

# VA-4D Visual Analysis of 4-Dimensional Fields, Processes & Dynamics



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**NOMVA**  
Norrköpings Communicative  
Visual Analytics

**KING'S**  
*College*  
**LONDON**

**ESA Project:** AO 1-6740/11/F/MOS

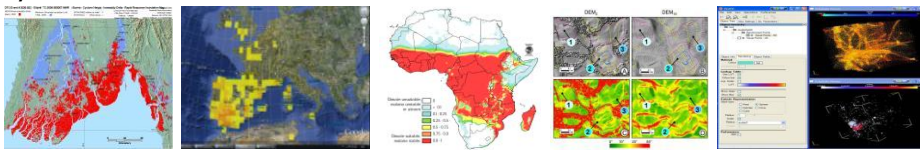
**Website:** [http://www.ca3-uninova.org/project\\_va4d](http://www.ca3-uninova.org/project_va4d)

## Objective:

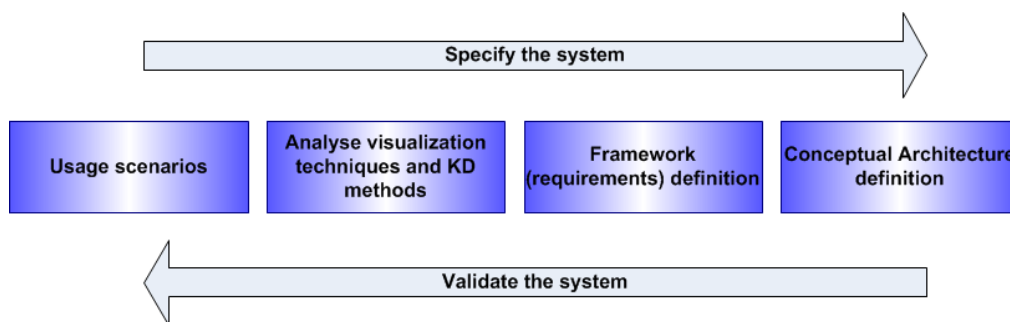
« Design a conceptual system for an intelligent Visual Analysis framework for large datasets of 4-Dimensional fields »

## Process:

1. Analysis of five scenarios from distinct domains.



- *Climate Changes influence in Floods*
  - *Evolution of Species/habitat distribution using remote sensing and projections of climate change*
  - *Monitoring vector borne diseases using satellite images*
  - *Visualisation of Natural Hazards for Scientists, Disaster Management and the Public*
  - *Space Science*
2. Survey of visualization tools and frameworks used in the scenario domains
  3. Assess best alternatives and analyse gaps
  4. Extract domain specific requirements
  5. Generalise and specify the Conceptual Design



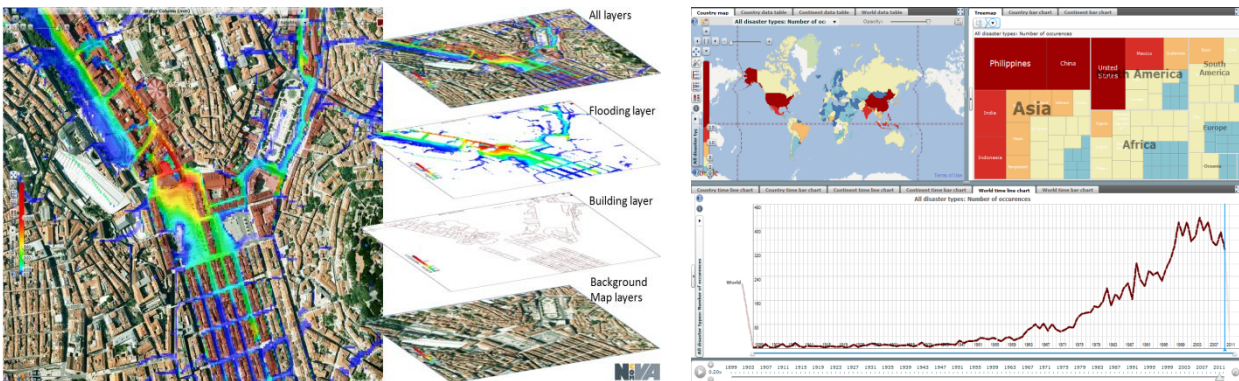
**Top-down** approach to extract domain specific requirements  
**Bottom-up** to generalize the requirements and specify the System

Detailed listing of requirements obtained via elicitation from domain experts, specifying high degrees of 3D and 4D interactivity, exploratory multivariate data analysis, handling of large datasets, and providing visualization of uncertainties associated with the models and data.

Strong emphasis on providing a **collaborative environment** customized for several communities (scientific, decision makers and general public) that maximizes knowledge and data sharing.

## Results:

1. Comprehensive scenarios description document
  - Currently available tools, data, and visualization types
2. Survey document of visualization tools and frameworks with classification of visualizations
  - Current market assessment and comparison matrix
3. Requirements definitions
  - Extensive listing of Functional, Visualization, Interface requirements with prioritization, and mapping to gap assessment
  - End-users directly involved in elicitation process – reflecting “real-life” needs
4. Gap Assessment document
  - Assessment between requirement listing and currently available tools
  - No available Visualization Framework fulfils all the requirements raised during the elicitation process – highlights the existing need
5. Conceptual System definition
  - Architectural model that responds to requirements
  - UML design of specific system modules
6. Uncertainty Handling and Visualization technical note
7. Set of functional demonstrations that validate the system concepts
  - Lisbon Flood demonstration video  
([www.ca3-uninova.org/projecto/VA-4D/VA-4D\\_Lisbon\\_Flood\\_demo.mp4](http://www.ca3-uninova.org/projecto/VA-4D/VA-4D_Lisbon_Flood_demo.mp4))
  - Space Science data visualization demonstration  
([www.ca3-uninova.org/projecto/VA-4D/VA-4D\\_Astro\\_demo.mp4](http://www.ca3-uninova.org/projecto/VA-4D/VA-4D_Astro_demo.mp4))
  - Natural Hazards eXplorer demonstration video  
([www.ca3-uninova.org/projecto/VA-4D/VA-4D\\_Natural\\_Disasters\\_demo.mp4](http://www.ca3-uninova.org/projecto/VA-4D/VA-4D_Natural_Disasters_demo.mp4))



For more detailed information of the project, please refer to the “VA-4D Final Report”, available on request from the project website.

## Project Consortium:

**Uninova-CA3** ([www.ca3-uninova.org](http://www.ca3-uninova.org)) Project Coordinator. Research group, specialised in computational intelligence for space applications

**SIM** (<http://sim.ul.pt>) Research group, experts in the fields of climate change and space sciences

**NComVA** ([www.ncomva.com](http://www.ncomva.com)) SME, providing innovative multi-variate spatio-temporal geovisual analytics, animation and storytelling tools

**KCL** ([www.kcl.ac.uk/spp/departments/geography/](http://www.kcl.ac.uk/spp/departments/geography/)) University, centre of research excellence, Environmental Monitoring and Modelling group and Hazards and Risk group