LIFE11 ENV GR 975
FLIRE: Floods and flre Risk assessment and management

Technical Report

Action B6

31/12/2012

Project location	Greece – Attiki region
Project starting date:	01/10/2012
Project ending date:	30/09/2015
Coordinating Beneficiary	National Technical University of Athens

Associated Beneficiary responsible for Action B6	FORTH
Contact person	Dr. Nektarios Chrysoulakis
Postal address	Foundation for Research and Technology - Hellas Institute of Applied and Computational Mathematics Regional Analysis Division, 100 N. Plastira Str., Vassilika Vouton, 70013, Heraklion, Crete, Greece
Telephone	0030 2810 391762
Fax :	0030 2810 391761
E-mail	zedd2@iacm.forth.gr
Other Associated Beneficiaries involved in Action B6	NTUA, ALGOSYSTEMS, ICL, NOA, IRPI-CNR
Contact Persons	NTUA: Christos Makropoulos NTUA: Chrysoula Papathanasiou ICL: Cedo Maksimovic IRPI: Tommaso Moramarco NOA: Vassiliki Kotroni ALGO: George Eftychidis,

Name of the Action: DSS Tools

Starting date of the Action: 1/9/2013

Ending date of the Action: 30/09/2015

Short description of the Action

Aim

The aim of this action is to develop a web-based decision Support System (DSS) which will combine information from different model outputs (fire and flood information) and create early warning information like fire warnings and flood warnings for the local authorities. This information is valuable for the urban safety during natural disasters like fire and flood cases as will help the decision makers to plan the timely response of the problem.

Objectives

The key objective is the development of a DSS platform that will integrate the various FLIRE tools to be used for combined real-time flood and forest fire risk management. A DSS is a computer based information system intended to help decision-makers compile useful information to identify and assess problems and help in making decisions. The basis of geospatial decision support is the Geographic Information Systems (GIS) that include data management, graphic display and spatial analysis functions. Beyond these common GIS decision aids, special features may also be included like optimization, statistical and spatial interaction functions (Böhner 2006; Batty, 2008; Nyerged, 2010). The role of the DSS platform to be developed in this Project is to enable an effective approach of flood and fire risk management, based on state-of-the-art technology, making use of the outcomes of scientific research.

Expected outcomes

- a Geodatabase that will contain all the outputs from hydrologic and hydraulic models (off-line integration), as well as all other spatial data that are required in DSS flood and fire visualizations. This geodatabase will contain both raster and vector file formats;
- a web-service for the DSS communication with the water forecasting models server;
- a web-service for the DSS communication with the fire model server (on-line integration);

- a web service for the DSS communication with the appropriate servers providing background information;
- a scenario management tool capable of storing the various scenarios parameters, as well as to match flood alert with the most close scenario.
- A core DSS mining tool which will retrieve the respective to the selected scenario models outputs from the geodatabase.
- A web service for early warning messages dispatching.
- A web-based Graphical User Interface.
- The I/O infrastructure for the data and information flow among the DSS parts.

Tasks:

- Decisions on the model outputs (DSS inputs) format (FORTH, NOA, NTUA, ICL, IRPI-CNR, ALGOSYSTEMS). High priority
- Selection of the software platform, that the system will be build. High priority
- Design and development of the system geodatabase (FORTH). High priority
- DSS design and mockup development (FORTH). High priority
- Development of the DSS (FORTH, NOA, NTUA, ICL, IRPI-CNR, ALGOSYSTEMS). High priority

Working Team:

FORTH

- **George Kocxylakis** – Geo-informatics/Database development who will:
  - design and develop the FLIRE DSS;
  - provide platform and system specifications;
  - work on the Integration of the DSS Tool and the planning tool for flood management in a common platform.
  - work on the checking and validation of the operation of all the components of the DSS Tool for the specific data flow of the case study area.

- **Poulicos Prastacos** – Civil Engineer/GIS who will:
  - coordinate the planning tool integration procedure in the DSS;
  - analyze system requirements;
  - analyze the system-models interactions;
  - support the DSS conceptual design.

- **Nektarios Chrysoulakis** - Physics / Remote Sensing who will:

    - coordinate the FORTH team;
    - analyze system requirements;
    - analyze the system-models interactions.
    - support the DSS development.

- **Dimitris Poursanidis** - Environmental Science / Cartographer who will:

    - Support the DSS development.
    - Develop the system geo-database.

- **Nikos Manioudakis** - Physics / GIS who will:

    - Support the DSS development and its host at FORTH Server.

NTUA

- **Maria Mimikou** – Project Coordinator, who will coordinate the NTUA team.

- **Chrysoula Papathanasiou** – Civil Engineer, Hydrologist, flood modeler, who will work on:
    - the definition of thresholds for the characterization of existing weather situation as flood prone or forest fire prone.
    - the definition of thresholds for “key parameters” that may lead to significant differences in the DSS predictions (e.g. new fire extends, significant changes in the water flow due to erosion, construction of flood protection measures or significant changes in the land use).
    - the updating of the offline scenario runs.
    - the expansion of the list of measures for the Planning Tool in cooperation with experts among the end users (if necessary).

- **George Karavokiros** – Computer Scientist, expert in network modelling, who will work on:
    - the parameterization of the offline scenario runs of the flood models.
    - the design of I/O routines and procedures for the flood models used for offline scenario runs.
    - the specification of the interface between the flood models and the central database of FLIRE, in close cooperation with FORTH.

- **George Zombanakis**, Civil Engineer, expert in Hydroinformatics, who will work on the development of the appropriate similarity metrics.

- **Christos Makropoulos** – Internal Project Coordinator, who will work on:
    - the definition of thresholds for “key parameters” that may lead to significant differences in the DSS predictions (e.g. new fire extends, significant changes in the water flow due to erosion, construction of flood protection measures or significant changes in the land use).
    - the updating of the offline scenario runs.
    - the development of the appropriate similarity metrics.

- **Evangelos Baltas** – Senior Engineer, Hydrologist and flood modeler, who will work on:
    - the definition of thresholds for the characterization of existing weather situation as flood prone or forest fire prone.

- **Nikolaos Mamassis** – Senior Engineer, Hydrologist, expert in Geoinformatics, who will work on:
    - the definition of thresholds for “key parameters” that may lead to significant differences in the DSS predictions (e.g. new fire extends, significant changes in the water flow due to erosion, construction of flood protection measures or significant changes in the land use).

ICL

- **Čedo Maksimović** - head of the Urban Water Research Group (UWRG) within the Department of Civil and Environmental Engineering at Imperial College London, project coordinator, senior engineer, advise on flooding/flood protection

- **Maria Aivazoglou** - research and development on urban flood and intecations on forest fires,

- **Callum Clench** - project manager

These members of the ICL team will cooperate and work on:

- the running of the urban flood scenario modelling

NOA

▪ **Vassiliki Kotroni** – Internal Project Coordinator, Research Director, Meteorologist,

▪ **Konstantinos Lagouvardos** – Research Director, Meteorologist, atmospheric modeler

These members of the NOA team will cooperate and work on:

- integration of the weather forecasting fields/data into the Weather Information Management tool of the DSS
- integration of weather observations into the Weather Information Management tool of the DSS
- definition of data format and data exchange procedures
- operational support/control of meteorological data feed to the DSS.

IRPI-CNR

- **Dr. Tommaso Moramarco –** Internal Project Coordinator, Researcher, who will coordinate the IRPI-CNR team
- **Dr. Silvia Barbetta –** Researcher, Flood advisor, Flood modeller, Data analysis, who will work on:
    - the development of the near real-time flood risk management tool based on a catchment modelling component, an urban modelling component and an Early Flood Warning System (EFWS)
    - the development of the planning tool indicating which effective interventions, structural and/or non-structural, have to be applied and where in the study area
- **Dr. Luca Brocca –** Researcher, Flood advisor, Flood modeller, Data analysis, who will work on:
    - the development of the near real-time flood risk management tool based on a catchment modelling component, an urban modelling component and an Early Flood Warning System (EFWS)
    - the development of the planning tool indicating which effective interventions, structural and/or non-structural, have to be applied and where in the study area
- **Temporary Fellow Researcher –** Flood modeller, Data analysis, who will work on:
    - the development of the near real-time flood risk management tool based on a catchment modelling component, an urban

modelling component and an Early Flood Warning System (EFWS)
    - the development of the planning tool indicating which effective interventions, structural and/or non-structural, have to be applied and where in the study area

ALGOSYSTEMS

- **George Eftychidis** – Forester, Forest fire behaviour analyst, who will work on:
    - the definition of the fire risk assessment index to be used in the EFiWS.
    - the definition of the potential fire scenarios that should be considered in the area of interest.
    - the definition of the context required and the relative parameters for associating the impact of fire occurrence to the severity of the flood.
    - the definition of the functionalities of the DSS and the design of the HMI and the FLIRE solution that will be implemented.

- **Vassiliki Varela** – Forester, Forest fire modeler, GIS programming expert, who will work on:
    - the design of the fire modeling according to the needs of FLIRE objectives.
    - setting up the required spatial data sets for running the fire propagation model.
    - the interfacing of the fire model to inputs provided by other partners of the project (meteorological data).
    - the integration of the GFMIS output with the flood model.
    - the definition of the interface between the forest fire model and the central database of FLIRE, in close cooperation with FORTH.
- **Christos Pateritsas,** Electrical engineer and Computer Science expert, who will work on:
    - programming the GFMIS web service.
    - programming the fire risk assessment web service.
    - supporting the integration of the web service in the DSS.

- **Costantinos Chassapis,** Physicist and Computers Networking specialist, who will work on:
    - the required adaptations of the fire modeling software to the needs of FLIRE DSS applications.

Deliverables

- System Design Report at 28/02/2014.

Milestones

- Data type definition (format and projection system) at 31/3/2013
- Definition of the architecture of the geodatabase at 30/8/2013
- Development of the Weather Information Management Tool (WIMT) at 30/8/2014
- Development of the Near Neal-time Flood Risk Management Tool (EFWS) at 30/8/2014
- Development of the Near Real-time Forest Fire Risk Assessment (EFiWS) and Management Tool at 30/8/2014
- Development of the Geodatabase at 30/8/2014
- Development of DSS light prototype at 28/02/2014
- Completion the DSS prototype at 27/02/2015

Gantt-chart

		2013				*2014*				*2015*		
		I	*II*	*III*	*IV*	*I*	*II*	*III*	*IV*	*I*	*II*	*III*
1	*Data type definition*	■										
2	*Geodatabase architecture*		■	■								
3	*WIMT*			■	■	■	■	■				
4	*EFWS*			■	■	■	■	■				
5	*EFiWS*			■	■	■	■	■				
6	*Geodatabase design*				■	■	■	■				
7	*DSS design and mockup development*			■	■	■	■	■	■	■		
8	*DSS development*							■	■	■	■	■

Key references

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- Böhner, C., (2006), Decision-support systems for sustainable urban Planning. International Journal of Environmental Technology and Management, 6, p. 193 – 205.
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- Chrysoulakis, N., Mitraka, Z., Diamantakis, E., González, A., Castro, E. A., San Josë, R. and I. Blecic, (2010). Accounting for urban metabolism in urban planning. The case of BRIDGE. In: CD-ROM of Proceedings of the 10th International Conference on Design & Decision Support Systems in Architecture and Urban Planning, organized by the Technical University of Einhoven, in Eindhoven, The Netherlands (July 19-22).
- Nyerged, T., (2010), Regional and urban GIS: a decision support approach, A Division of Guilford Publications, Inc, New York, USA.