

Investigating flood risk cost in Kungsbacka using the ICPR FloRiAn GIS-tool

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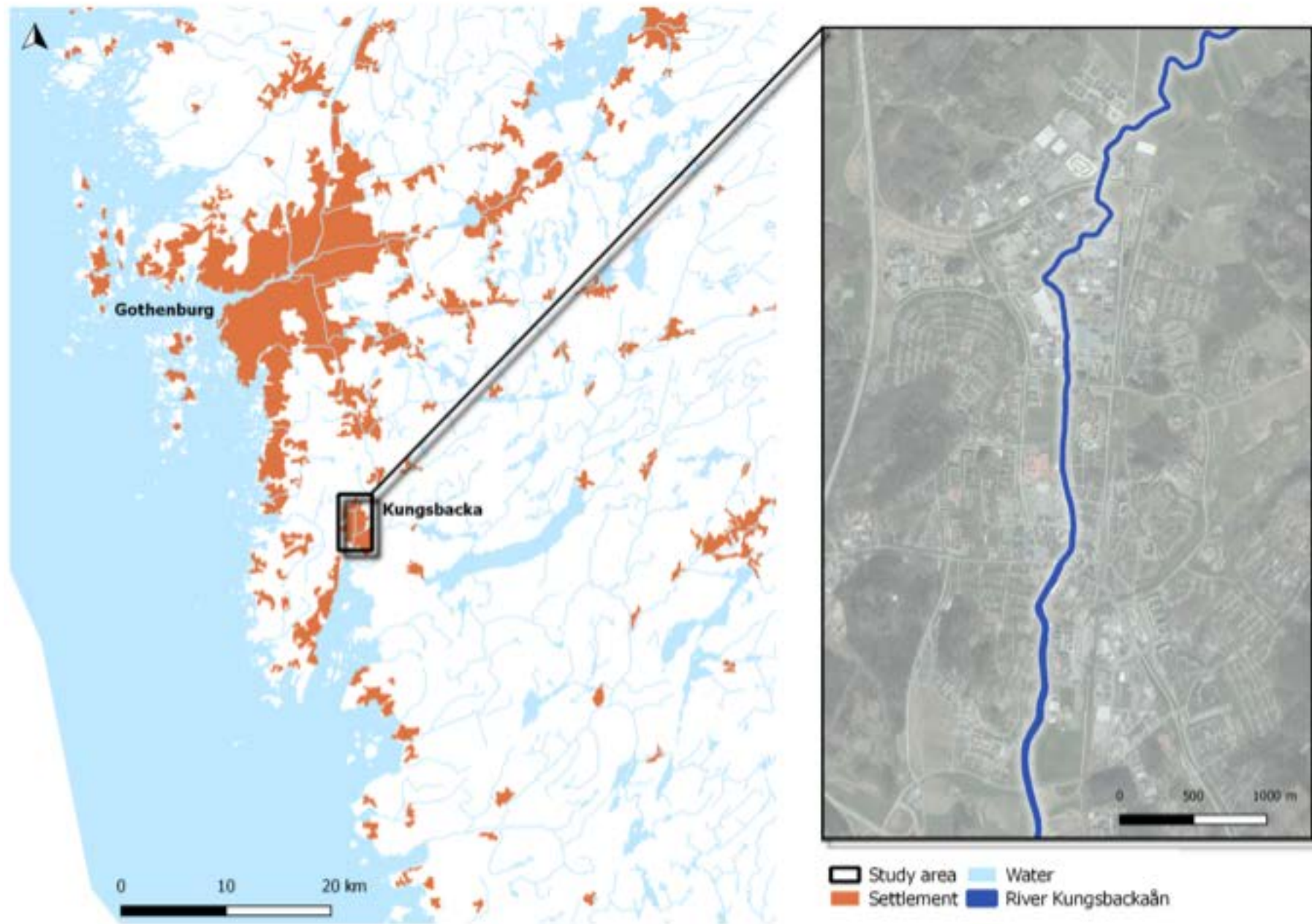


AIM

- ❖ Investigate the risk cost of a 50-year flood, a 100-year flood and a “worst-case scenario” flood in Kungsbacka, a city that has been identified by the Swedish Civil Contingencies Agency as one of the most flood prone areas in the country.
- ❖ By utilising the recently developed ArcGIS tool “ICPR FloRiAn”, the study also aims to identify advantages and barriers to further implementations of the tool in a Swedish context.”

Risk cost = probability of flooding x possible consequences of the flood

STUDY AREA



ABOUT FLORIAN

ICPR - International Commission for the Protection of the Rhine

EU Flood Directive (2007/60/EC)

Aims to decrease adverse flood impact on four receptors

Receptors:

❖ ECONOMY (monetary)



Required data:

Land use, value of land, damage functions

❖ CULTURAL HERITAGE (non-monetary)



Cultural objects, impact functions

❖ PEOPLE'S HEALTH (non-monetary)



Number of inhabitants in flooded area, land use (populated or not), impact functions

❖ ENVIRONMENT (non-monetary)



Protected areas, potentially polluting objects, impact functions

FloRiAn uses damage functions which connect a certain depth to a reduction in value

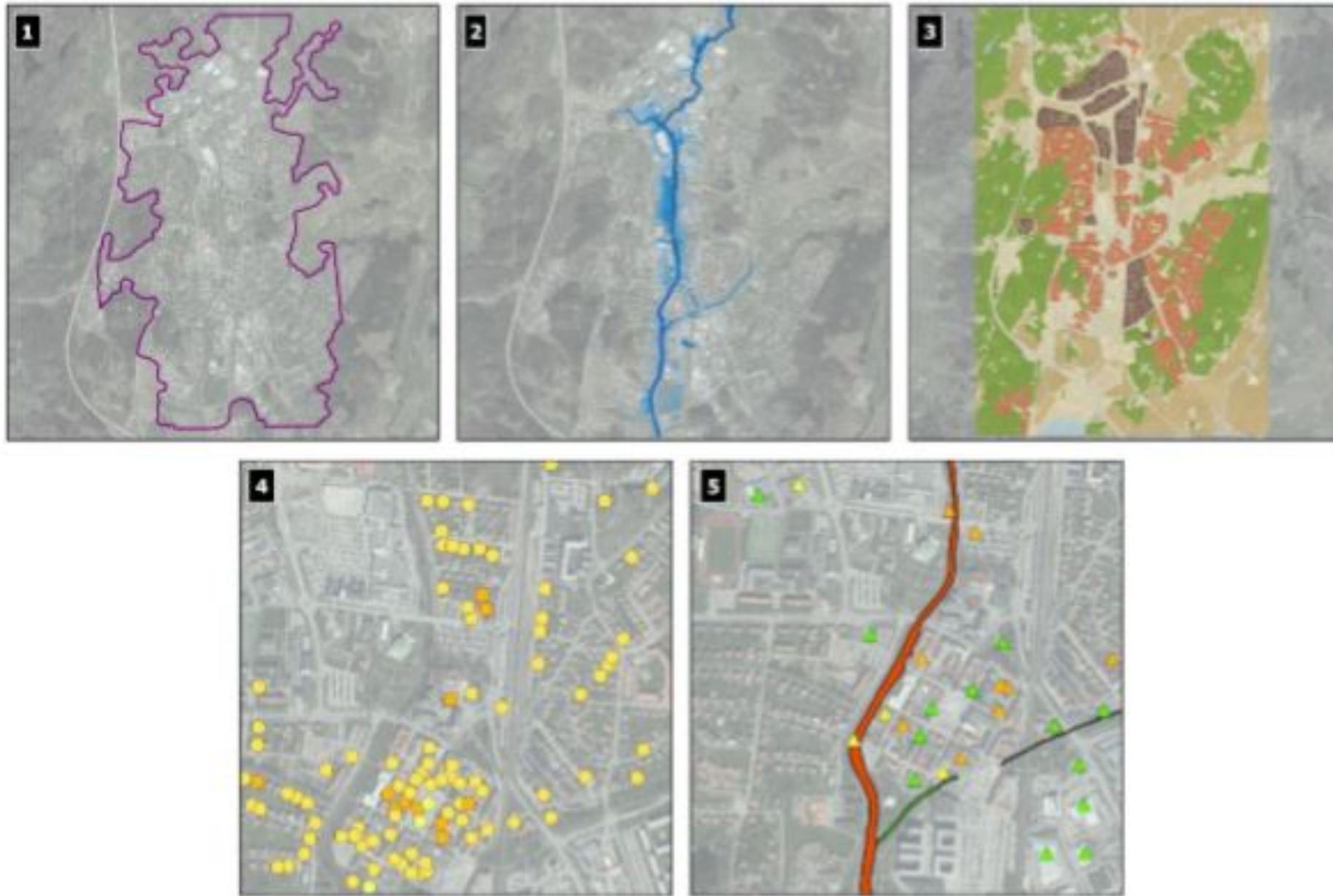
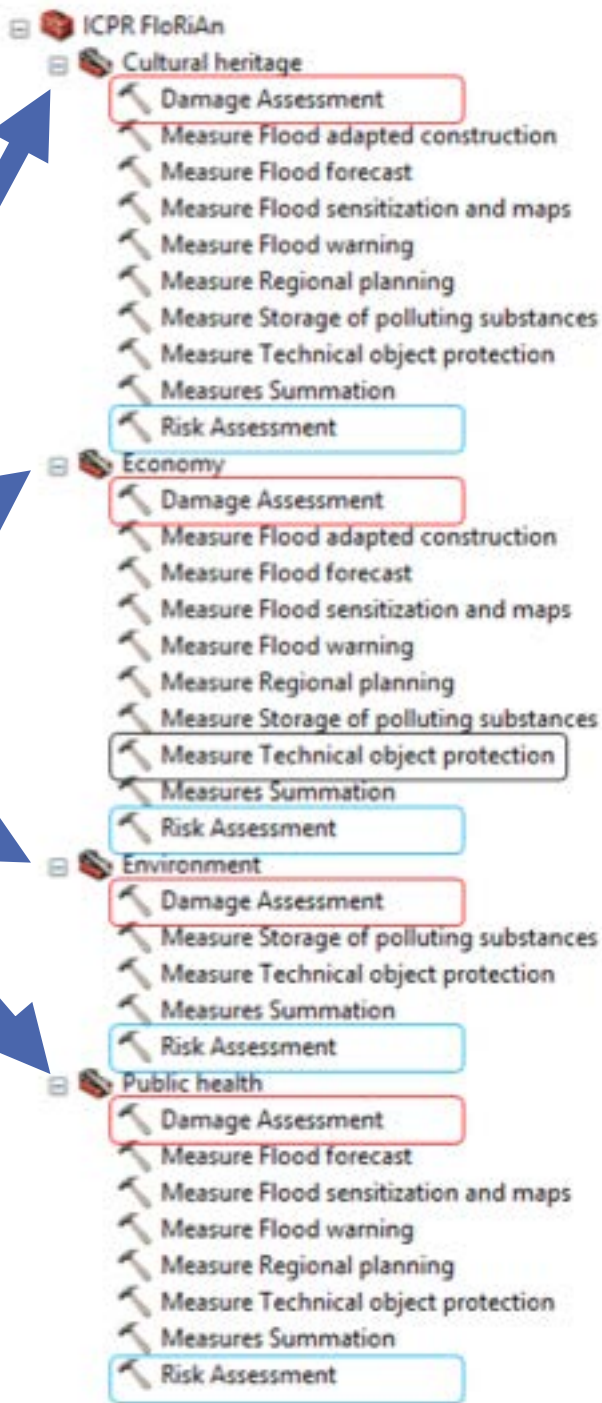


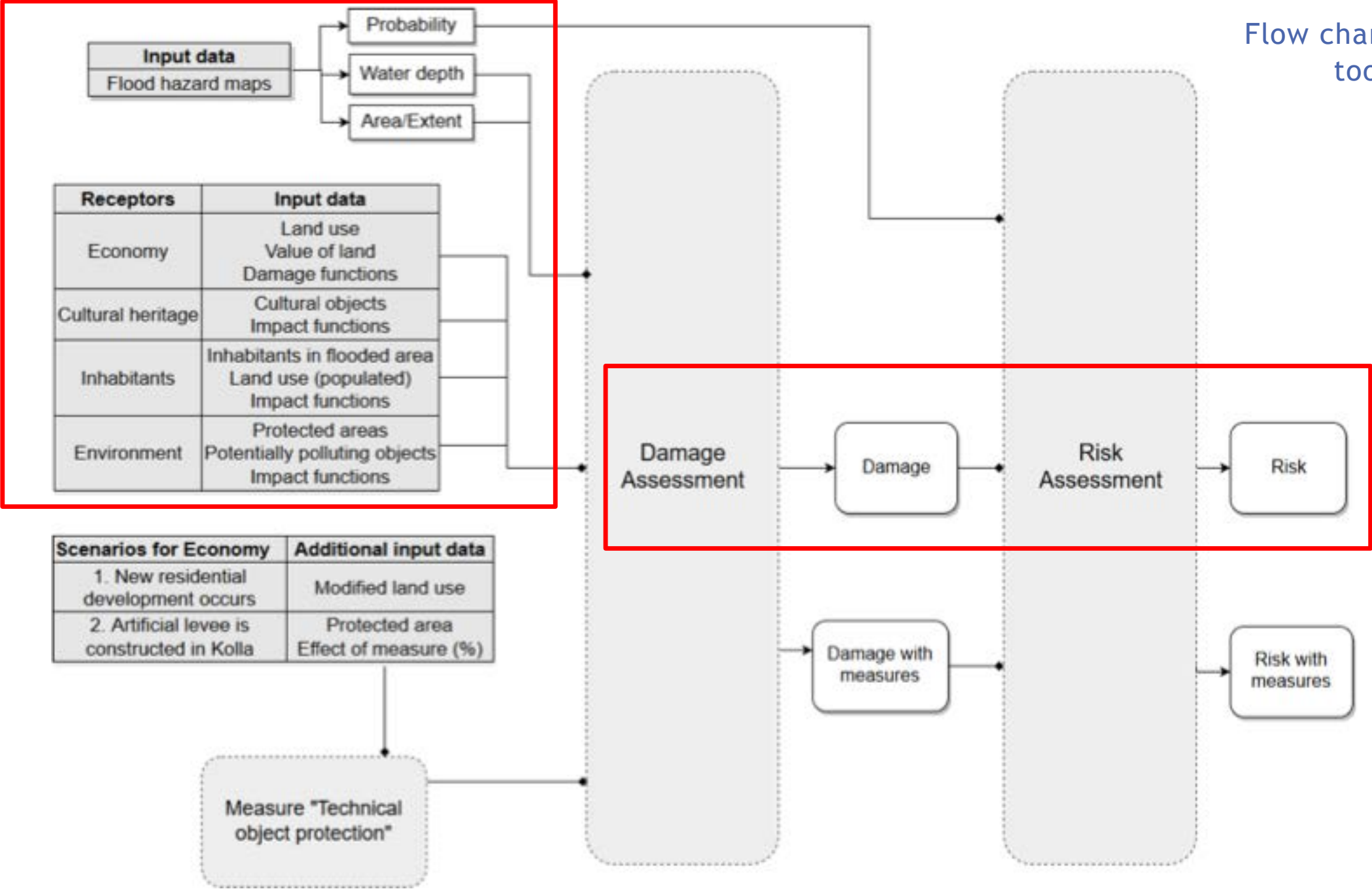
Fig. 5. Example of datasets used in the thesis. 1 = administrative area, 2 = flood raster (100-year flow), 3 = land use raster, 4 = cultural heritage objects, 5 = environmentally vulnerable areas (river) and potentially polluting objects. Data sources: Statistics Sweden, MSB, Halland County Administration.

The circled tools were used in the thesis

Receptors

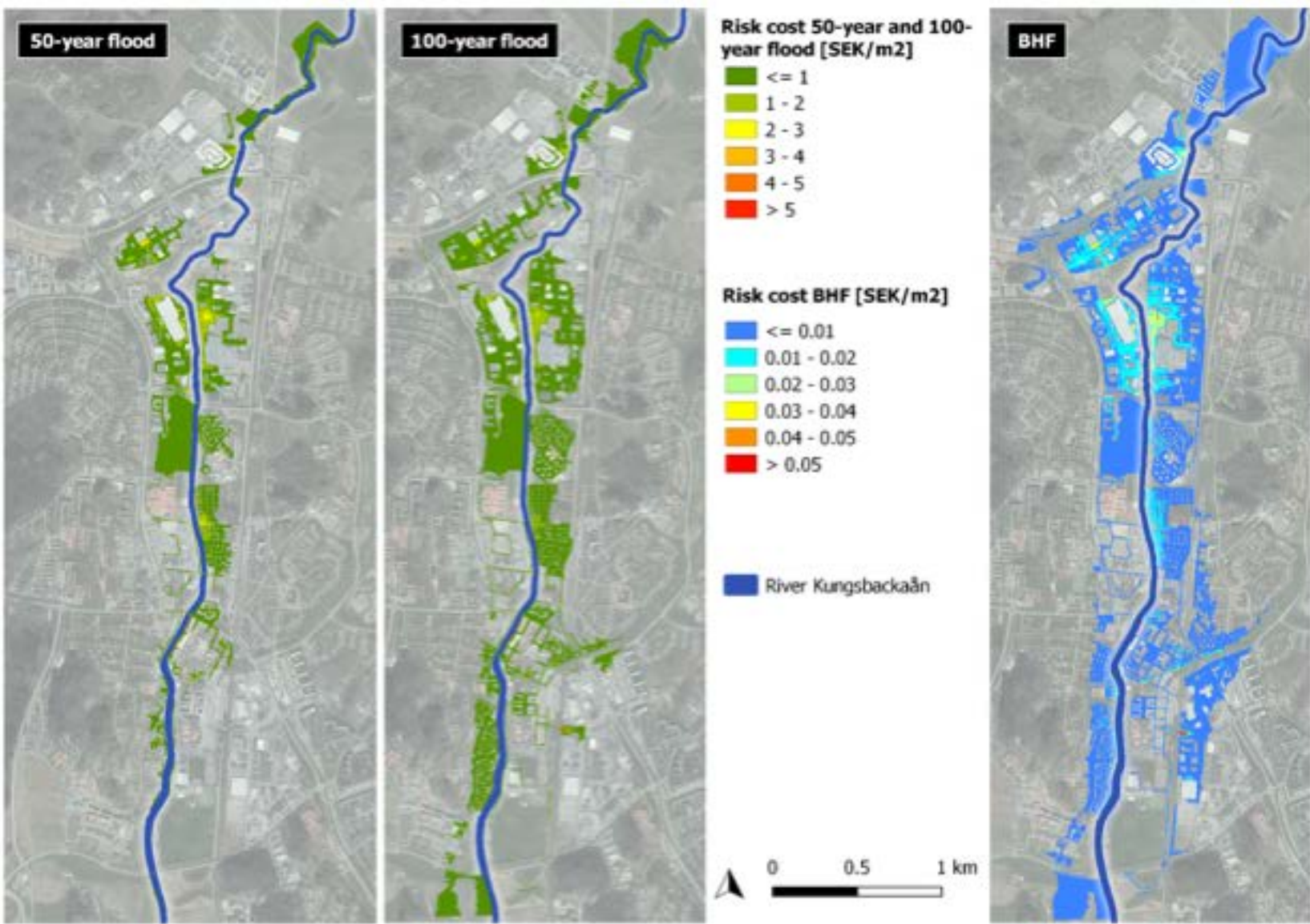


Flow chart of FloRiAn tool runs



RESULTS - ECONOMY

The map shows an overview of the economic risk cost (SEK/m²/year) for the three flows. The 50-year flood and the 100-year flood share a legend, whereas the BHF is shown on a separate colour scale due to its small values - in turn due to a much longer return period. The 100-year flow is adjusted for the predicted climate conditions at the end of the century. The river is also shown for orientation.



The table shows the total economic risk (SEK/year) in the flooded area for the three flows. The 100-year flow is adjusted for the predicted climate conditions at the end of the century. The values have been rounded to the nearest thousand.

	50-year flow	100-year flow	BHF*
Economic risk (SEK/year)	176 000	226 000	6000

*BHF = extreme flow, used as a worst case scenario, approximate return period 10 000 years

Advantages

The effect of measures against floods can be calculated

The tool is relatively easy to use

Adapted to EU legislation

Can be used for scenarios of increased residential construction, climate change, flood protection etc. as long as data are available

Disadvantages

Rigid model, specific data are required

Only considers depth as factor influencing magnitude of damages

Since the receptors are analysed separately and the indirect effects of floods are not included in the analysis, it can be difficult to overview the comprehensive risk cost

CONCLUSIONS

- ❖ Flood risk cost in Kungsbacka is generally low, particularly risk cost on Culture, People's health and Environment.
- ❖ The analysis of risk to People's health does not add much to the information on flood risk that is already available in Sweden.
- ❖ The analysis of Culture and Environment can be adjusted to Swedish conditions although further study is needed to determine what is considered "low" or "high" risk.
- ❖ The analysis of Economy can be adapted to Swedish conditions, but it is data-intensive and potentially problematic because of the lack of local damage functions. The economic value of each land use category is difficult to estimate, but with more detailed municipal land use data and consultation with experts this might be achieved.
- ❖ The lack of reliable damage functions for Sweden adds an element of uncertainty to risk cost estimations. Swedish flood risk management would benefit from the creation of a database of urban objects and features vulnerable to floods, and the degree to which these are impacted by flood depth and/or other factors. This could be useful for other tools and methods used for estimating quantitative flood risk than FloRiAn.



Thank you!



For more information on the ICPR FloRiAn toolset,
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