

APPENDIX

Supplementary Information

for

**How multi-level societal learning processes facilitate transformative change: A
comparative case study analysis on flood management**

Ecology and Society

Supplementary Figures

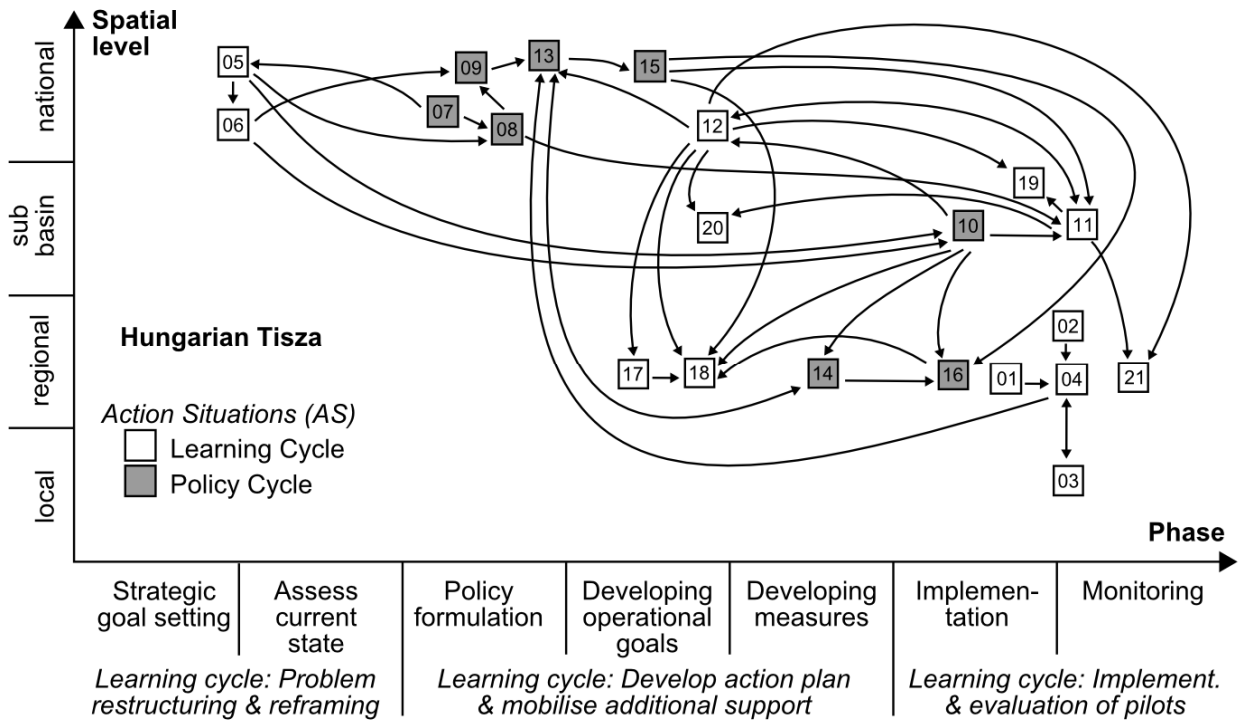


Figure A1. Formal policy and informal learning processes and their interdependencies in the Hungarian Tisza. Non-aggregated version of Fig. 3. The numbers refer to the ASs as listed in Table A2.

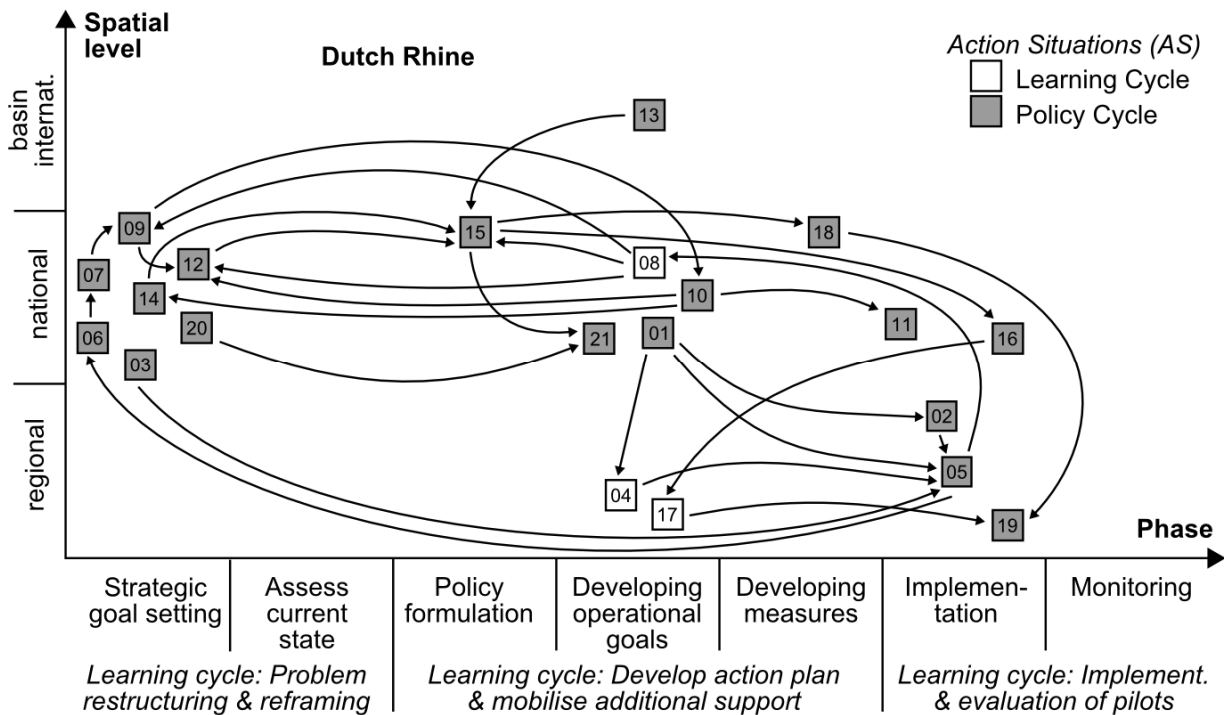


Figure A2. Formal policy and informal learning processes and their interdependencies in the Dutch Rhine. Non-aggregated version of Fig. 4. The numbers refer to the ASs as listed in Table A3.

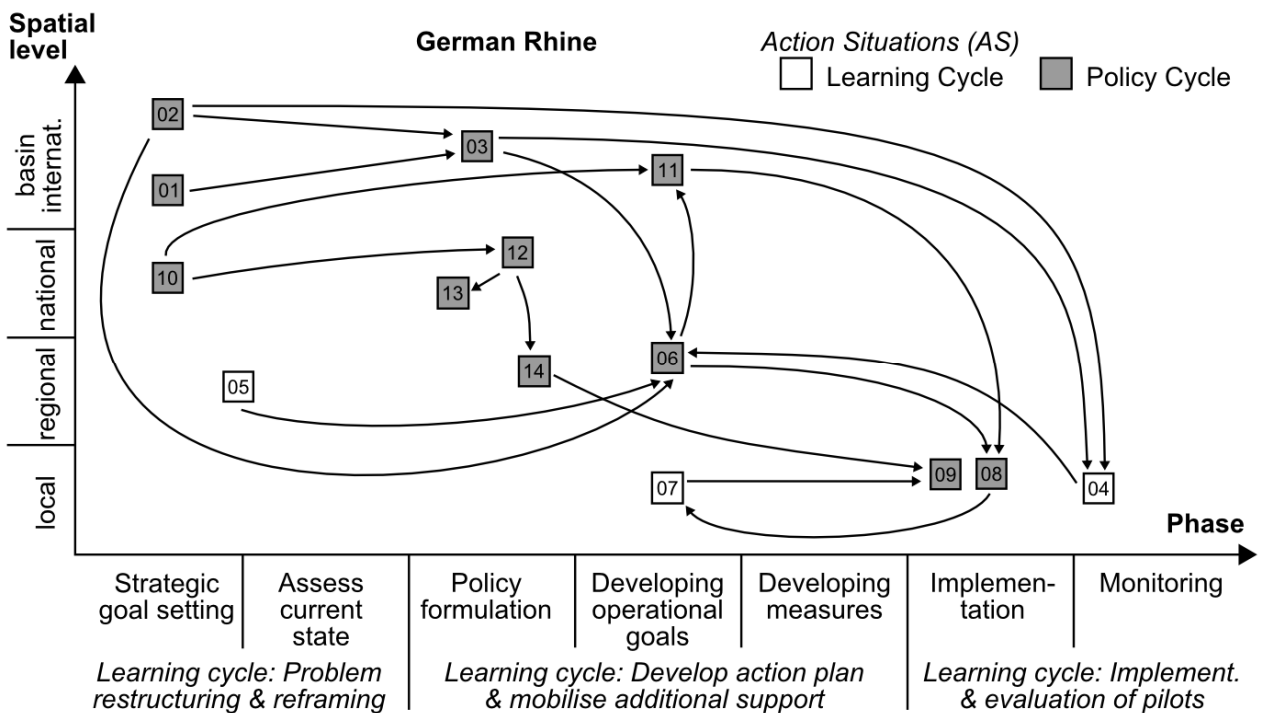


Figure A3. Formal policy and informal learning processes and their interdependencies in the German Rhine. Non-aggregated version of Fig. 5. The numbers refer to the ASs as listed in Table A4.

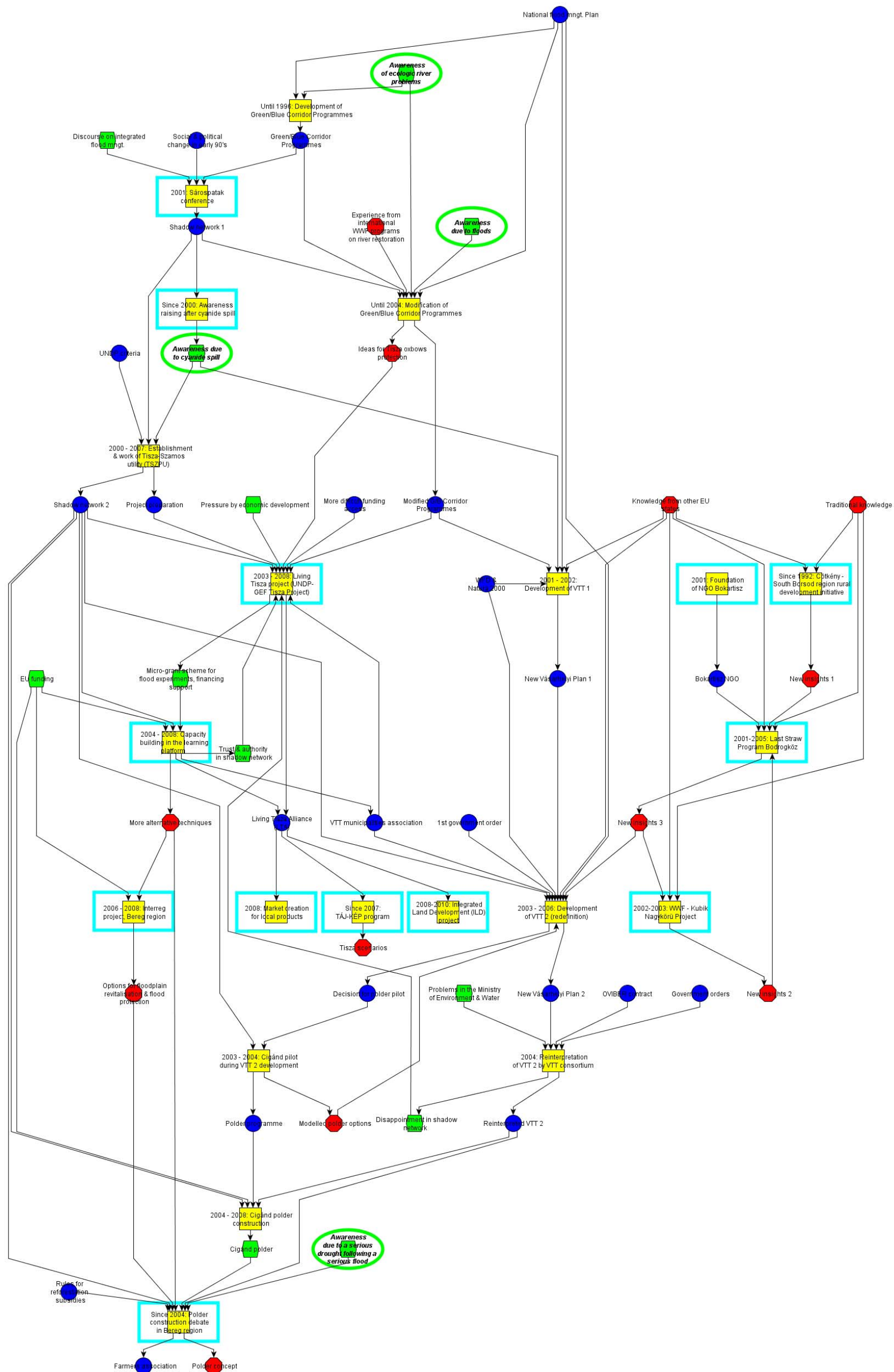


Figure A4. Tisza: Network of action situations (AS) linked by institutions (blue circle), knowledge (red octagon) or operational outcomes (green hexagon). Learning AS are marked by a turquoise rectangle. Extreme events and their impacts on public perception and policy response are marked by a green oval.

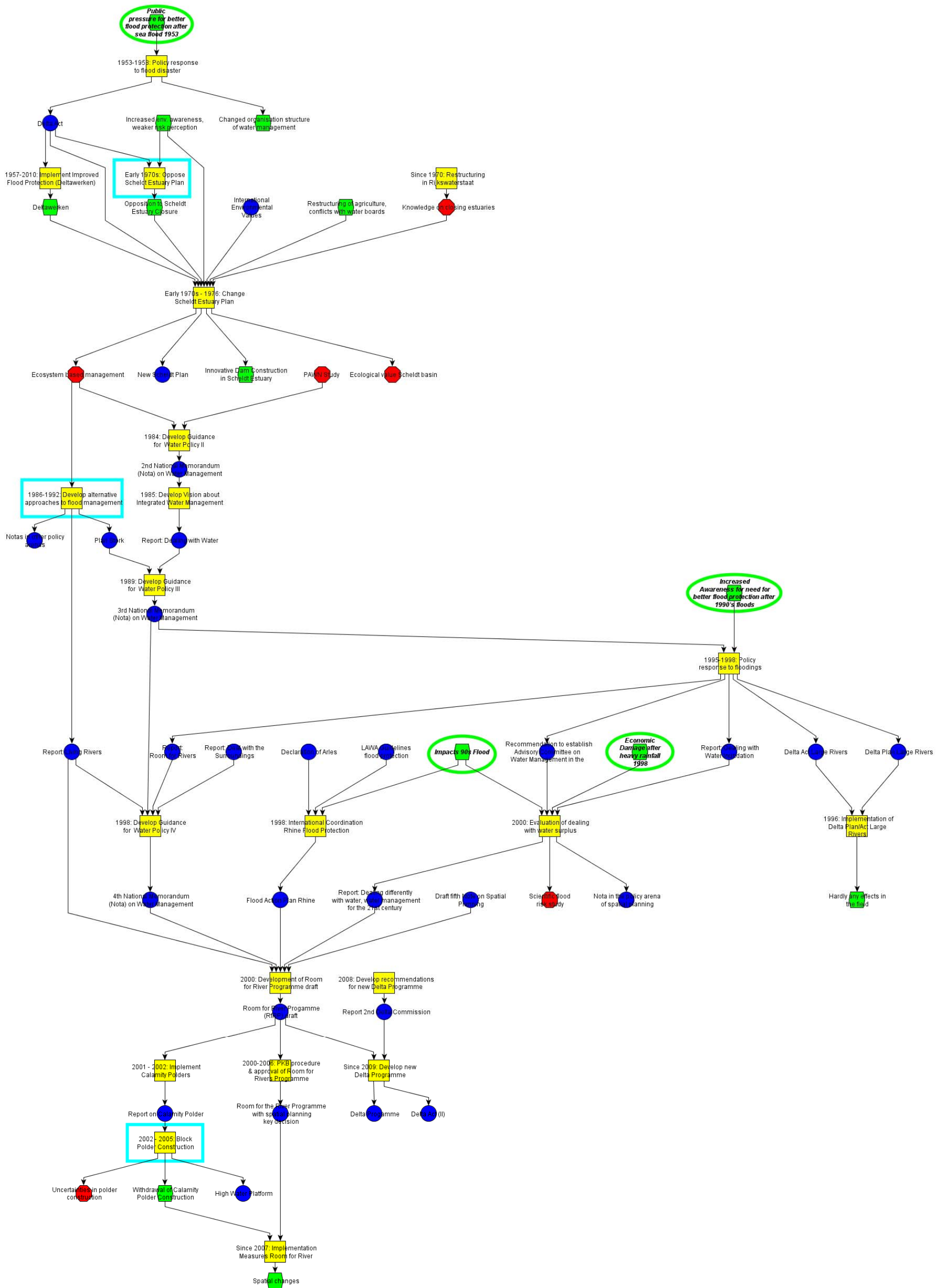


Figure A5. Rhine Netherlands: Network of action situations (ASs) linked by institutions (blue circle), knowledge (red octagon) or operational outcomes (green hexagon). Learning AS are marked by a turquoise rectangle. Extreme events and their impacts on public perception and policy response are marked by a green oval.

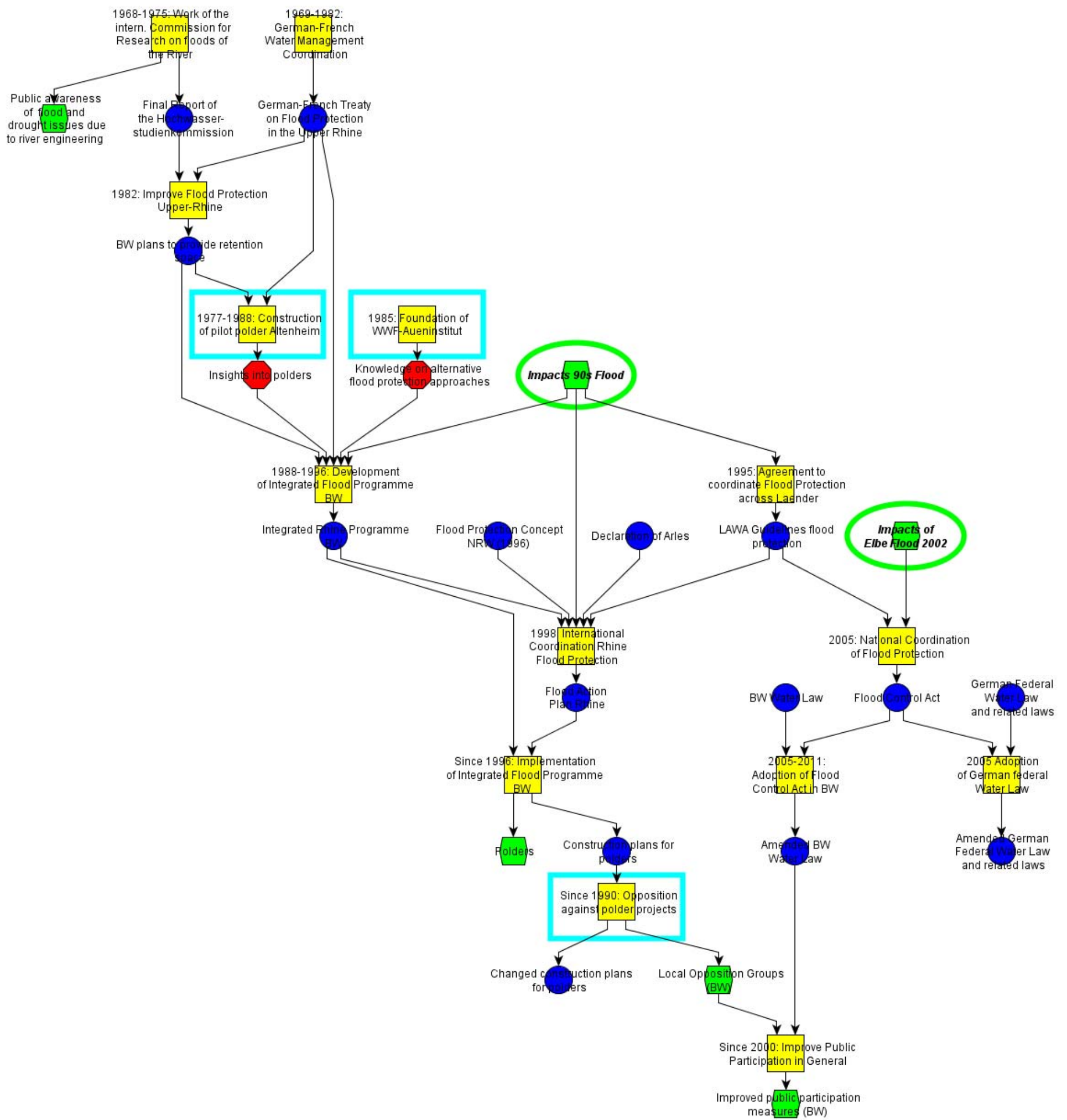


Figure A6. Rhine Germany: Network of action situations (ASs) linked by institutions (blue ball), knowledge (red octagon) or operational outcomes (green hexagon). Learning AS are marked by a turquoise rectangle. Extreme events and their impacts on public perception and policy response are marked by a green oval.

Supplementary Tables

Table A1. Definition of terms used for the Management and Transition Framework (MTF) analyses in this paper (cf. Pahl-Wostl et al, 2010).

MTF Term	Explanation	Attributes Used in the Analyses
Action Situation (AS)	Structured social interaction context that leads to specific outcomes.	Spatial Unit (cf. below) Phase (cf. below)
Actor	Individual or collective participant populating an ‘action arena’ and taking part in AS with certain ‘roles’.	Spatial Unit (cf. below) Individual, collective, collaborative
Spatial Unit		National, regional International, national basin, sub-basin
Phase Policy Process	Stylized phased of formal policy processes	<ul style="list-style-type: none"> • Strategic goal setting • Assess current state • Policy formation • Developing operational goals • Developing measures • Implementation • Monitoring
Phase Learning	Stylized phases of largely informal learning processes	<ul style="list-style-type: none"> • Problem structuring and reframing • Develop action plan and mobilise additional support • Implementation and evaluation of pilots/experiments
Role	A ‘role’ is held by an ‘actor’ during an AS. Roles belong thus to the relation ‘actor’ - AS and not to the ‘actor’	Lead Active participant Passive participant
Institution	Institution refers to a set of rules, decision-making procedures, programs that define social practices, assign roles to the participants in these practices, and guide interactions among the occupants of individual roles.	Formal or informal
Knowledge	Knowledge refers to meaningful information and experience.	
Operational Outcome	Operational Outcomes are concrete measurable effects of water management. Examples are technical or infrastructural actions (e.g. construction of dykes), improvements of water quality, increased public awareness.	

Table A2. Action Situations for the Tisza Hungary (HU, learning ASs in pink).

No.	Name Action Situation	Spatial Unit	Admin. Level	Lead Actor	Phase
HU01	2001: Foundation of non-governmental organization (NGO) Bokartisz	Bodrog/Bodrogszék region	Regional	Mr. G. Molnár	Learning Cycle - Implementation and Evaluation of Pilots/Experiments
HU02	Since 1992: Cötkény - South Borsod region rural development initiative	South Borsod	Regional	Cötkény (A. Sárvári)	Learning Cycle - Implementation and Evaluation of Pilots/Experiments
HU03	2002-2003: World Wide Fund For Nature (WWF) - Kubik Nagykörű Project	Municipality of Nagykörű	Local	WWF Hungary NGO (L. Haraszthy)	Learning Cycle - Implementation and Evaluation of Pilots/Experiments
HU04	2001-2005: Last Straw Program Bodrogszék	Bodrog/Bodrogszék region	Regional	Mr. G. Molnár	Learning Cycle - Implementation and Evaluation of Pilots/Experiments
HU05	2001: Sárospatak conference	Hungary	National	Bokartisz NGO (G. Molnár)	Learning Cycle - Problem Structuring and Reframing
HU06	Since 2000: Awareness raising after cyanide spill	Hungary	National	Hungarian Ministry of Environment & Water (J. Váradi)	Learning Cycle - Problem Structuring and Reframing
HU07	Until 1996: Development of Green/Blue Corridor Programmes	Hungary	National	Hungarian Ministry of Environment & Water (J. Váradi)	Policy Formulation
HU08	Until 2004: Modification of Green/Blue Corridor Programmes	Hungary	National	Hungarian Ministry of Environment & Water (J. Váradi)	Policy Formulation
HU09	2001 - 2002: Development of New Vásárhelyi Plan (VTT) 1	Hungary	National	Hungarian Ministry of Environment & Water (J. Váradi)	Policy Formulation
HU10	2000 - 2007: Establishment & work of Tisza-Szamos utility	Tisza river & Szamos tributary	Sub-Basin	Hungarian Ministry of Environment & Water (J. Váradi)	Implementation
HU11	2003 - 2008: Living Tisza project (UNDP-GEF Tisza Project)	Hungarian Tisza	Sub-Basin	Mr. P. Kajner	Learning Cycle - Implementation and Evaluation of Pilots/Experiments
HU12	2004 - 2008: Capacity building in the learning platform	Hungary	National	NeWater project	Learning Cycle - Develop Action Plan and Mobilise Additional Support
HU13	2003 - 2006: Development of VTT 2 (redefinition)	Hungary	National	Bokartisz NGO (G. Molnár)	Policy Formulation

HU14	2003 - 2004: Cigánd pilot during VTT 2 development	Bodrog/Bodrogeköz region	Regional	National government, interministerial committee	Developing Measures
HU15	2004: Reinterpretation of VTT 2 by VTT consortium	Hungary	National	VTT consortium (lead: National Water Management Investment Projects Company (OVIBER))	Developing Operational Goals
HU16	2004 - 2008: Cigánd polder construction	Bodrog/Bodrogeköz region	Regional	OVIBER	Implementation
HU17	2006 - 2008: Interreg project, Bereg region	Bereg region	Regional	Upper Tisza Regional Water Directorate FETIKÖVIZIG (Bodnár G.)	Learning Cycle - Develop Action Plan and Mobilise Additional Support
HU18	Since 2004: Polder construction debate in Bereg region	Bereg region	Regional	Shadow network 2	Learning Cycle - Develop Action Plan and Mobilise Additional Support
HU19	2008-2010: Integrated Land Development project	Tisza basin In Hungary, Romania & Serbia	Sub-Basin	International Commission for the Protection of the Danube River	Learning Cycle - Implementation and Evaluation of Pilots/Experiments
HU20	Since 2007: TÁJ-KÉP program	Hungarian Tisza	Sub-Basin	Research Institute for Soil Science and Agricultural Chemistry	Learning Cycle - Develop Action Plan and Mobilise Additional Support
HU21	2008: Market creation for local products	Western Hungary (Hungarian Tisza basin & Budapest)	Regional	Institutionalised Living Tisza Alliance	Learning Cycle - Implementation and Evaluation of Pilots/Experiments

Table A3. Action Situations for Rhine Netherlands (NL, learning ASs in pink).

No.	Name Action Situation	Spatial Unit	Admin. Level	Lead Actor	Phase
NL01	1953-1958: Policy response to flood disaster	The Netherlands	National	National Parliament	Developing Operational Goals
NL02	1957-2010: Implement Improved Flood Protection (Deltawerken)	Province of Zeeland	Regional	Rijkswaterstaat	Implementation
NL03	Since 1970: Restructuring in Rijkswaterstaat	The Netherlands	National	Rijkswaterstaat	Strategic Goal setting
NL04	Early 1970s: Oppose Scheldt Estuary Plan	Province of Zeeland	Regional	No identifiable lead actor	Learning Cycle - Develop Action Plan and Mobilise Additional Support
NL05	Early 1970s - 1976: Change Scheldt Estuary Plan	Province of Zeeland	Regional	National Parliament	Implementation
NL06	1984: Develop Guidance for Water Policy II	The Netherlands	National	Rijkswaterstaat	Strategic Goal setting
NL07	1985: Develop Vision about Integrated Water Management	The Netherlands	National	Rijkswaterstaat	Strategic Goal setting
NL08	1986-1992: Develop alternative approaches to flood management	The Netherlands	National	WWF NL	Learning Cycle - Develop Action Plan and Mobilise Additional Support
NL09	1989: Develop Guidance for Water Policy III	The Netherlands	National	Rijkswaterstaat	Strategic Goal setting
NL10	1995-1998: Policy response to floodings	The Netherlands	National	National Government	Developing Operational Goals
NL11	1996: Implementation of Delta Plan/Act Large Rivers	The Netherlands	National	Rijkswaterstaat	Implementation
NL12	1998: Develop Guidance for Water Policy IV	The Netherlands	National	Rijkswaterstaat	Strategic Goal setting
NL13	1998: International Coordination Rhine Flood Protection	International Rhine basin	Basin	Rhine riparian countries	Developing Operational Goals
NL14	2000: Evaluation of dealing with water surplus	The Netherlands	National	National Parliament	Strategic Goal setting
NL15	2000: Development of Room for River Programme draft	The Netherlands	National	National Government	Policy Formulation

NL16	2001 - 2002: Implement Calamity Polders	The Netherlands	National	State secretary M. de Vries for Transport, Public Works, and Water Management, New state secretary Schultz-van Hagen for Transport, Public Works, and Water Management	Implementation
NL17	2002 - 2005: Block Polder Construction	Area in the Gelderland Province	Regional	Hoogwaterplatform Ooijpolder Dueffelt	Learning Cycle - Develop Action Plan and Mobilise Additional Support
NL18	2000-2006: PKB procedure & approval of Room for Rivers Programme	The Netherlands	National	National Parliament	Developing Measures
NL19	Since 2007: Implementation Measures Room for River	The Netherlands (regional)	Regional	Rijkswaterstaat	Implementation
NL20	2008: Develop recommendations for new Delta Programme	The Netherlands	National	National Government	Strategic Goal setting
NL21	Since 2009: Develop new Delta Programme	The Netherlands	National	National Parliament	Strategic Goal setting, Developing Operational Goals

Table A4. Action Situations for the Rhine Germany (DE, learning ASs in pink).

No.	Name Action Situation	Spatial Unit	Admin. Level	Lead Actor	Phase
DE01	1968-1975: Work of the intern. Commission for Research on floods of the River Rhine (HSK)	International Rhine basin	Basin	German federal government, French Government, Swiss government, Austrian government	Strategic Goal setting
DE02	1969-1982: German-French Water Management Coordination	Germany (BW, He, NRW), France	International	German federal government, French Government	Strategic Goal setting
DE03	1982: Improve Flood Protection Upper-Rhine	Germany (Baden-Wuerttemberg (BW), Hesse (He), North Rhine-Westphalia (NRW)), France	International	BW State Government, RPF State Government, HE State Government,	Policy Formulation
DE04	1977-1988: Construction of pilot polder Altenheim	Baden-Wuerttemberg (local level)	Local	BW State Government	Learning Cycle - Implementation and Evaluation of Pilots/Experiments
DE05	1985: Foundation of WWF-Aueninstitut	Baden-Wuerttemberg	Regional	WWF Germany	Learning Cycle - Problem Structuring and Reframing
DE06	1988-1996: Development of Integrated Flood Programme BW	Baden-Wuerttemberg	Regional	BW State Government	Developing Operational Goals
DE07	Since 1990: Opposition against polder projects	Baden-Wuerttemberg (local level)	Local	No identifiable lead actor	Learning Cycle - Develop Action Plan and Mobilise Additional Support
DE08	Since 1996: Implementation of Integrated Flood Programme BW	Baden-Wuerttemberg (local level)	Local	Landratsaemter BW	Implementation
DE09	Since 2000: Improve Public Participation in General	Baden-Wuerttemberg (local level)	Local	Ministry of the Environment BW, Upper Water Agencies BW	Implementation
DE10	1995: Agreement to coordinate Flood Protection across Laender	Germany	National	Bundeslaender	Strategic Goal setting

DE11	1998: International Coordination Rhine Flood Protection	International Rhine basin	Basin	Rhine Minister Conference, NL Delegation, Switzerland (CH) Delegation, DE Delegation	Developing Operational Goals
DE12	2005: National Coordination of Flood Protection	Germany	National	Bundeslaender, German federal government, Bundestag	Policy Formulation
DE13	2005: Adoption of German federal Water Law	Germany	National	German Ministry of Transport, Building and Urban Development, German Ministry of the Environment, German Ministry of the Economy	Policy Formulation
DE14	2005-2011: Adoption of Flood Control Act in BW	Baden Wuerttemberg	Regional	Ministry of the Environment BW	Policy Formulation

Case Study Databases

Case study databases for the three case studies can be downloaded on the following website: <http://www.newater.uni-osnabrueck.de/index.php?pid=1625>