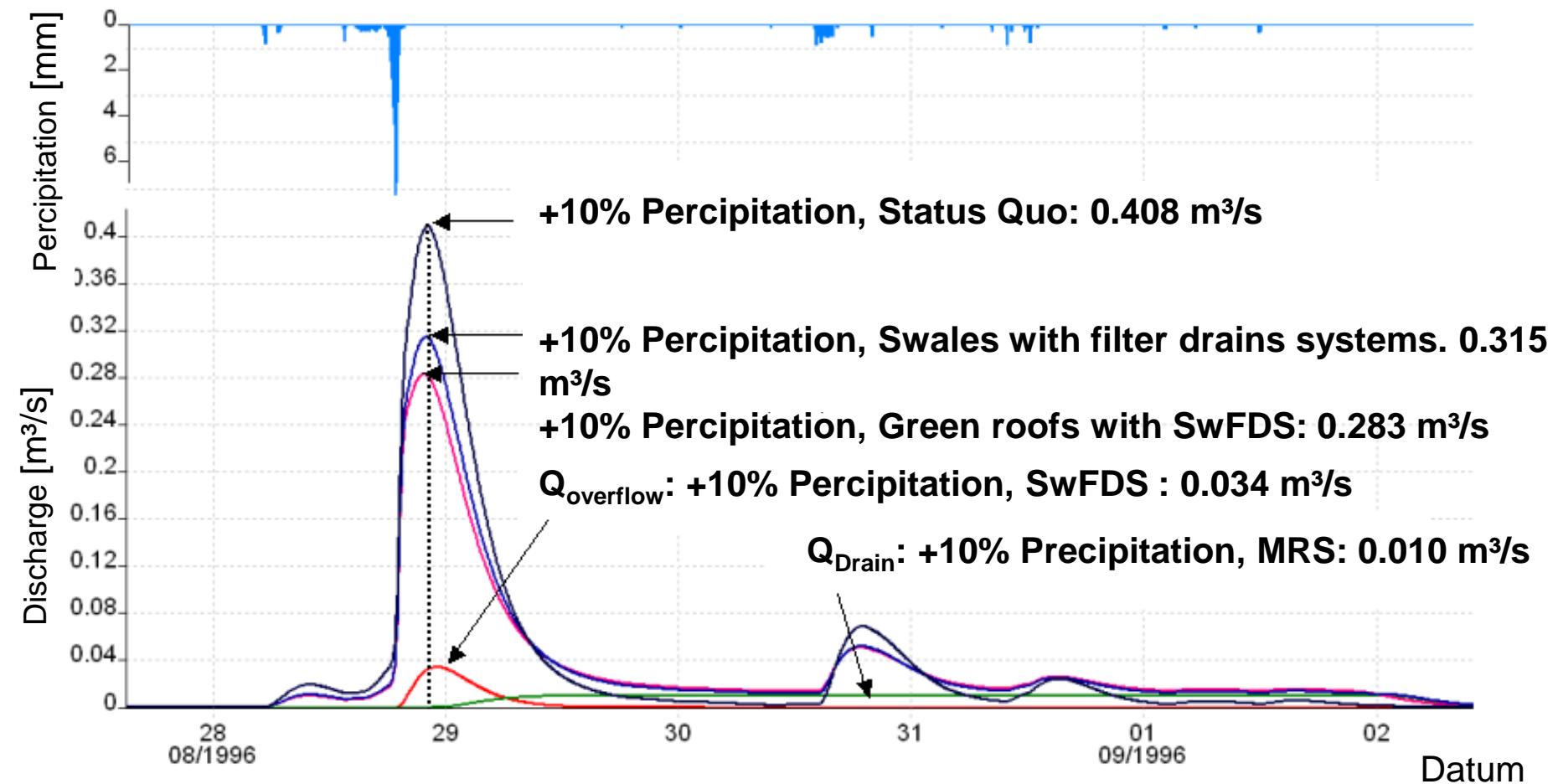
Implementation- FPRM



- All calculations are implemented as remote services
- Automatic calculation chaining

Implementation- FPRM

Efficiency assessment for FPRM



Results for a 10 year precipitation event