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Synthesis – what we learned, what is next?

Delft Meeting

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Questions we asked:

- Where on the coast are **hotspot** areas of higher risk?
- What is the impact of future coastal hazard scenarios?
- What are effective **Disaster Risk Reduction (DRR)** measures at a hotspot?
- How can DRR measures best be implemented?

And

- What are the socio-cultural and historic aspects of DRR measures?
- Can a generic approach be applied across Europe, in data-rich and data-starved environments?

Products we made:



How far did we get?

Technology Readiness Level (TRL)	Description
TRL 1	Basic principles observed
TRL 2	Technology concept formulated
TRL 3	Experimental proof of concept
TRL 4	Technology validated in lab
TRL 5	Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 6	Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 7	System prototype demonstration in operational environment
TRL 8	System complete and qualified
TRL 9	Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Tool	TRL
Storm Impact Database	<i>TRL 6: Technology demonstrated in relevant environment.</i> The system was developed and already assessed and used by external users. External users have requested to add their own data.
CRAF (Phase 1)	<i>TRL 7: System prototype demonstration in operational environment.</i> Phase 1 of the CRAF was successfully demonstrated in 10 different case study locations and has been applied by partners in other areas as well (Denmark, West Africa, Pacific Islands).
CRAF (Phase 2)	<i>TRL 6: Technology demonstrated in relevant environment.</i> Phase 2 of the CRAF was successfully demonstrated in 10 different case study locations, demonstrating the tool's value for coastal management. Compared to CRAF Phase 1 however, Phase 2 has not yet been implemented in other pilot projects and is not yet at the development level to be applied operationally
Web-based Management Guide	<i>TRL 8: system complete and qualified.</i> The Web-based Management Guide is fully developed and operational. It was also validated by case study owners and end-users.
Hotspot (EWS/DSS) tool	<i>TRL 6: technology demonstrated in relevant environment.</i> The Hotspot Tool was successfully demonstrated at 10 different environments.
MCA	<i>TRL 6: Technology demonstrated in relevant environment.</i> The MCA is fully developed and ready to be applied. It was also validated by case study owners and end-users.



What is your assessment?

<u>Please state your Case Study</u>	<u># of Answers</u>
Bocca Di Magra (IT)	1
Kiel Fjord (DE)	1
Kristianstad Municipality (SE)	2
La Faute Sur Mer (FR)	1
North Norfolk (GB)	3
Porto Garibaldi (IT)	1
Ria Formosa (PT)	3
Tordera Delta (ES)	1
Varna (BG)	1
Zeebrugge (BE)	1

What is next, and what is needed?

- **We demonstrated the application of tools across Europe**
 - But what is needed to get it to TRL 9?
- **Historical knowledge of floods helps raise awareness**
 - What data collection is needed to extend the data base?

What is next, and what is needed?

We progressed from

- **analysing single hazards to multiple hazards, and**
- **from assessing direct impacts to indirect impacts, systemic disruptions and recovery.**
- **But:**
 - What is needed to get to an impact-based risk assessment approach?
 - How do we validate these assessment tools?
 - Where do we get the data? And how do we set standards?



What is next, and what is needed?

We experienced that coastal risk assessment needs many disciplines working together

- **How do we educate a younger generation to**
 - 1) recognize this, and
 - 2) develop expertise to contribute to a team.

In our end-user interaction, eco-system based solutions hardly ever made it to the Final Four alternatives.

- What is lacking: space, experience, evidence, trust?
- How do we overcome this?



What is next, and what is needed?

- **We developed a number of informative (databases, MCA) and assessment (CRAF, hotspot) tools**
 - What tools are missing?
 - Which should be redesigned or expanded if we could do the project over again?
- **We engage our end-users and stakeholders in a number of events during the project**
 - How do we keep them involved without overburdening them?
 - How do we integrate local knowledge and experiences with scientific knowledge?
 - How do we include not only professionals but also citizens of various ages, genders, backgrounds?

Tool 1: Storm Impact Database

Barriers or enabling factors?

- Now limited to one site. Should be expanded.
- Some technical problems with the interface, more flexibility needed.
- Language barriers, English is not used by all local End-Users

Do you have any suggestions on how to improve the tool?

- Open it up to the world.
- Publish as data set on Research Gate
- Disseminate its existence.
- Built an interface with a graphical user interface (GUI)

Tool 2a: CRAF I

Barriers or enabling factors?

- Set data standards for collection, storage, processing.
- Hotspots are already known a priori by end users.
- First set up of CRAF I was not really suited for complex topography.
- Difficult to obtain socio-economic data

Do you have any suggestions on how to improve the tool?

- Make case study site applications part of the manual
- Include long-term evolution of the hotspot distribution
- Turn it into proper software (TRL 9)



Tool 2b: CRAF II

Barriers or enabling factors?

- INDRA model is not user friendly, and documentation should be much more detailed.
- Data needed for the tool (business, insurance) is not public
- difficult to apply with good data quality even for developed countries.

Do you have any suggestions on how to improve the tool?

- Implement in ArcGIS or QGIS
- Combine CRAFII with 2D high resolution hazard model and not with profile models, and with the BN.
- The preprocessing of the data should be automated and standardize

Tool 3: Web-based Guide

Barriers or enabling factors?

- Promote why it is better than the rest
- DRR are already well known by coastal managers
- Information is only in English
- Lack of awareness

Do you have any suggestions on how to improve the tool?

- Post about tool on forums, mailinglists, etc.
- Publications might help as well (planned)
- Include technical aspects of all measures or how to get them

Tool 4.1: Bayesian Network

Barriers or enabling factors?

- Visual presentation is not suitable for non-experts.
- Difficulties related to the set-up and the IT implementation of the local BN.
- Post-processing is needed for less technical skilled audience.

Do you have any suggestions on how to improve the tool?

- Include probability distributions (possible, but nobody did)
- Combine with INDRA
- Improve the visual aspects

Tool 4.2: FEWS

Barriers or enabling factors?

- Implementing FEWS is not straightforward
- Someone needs to host and maintain the operational system.
- Access to public high quality forecasts as timeseries data (not graphic!)”
- Strong support and interest on behalf of the coastal community;
- Lack of high resolution meteo data, large amount of computational time in view of operational use

Do you have any suggestions on how to improve the tool?

- Make it possible to implement scenario calculations
- Make GUI based configuration tool

Tool 4.3 web-based viewer

Barriers or enabling factors?

- Not used in MCA meetings
- Too complex end-user application.
- Key results were pulled out and displayed separately.

Do you have any suggestions on how to improve the tool?

- Tool needs to be tailor-made for the site specific problems and audience
- Better visualisation of the results maybe per receptor and not only per area
- Easier selection of scenarios

Tool 5: MCA

Barriers or enabling factors?

- Challenge is to get the people motivated to come together.
- More training would be an advantage.
- Having facilitators with a social science background would be of great advantage
- Not all end-users may want to participate and the obtained results can be biased do to that.

Do you have any suggestions on how to improve the tool?

- Work with people with social science background
- Integrate effectiveness of the measure as a value given from the scientists or as an evaluation by end-users after being informed by the scientists.