ECCONET: methodological overview

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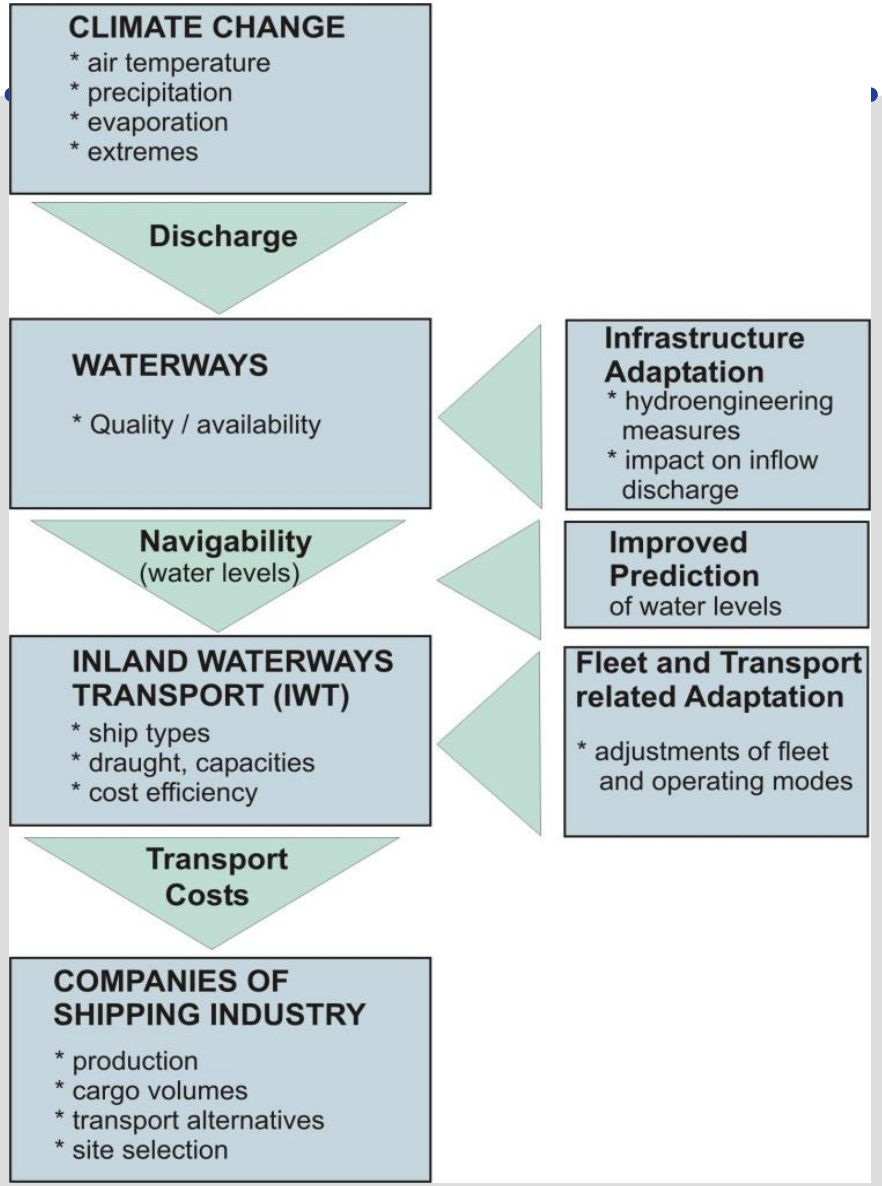
Outline presentation

- Project plan and objectives ECCONET
- Methodological issues
  - Modelling
  - Adaptation measures

ECCONET

- Effects of Climate Change on the inland waterway network
- 7th Framework Program, European Commission
- 10 partners, 5 countries, multidisciplinary:
  - Meteorology
  - Hydrology
  - Infrastructure Management
  - Shipbuilding
  - Economics/Logistics

Going through the impact chain



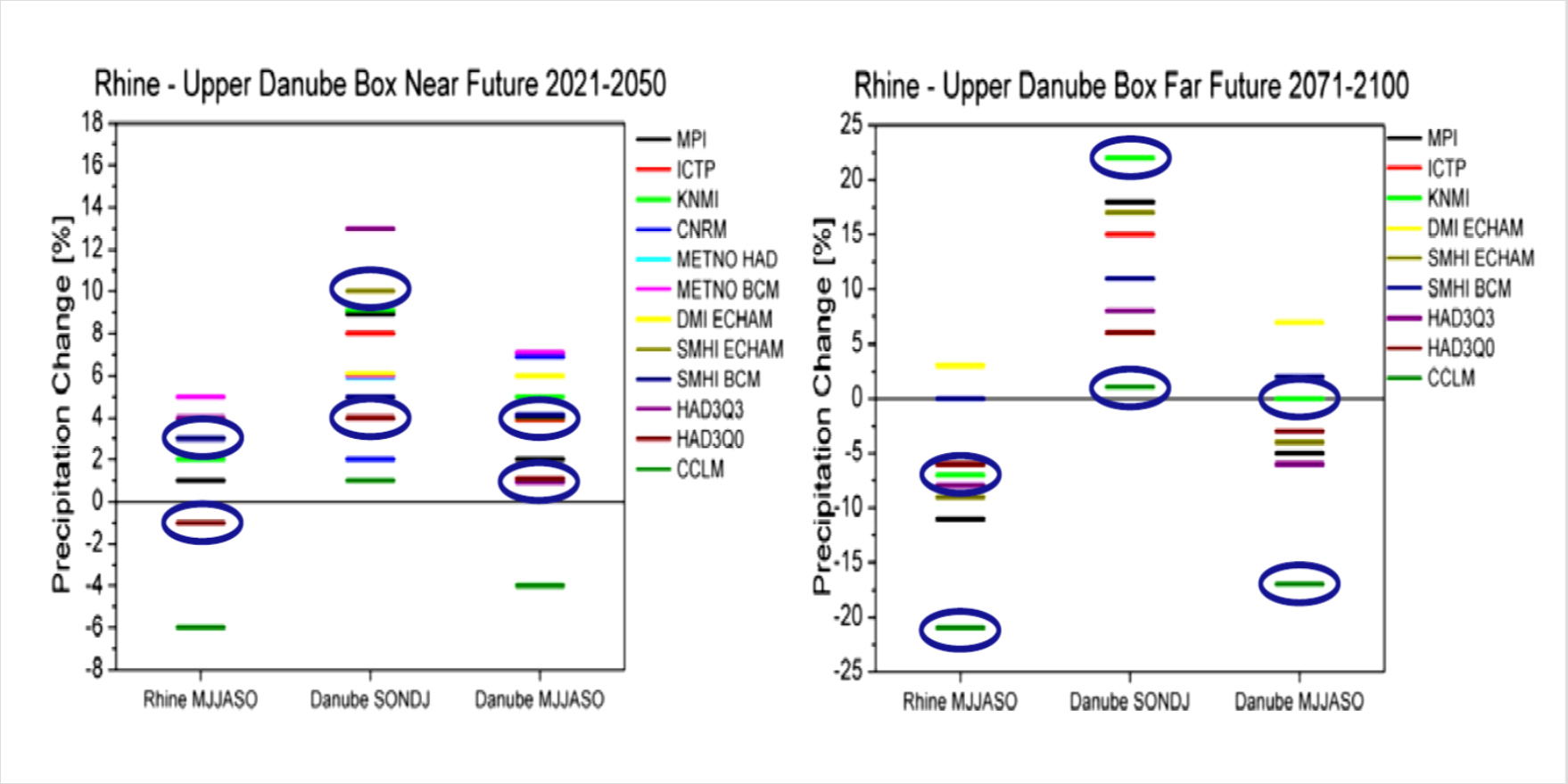
Goal

Provide advice to policy makers and the industry

Methodology and modeling

	Time span	Important output variables	Complications
Climatological models	30 year-averages for example:1960-1990, 1991-2021, 2021-2050, 2040-2070, etc.	precipitation, temperature	Bias-prediction, regional climate scenarios, large set of model chains (ensembles), uncertainty
Hydrological modelling	Daily and even hourly variations for all modelled years (30 years)	water levels/water depths on different river stretches based on nature of river	Added uncertainty due to regional variance and anthropogenic factors. Large running time
Transport-economic modelling	Based on an OD-matrix for 1 year. Predictions should be based on averages or should be composed of different characteristic situations	Flow of goods by transport mode (inland waterways are 1 of the modes) Costs of transport (minimized by model)	Difficult to handle sub-annual information (for example seasonal variance) Uncertainty in OD matrix. Only a limited set of model runs is possible

Selected impact chains



Representative years

	2005 ‘reference’			Near future 'dry' scenario		
Water depth	Median	D5	D10	Median	D5	D10
1.6	0	0	0	0	4	24
1.8	0	20	36	5.5	55	74
2	14	61	86	28.5	79.5	121.5
2.4	133	192	221	135.5	203.5	234.5
2.6	182	260	273	216	259.5	307.5
3.25	301	334	344	324	365	365
3.55	328	351	352	344	365	365

Current setup

- Selected dry and wet climate change impact chains used in climate modeling
- From hydrological results extraction of representative years
- D2 = ‘dry’ year expected each 2 year
  D5 = ‘dry’ year expected each 5 years
  D10 = ‘dry’ year expected each 10 years
- Economic model predicts transport flows for each ‘water level situation’
- Distribution of water level occurrence determines impact
  Total effect = x days * WL 1 + y days * WL 2 + ..
- Adaptation is measured in centimeters and influences transport flows positively
- Partners try to give adaptation in quantitative terms preferably
- Cost effectiveness of adaptation will be calculated next year

Chosen ship types

#	CEMT class	Name (type of ship, train)	Length (m)	Beam (m)	Draught at 78% load (m)	Draught min. (m)	Payload at min.draught (t)	Draught max. (m)	Payload at max. draught (t)
		RHINE SHIPS							
1	III	Gustav Koenigs	80	8.2	2.10	1.10	240	2.50	1080
2	IV	Johann Welker ("Europe"-ship)	85	9.5	2.36	1.20	312	2.80	1560
3	Va	GMS 110	110	11.4	2.95	1.35	392	3.50	2873
4	Vb	GMS 135	135	11.4	2.93	1.35	672	3.50	3802
5	Vb	Koppelverband GMS 110 + 1 x E-II Rhine	185	11.4	2.92	1.35	1005	3.50	5292
		DANUBE SHIPS							
1	III	Gustav Koenigs	80	8.2	2.10	1.10	240	2.50	1080
2	Vb	Koppelverband GMS 95 + E-II-Danube	172	11	2.14	1.35	935	2.50	3240
3	VIb	Koppelverband GMS 95 + 3 E-II-Danube	172	22	2.11	1.35	2270	2.50	6380
4	VIc	PB + 3x2 Danube barges PB + 2x3 Danube barges	270 190	22 33	2.06 2.06	1.60 1.60	5180 5180	2.50 2.50	9420 9420

Fleet adaptation

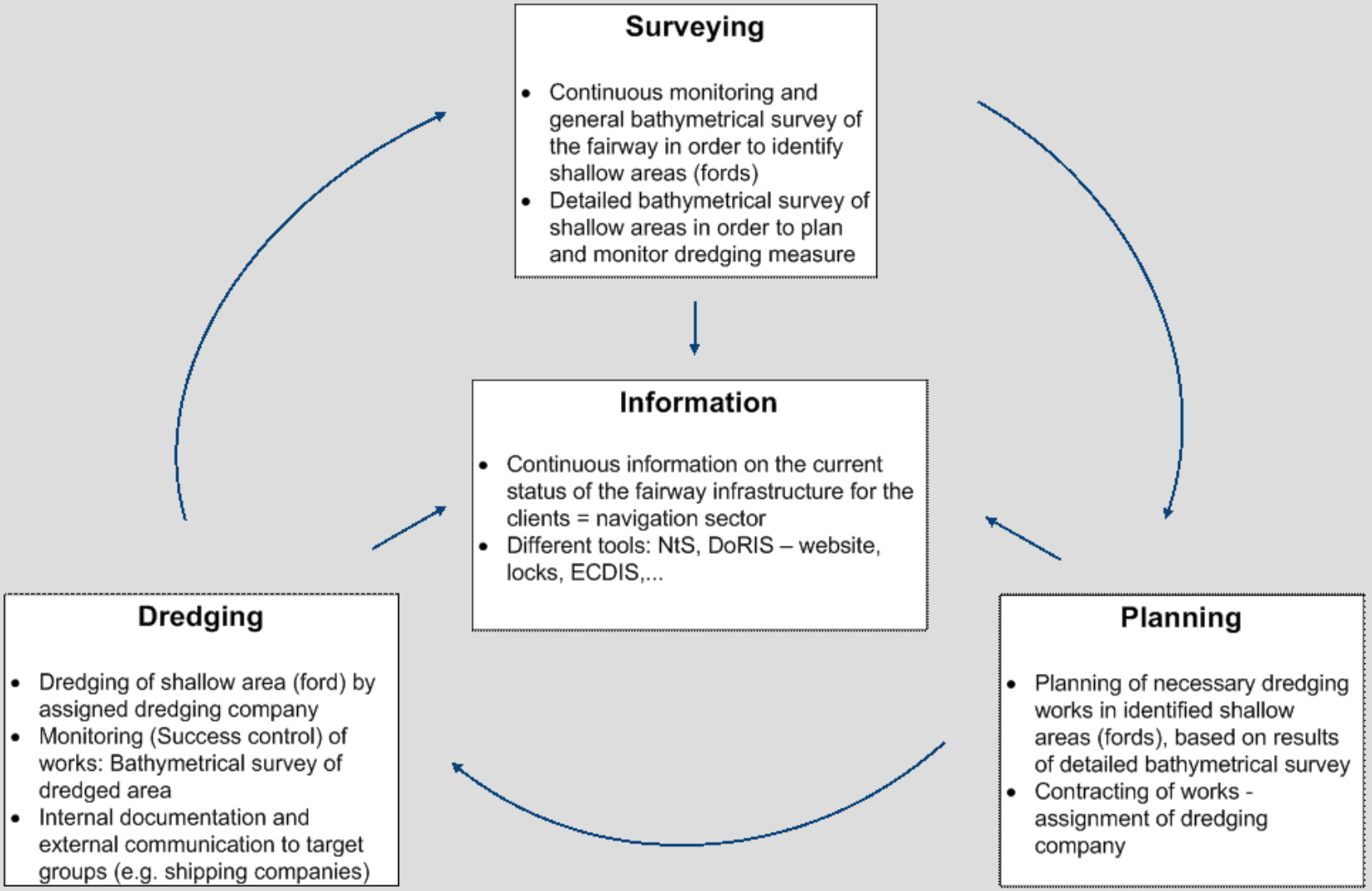
Measure		Primary effect	Preliminary assessment
A1	Lightweight structure	Reduction of own weight causing lower draught	Further research necessary on technical solutions
A2	Adjustable tunnel	Navigation in lower water levels	In combination with A1
A3	Side blisters	Payload gain between 115 and 260 tonnes	Theoretical approach, handling provides to be difficult
A4	Flat hulls (multiple screw push boats)	Draught reduction from 1.7 to 1.4 meter	**Promising approach** especially for push boat technology, even at increased construction cost
B1	Small instead of large vessels	Small vessels are less water sensitive	Goes contrary to scale effect
B2	Upgrade of small vessels to continuous operation	Increased performance	**Promising approach**
B3	Coupling convoys	Redistribution of load	**Promising** due to increased scale effect
C1	Strategic alliance between IWT and other modes	Co-operation with other modes	Capacity limits of rail and high prices make this difficult

Adaptation measured in cm

- Example: weight reduction

	savings	immersion	More carrying capacity at reduced draught for x[cm] - corresponds to the same drop of water depth and unchanged carrying capacity water level drop [cm]										Compensation of carrying capacity [t]
	[t]	[t/cm]	5	6	7	8	9	10	15	20	25	30	
Gustav Koenigs extended	45	6,1	31	37	43	45	45	45	45	45	45	45	
Johann Welker extended	55	7,5	38	45	53	55	55	55	55	55	55	55	
GMS 110	90	11,1	56	67	78	89	90	90	90	90	90	90	
GMS 135	150	14,3	72	86	100	115	129	143	150	150	150	150	
JOWI	200	21,1	105	127	148	169	190	200	200	200	200	200	
Europe II Barge	70	8,0	40	48	56	64	70	70	70	70	70	70	

Infrastructure adaptation



Seasonal prediction methods

- Improved prediction of water level situation (currently 3-5 days)
- Possibility of 1-3 months predictions and more was studied
- **Conclusion:** theoretically very appealing, also large interest from the sector..
  Unfortunately:
  - High R&D costs with a relatively low success rate for actual ‘trustworthy method’
  - Possible: extraction of trends in seasonal forecast…
  - From our data: 2011 could have been as bad as 2003 for inland waterway transport, if the summer had not been that ‘wet’.

Adaptation by industry

- **Survey method:** Very low response rate
  - **80 questionnaires were sent out, only 9 filled in. (+- 10 % response)**
- We have the impression that the issue of climate change is currently not alive in the sector.
- Our results show that the impact of climate change should not be **over**estimated, the impact is relatively low, especially compared to economic variables
- Additionally very large time spans -> potential negative side-effects only really apparent for 2100

Work planned

- Evaluation of adaptation measures:
  - By transport network modeling
  - Cost effectiveness analysis
- Policy advice
- Project end date January 2013

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