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LATIS: The tool for flood risk calculations in Flanders

Introduction

Since 2002, Flanders Hydraulics developed in cooperation with the Geography department of Ghent University a methodology to calculate flood risk in a quantitative and objective manner. This development was driven by a decision of the Flemish Government to protect Flanders no longer against all floods and the highest water levels but to avoid serious economic damage. The methodology defines flood risk as the product of the probability of a flood event and the damage caused by that event. The damage is a function of the water depth and the maximal damage, which is dependent on the land use and the socio-economic context.

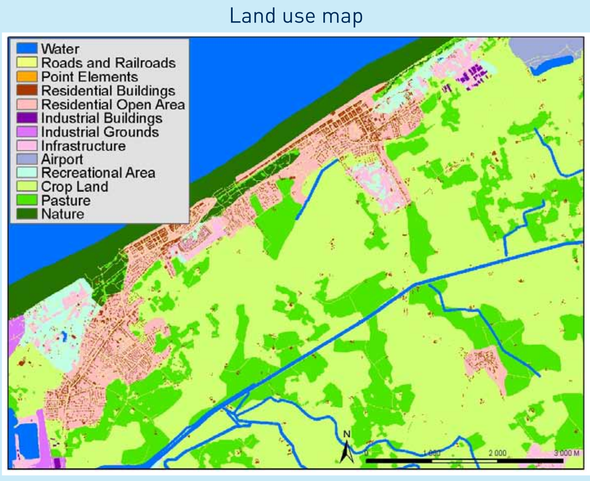
This methodology was implemented in a tailor-made GIS-based flood risk assessment tool called LATIS. The tool integrates a variety of land use information and socio-economic data with potential flood maps the damage and risk of certain flooding events. In addition, LATIS is also able to calculate the casualties of a flood and the additional damage caused by high flow velocities. Recently, a new module that specifically calculates the casualties and damage on the sea wall was also implemented in the software. In the past years, LATIS was used for several studies in Flanders, varying from assessments of the impact of different climate change scenarios on flood risk to studies on coastal defence alternatives within the framework of the Integrated Masterplan for Flanders' Coastal Safety and the Belspo project CLIMAR.

Methodology

STEP 1

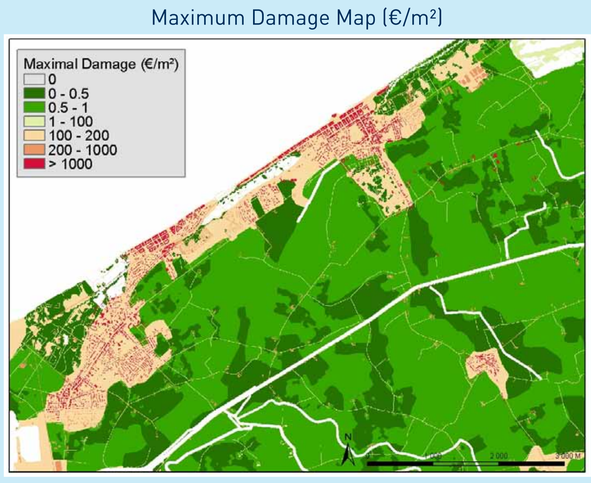
CORINE LAND COVER
+
- Roads and railroads
- KADVEC
- Point Elements
- Small scale land use map
- Waterways

Land use map



+ socio-economic data
- Housing prices
- Agricultural production
- Agricultural prices
- Insured value of industrial buildings
- Prices of cars
- ...

Maximum Damage Map (€/m²)



STEP 2

Maximum Damage Map → Damage = function of water depth and maximum damage

Flood Maps → Different function for different land use categories: damage functions

STEP 3

Damage Map → **Damage Map**

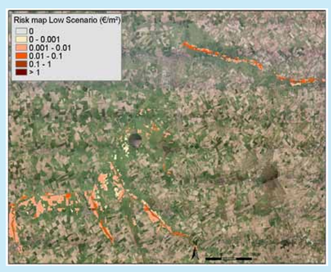
$$Risk = \sum f_x * S_x$$

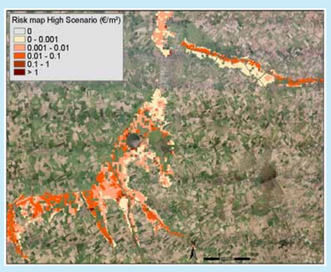
fx = chance of occurence of a certain flood event
Sx = damage of that flood event

Applications: Impact of climate change on flood risk

CCI-HYDR project

The Belspo project CCI-Hydr came up with 3 climate change impact scenarios for Belgium. The impact on hydrology of these wet, mild and dry scenarios (called high, mean and low) is translated to new boundary conditions for hydrodynamic river models and flood maps for the climate change scenarios are generated for different return periods. Given the fact that the land use remains identical, the effect of climate change on flood damage and risk can be calculated. In near future combinations of climate change scenarios and land use change prognoses will be possible.

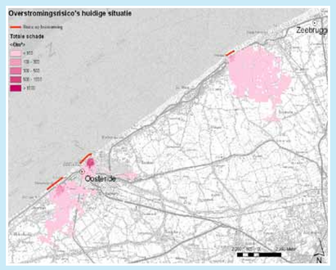


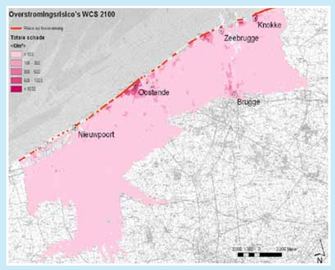


	Damage (10^3€)			Risk
	T1	T50	T100	10^3 €/year
Present climate	1514	7456	9348	1964
Low scenario	416	1536	1946	501
Mean scenario	702	5690	7426	1082
High scenario	1748	8066	53651	2789

CLIMAR project

The Belspo project CLIMAR evaluates adaptation measures for marine activities under different climate change scenarios. The consequences of the base scenario (do nothing), as well as the merits in terms of cost-benefit of each proposed intervention are calculated using LATIS.





	M+	WCS
Wind speed increase	+ 4%	+ 8%
Mean sea level rise	+ 60 cm	+ 200 cm

	Present	M+	WCS
Damage (€)	4,08*10⁸	3,35*10⁹	1,7*10¹⁰
Victims (-)	10	260	6700