Geovisual Analytics and Storytelling Applied to a Flood Scenario

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NCVA

Linköpings universitet

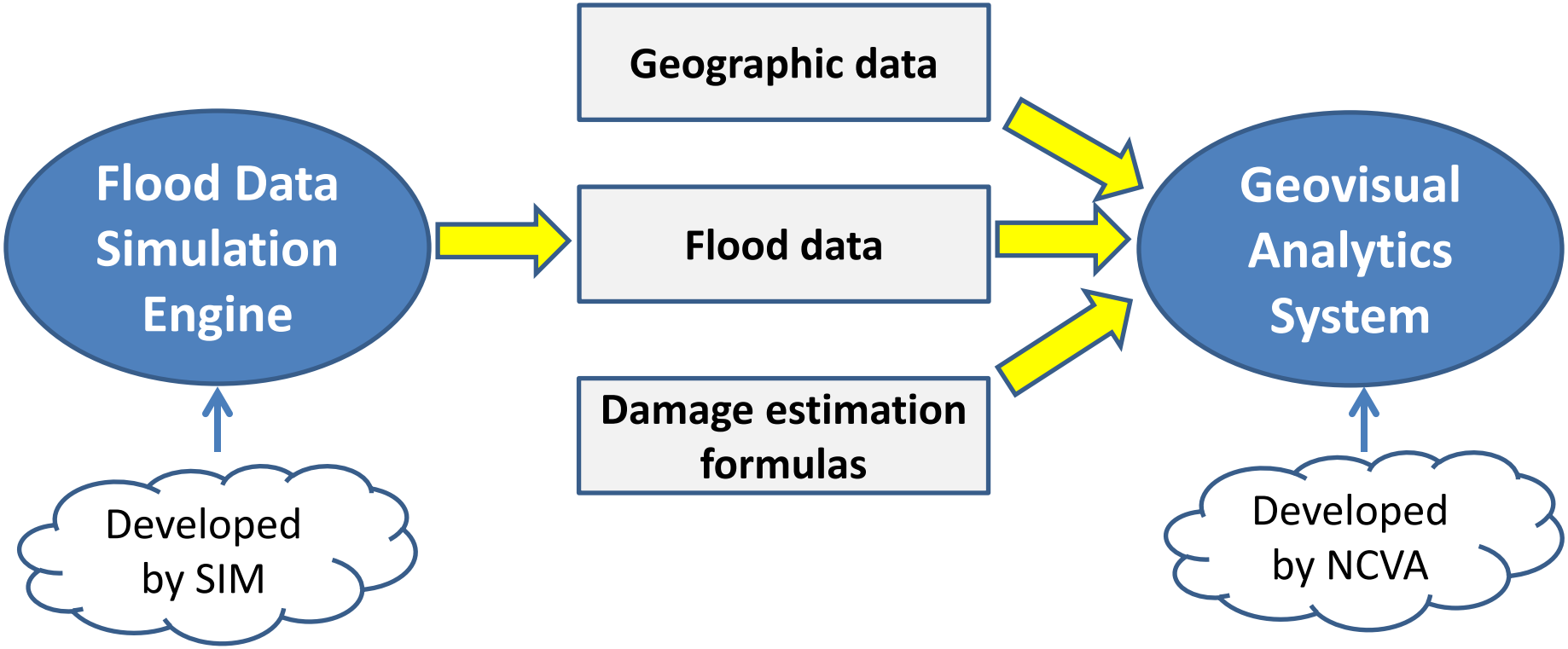
Introduction

- A serious flood event in Lisbon on 29 October 2010 caused a lot of damage on buildings

Introduction

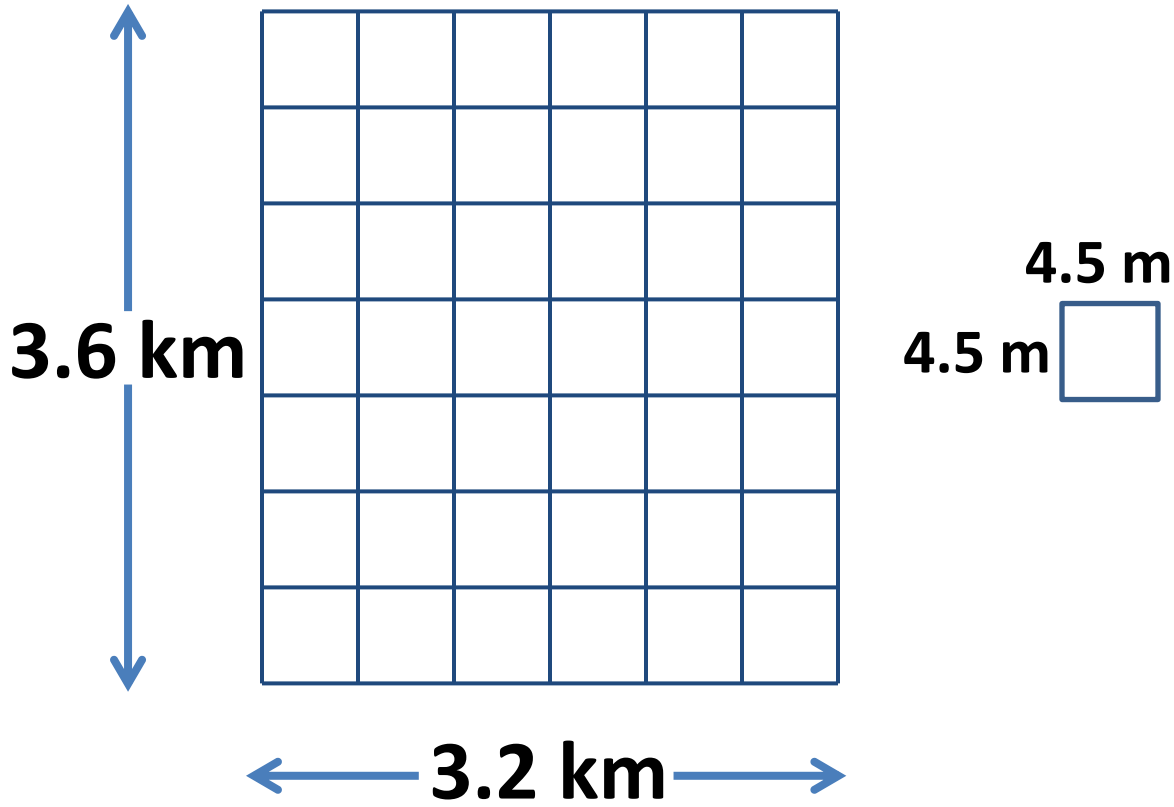
- Planners, policy makers and insurance companies would like to have a tool to
  - explore flood data,
  - estimate the damage, and
  - support making plan for rescuing or evacuating people
  - support presentation and dissemination
- Research is done in close collaboration with Uninova and SIM in Lisbon.

Data Input


Geographic data
Flood Data Simulation Engine
Flood data
Geovisual Analytics System
Damage estimation formulas
Developed by SIM
Developed by NCVA

Data Input – Flood Simulation Data

- Simulation for **Lisbon down town**
- Data of **4 hours**, time resolution of **10 minutes**



Data Input - Geographic Data

- Buildings in Lisbon downtown

Data Input - Formulas

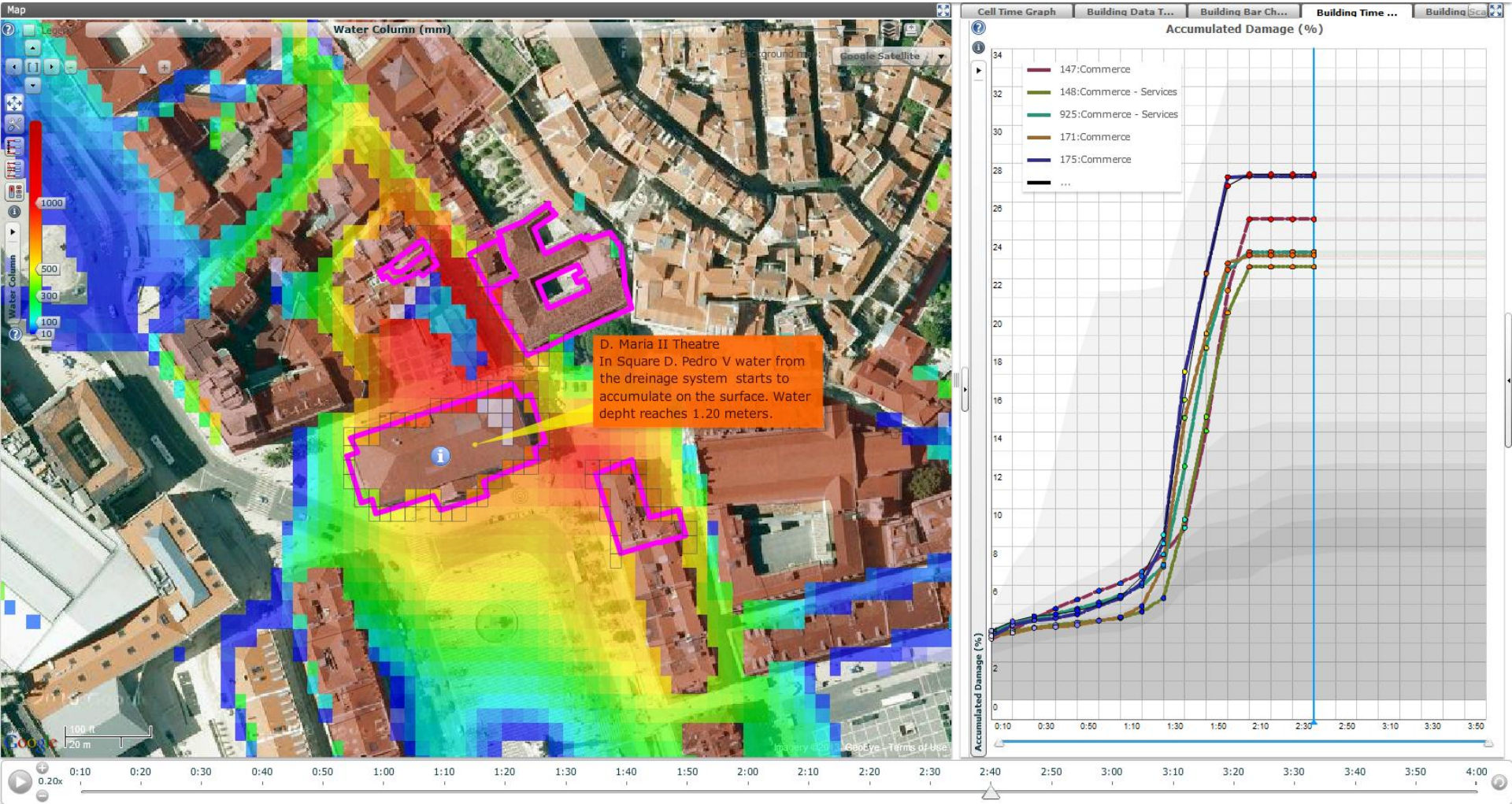
- Damage estimation (*x*: water-column in meter)

	Building Function	Formula
A	Buildings (structure)	$Y = 3 + 5x$
B	Dwelling (fixed assets)	$Y = 60\sqrt{x}$
C	Commerce or Services or others (fixed assets)	$Y = 57\sqrt{x}+5$
D	Industry (fixed assets)	$Y = 20x$
E	Commerce or Services or Industry (stock)	$Y = 5 + 38x$
P1	Weight or normalization to have the results in % according to the damage importance	0.1
P2		0.3
P3		0.2
P4		0.2
P5		0.2

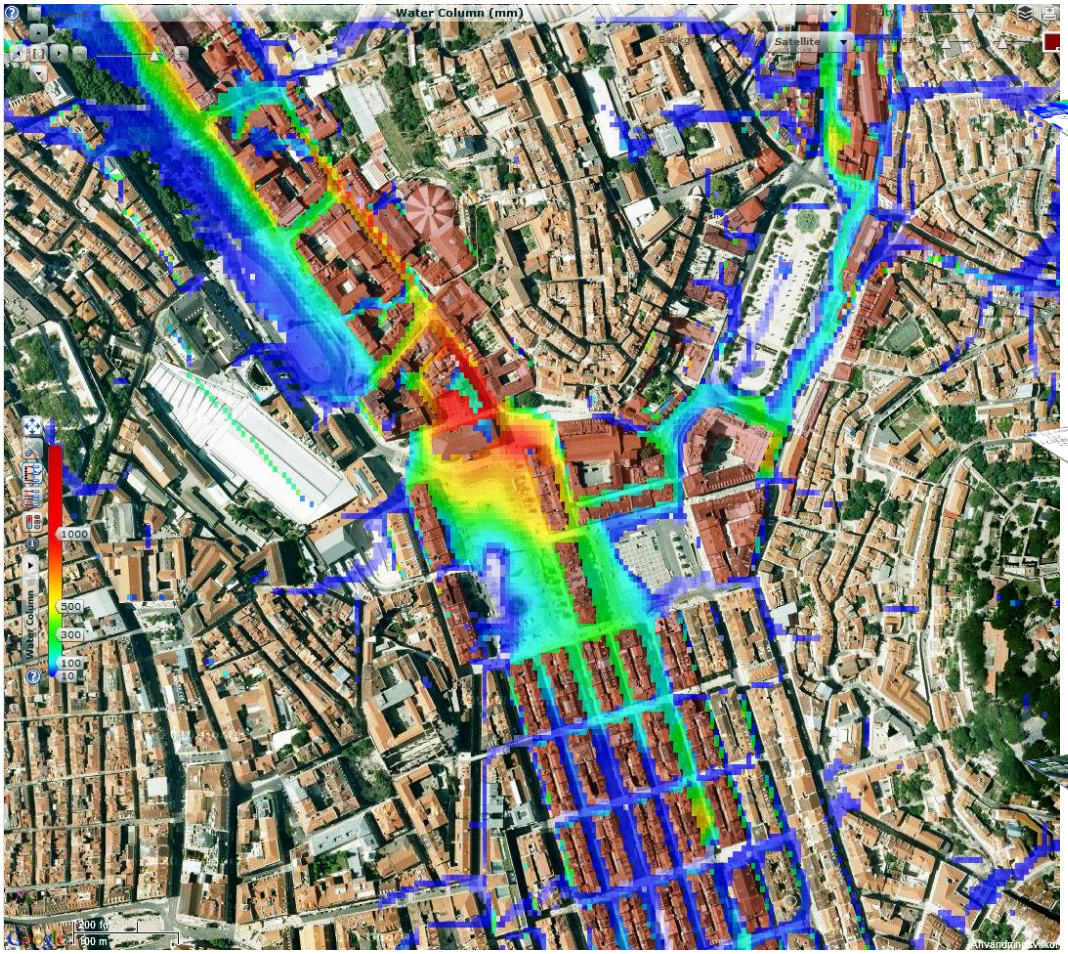
Building Function 1	Building Function 2	Formula
Commerce	NA	A*P1 + C*P2 + E*P3
Commerce	Services	A*P1 + C*P2 + E*P3
Commerce	Commerce	A*P1 + C*P2 + E*P3
Commerce	Dwelling	A*P1 +B*P4 + C*P2 + E*P3
Commerce	Industry	A*P1 + C*P2 + D*P5 + E*P3
Dwelling	NA	A*P1 + B*P4
Dwelling	Commerce	A*P1 +B*P4 + C*P2 + E*P3
Industry	NA	A*P1 + D*P5 + E*P3
Others	NA	A*P1 + C*P2
Others	Commerce	A*P1 + C*P2 + E*P3
Others	Dwelling	A*P1 + B*P4 + C*P2
Others	Services	A*P1 + C*P2 + E*P3
Services	NA	A*P1 + C*P2 + E*P3
Services	Commerce	A*P1 + C*P2 + E*P3
Services	Dwelling	A*P1 + B*P4 + C*P2 + E*P3
Services	Industry	A*P1 + C*P2 + D*P5 + E*P3

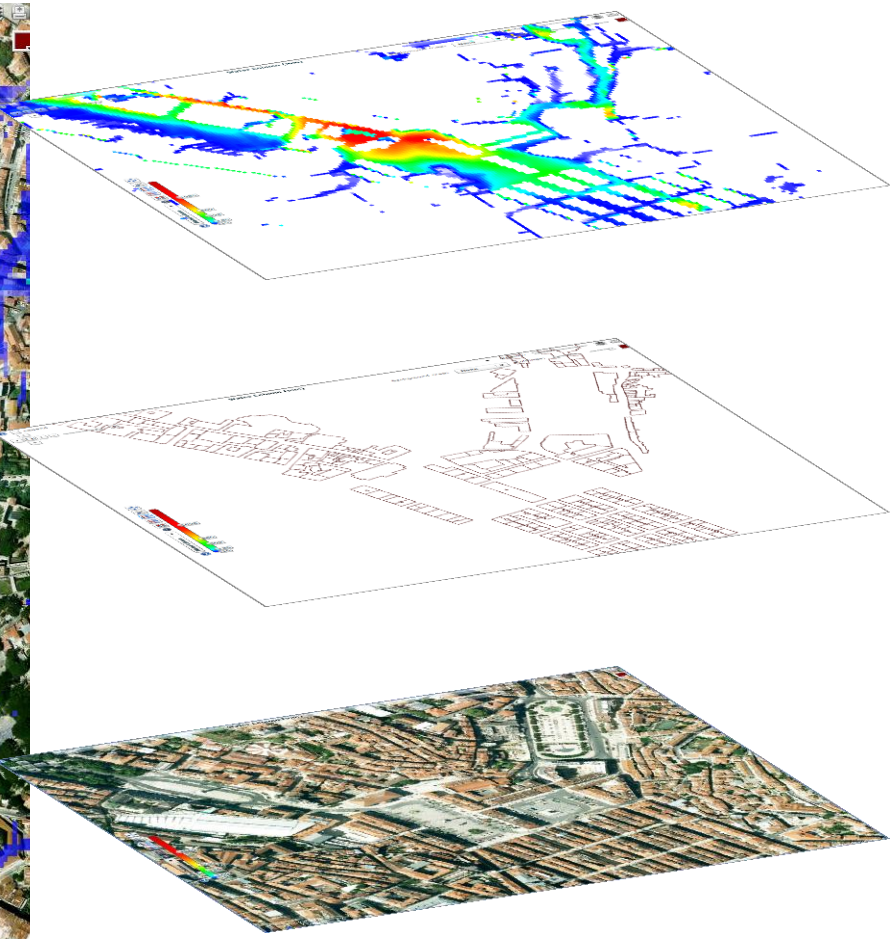
GeoVisual Analytics Approach

- Multiple linked views



Interactive Map with Dynamic Layers





Interactive Map with Dynamic Layers

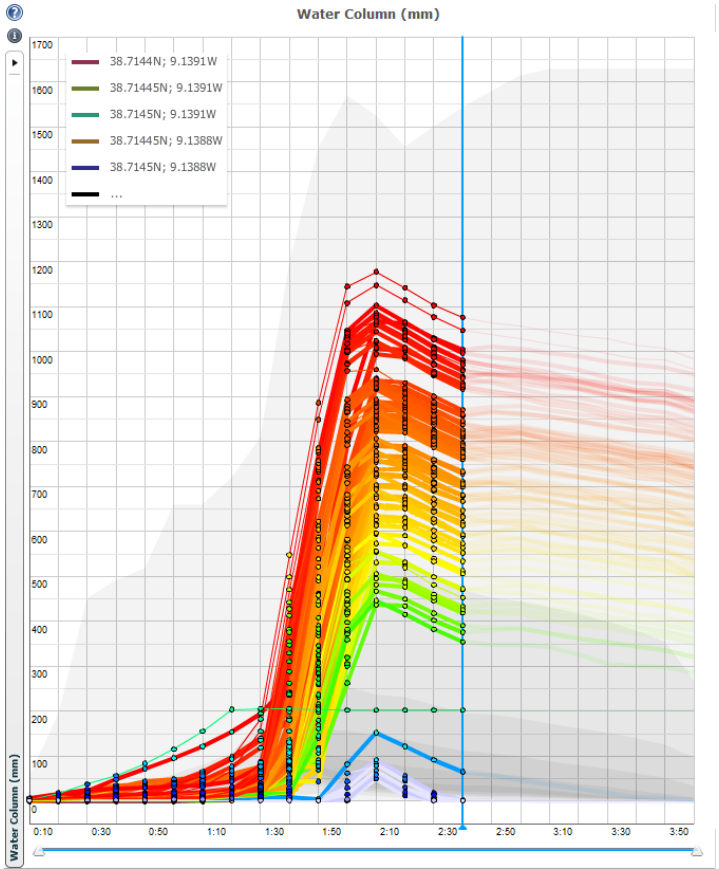
- Rich interaction techniques
  - Selection, hovering
  - zooming, panning
  - Auto focusing
  - Marker placing
  - Annotation
  - Route creating, distance measuring
  - Path finding

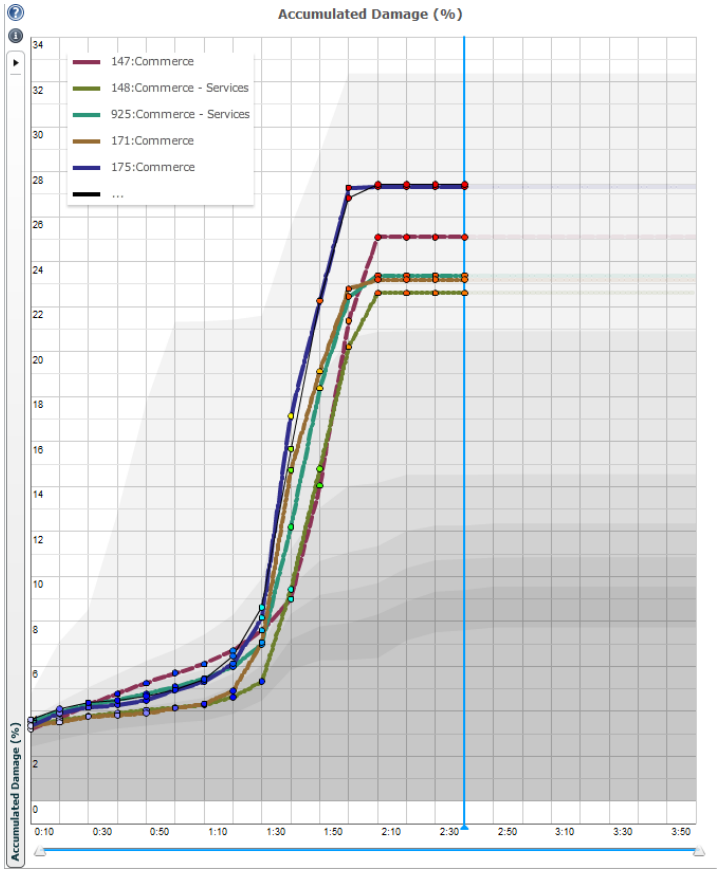
Interactive Map - Analysis Features

- Calculate water depth average level around the buildings
- Calculate damage on buildings based on given formulas
- Find buildings in danger
- Add annotation for collaboration
- Create routes for evacuating people

Other Interactive Visualizations

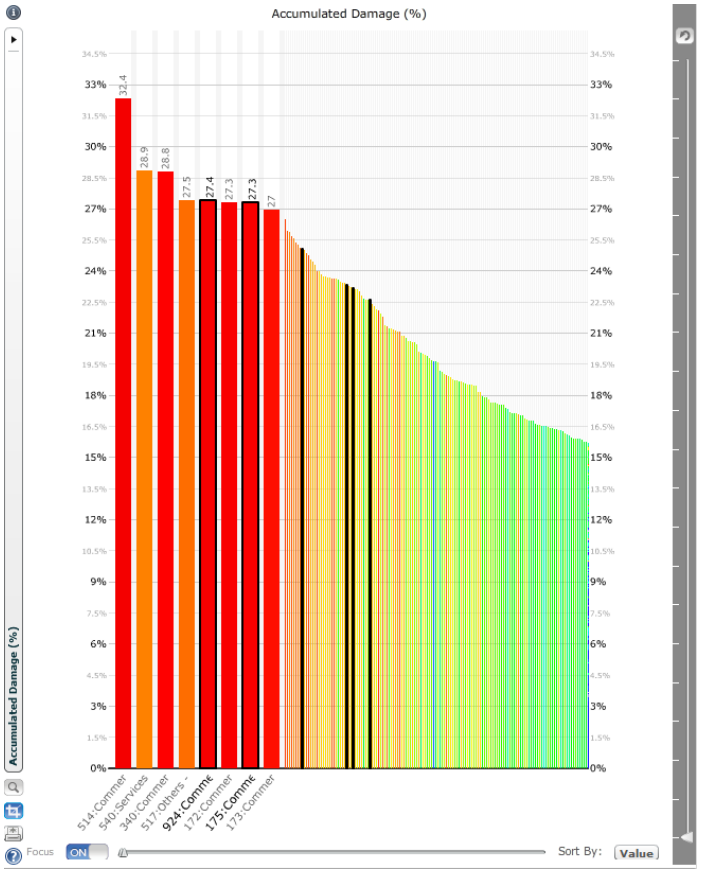
- Interactive time graphs for exploration and analysis of flood cells and buildings

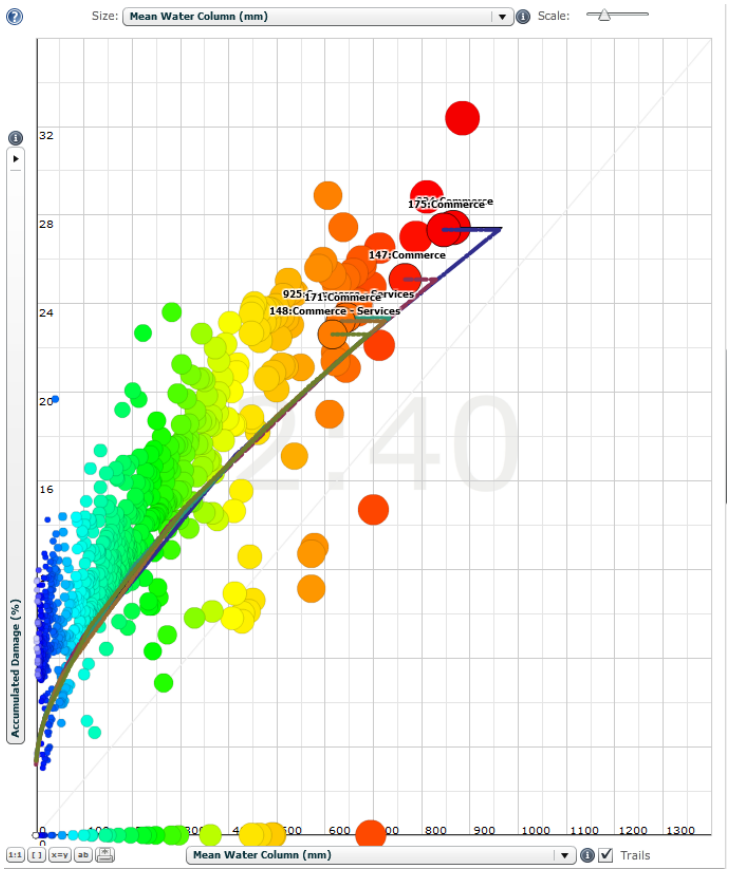




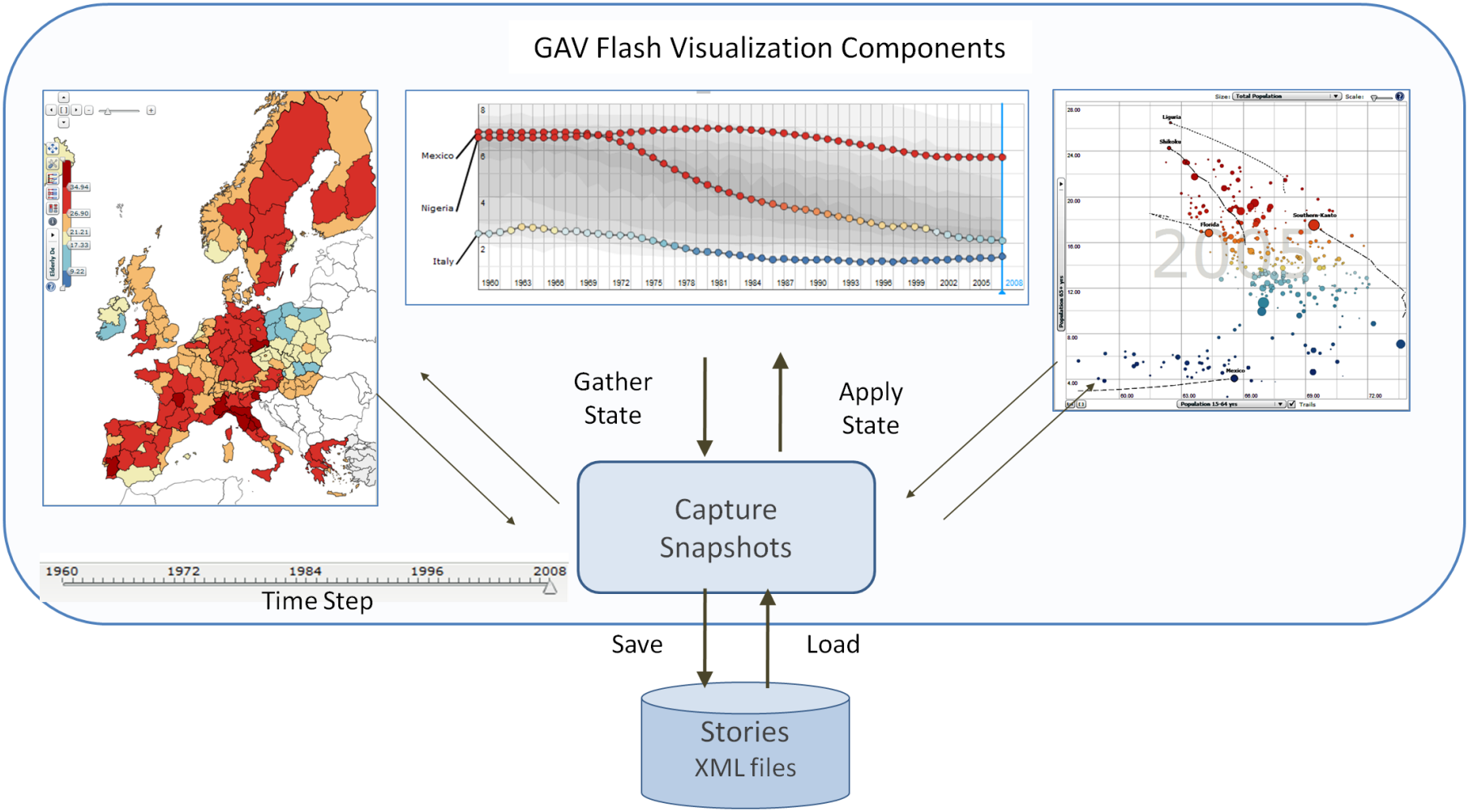
Other Interactive Visualizations

- Interactive bar chart and interactive scatter plot for exploration and analysis of buildings

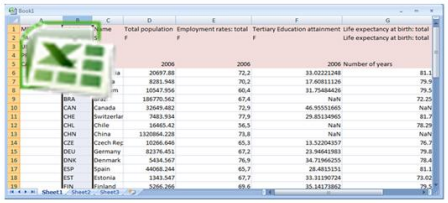




Snapshot and Storytelling



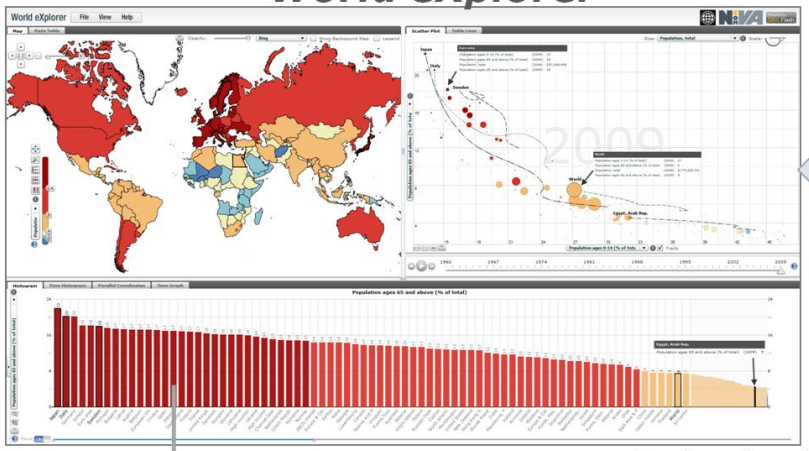
Statistical data



database

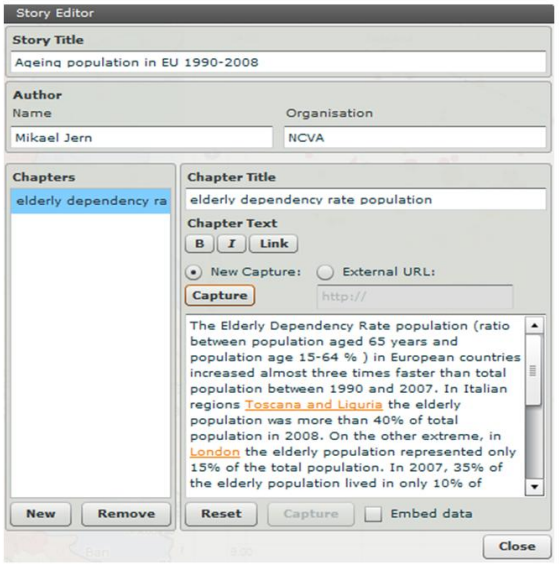
THE WORLD BANK
Working for a World Free of Poverty

World eXplorer



Story

Story Editor
metadata & hyperlinks



Gain insight

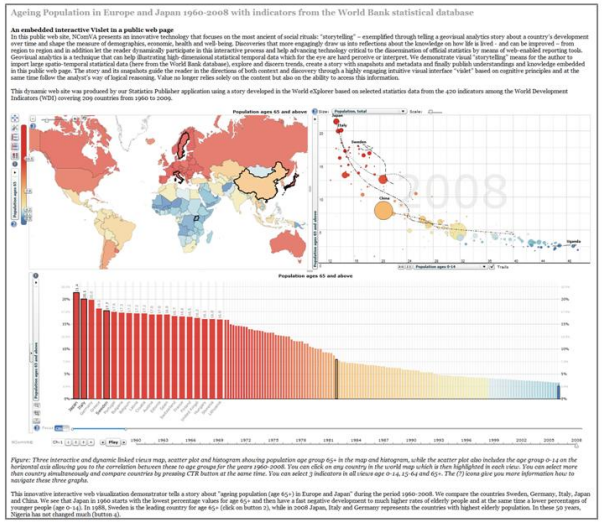
Select Statistical data and explore

Create a story
Snapshots and Metadata

Story

HTML code

Statistics Publisher
Blogs and Web pages



Get feedback
reach consensus, trust

Share stories with colleagues

Demo

- http://vitagate.itn.liu.se/GAV/flood/
- http://vitagate.itn.liu.se/GAV/flood/story/

Conclusion

- Multiple linked views system
- Interactive map with dynamic layers
- Other interactive visualizations
- Features for visual analysis
- Snapshot mechanism and storytelling for collaboration and dissemination

Future work

- Feedbacks from real users
- Dynamic formulas
- More layers to the map based on users' needs.
- Online scenario in which data comes every 10 minutes
- Performance for larger datasets

Thank you for your attention!

Online demo:
http://vitagate.itn.liu.se/GAV/flood/
http://vitagate.itn.liu.se/GAV/flood/story/

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