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

Technical Report

Action B3

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 B3	National Technical University of Athens
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Other Associated Beneficiaries involved in Action B3	ICL, IRPI-CNR
Contact Persons	ICL: Cedo Maksimovic, Maria Aivazolglou, Callum Clench IRPI: Tomasso Moramarco, Silvia Barbetta, Luca Brocca

Name of the Action: Flood Risk Assessment

Starting date of the Action: 01/04/2014

Ending date of the Action: 30/09/2014

Short description of the Action

Aim

The aim of the Implementation Action B.3 is the completion of flood risk assessment in the study area, making full use of the outcomes of the two precedent Actions B.1 (Catchment modelling) and B.2 (Urban flood modelling)

Objectives

- Quantification of the **vulnerability** of the study area to floods and visualization of the **spatial distribution and the intensity** of floods with the production of **flood hazard maps** that will be used by the Early Flood Warning System
- Estimation of the **socioeconomic impact** of floods with the production of **flood risk maps** that will be used by the Early Flood Warning System
- Using of a set of fuzzy similarity metrics for the association between near real-time weather information and rainfall scenarios and thus computed flood risk, in order to **save** considerable **time for the issuing of warnings** by the DSS.

Expected outcomes

As foreseen in the submitter proposal, the expected outcomes of Action B.3 are:

- Coupling of the catchment and the urban models
- Generation of stochastic rainfall timeseries
- Accurate mapping of flood hazard in the study area
- Accurate mapping of flood risk in the study area
- A set of fuzzy similarity metrics for a Case Based Reasoning approach to linking forecasted and real-time rainfall data to computed flood risk.

No constraints, deviations and/or amendment to the submitted proposal have been identified so far for Action B.3. However, as also mentioned in the submitted proposal, two critical issues for the sound implementation of the Action are: (1) the appropriate choice of catchment and urban models considering the facilitation of their coupling and (2) the development of appropriate fuzzy measures to ensure correct categorization of cases (a detailed examination of the attributes contained within the forecasted and telemetric rainfall datasets is required for this design).

Tasks

1. Integration of catchment modelling and urban modelling components (**NTUA**, **ICL**, **IRPI-CNR**) [**high priority**]
2. Retrieval of historic rainfall datasets from the HOA (http://hoa.ntua.gr) and the meteorological stations of NOA (www.noa.gr) (**NTUA**) [**high priority**]
3. Generation of stochastic rainfall timeseries (covering events that range between recurrent events [T=2 years] and exceptional events [T=200 years] and considering climate change scenarios) from the historical timeseries (**NTUA**) [**high priority**]
4. Development of representative rainfall scenarios based on rainfall with different characteristics (**NTUA**) [**high priority**]
5. Setting up and running of the integrated (catchment and urban) model using rainfall scenarios and extended topographic and other relevant datasets (**NTUA**, **ICL**) [**high priority**]
6. Generation of flood hazard maps (maps depicting water levels and velocities in inundated areas) for each rainfall scenario (**NTUA**, **ICL**, **IRPI-CNR**) [**high priority**]
7. Collection and analysis of socioeconomic datasets for the inundated areas (including inter alia information on loss of human lives, land use data and information on damage to residences and other buildings, property values, information on loss of agricultural production, reduced harvest, population densities and socioeconomic status of residents (residents' GPD etc)) (**NTUA**, **ICL**) [**high priority**]
8. Consideration of the ecological impact of floods (using the relevant indicators developed and monitored for Action C.2) (**NTUA**, **IRPI-CNR**) [**high priority**]
9. Generation of flood risk maps for each rainfall scenario (**NTUA**, **ICL**, **IRPI-CNR**) [**high priority**]
10. Development of a scenario database with representative rainfall scenarios and their resulting flood risk and flood hazard maps (**NTUA**, **ICL**, **IRPI-CNR**) [**high priority**]
11. Development of a set of fuzzy similarity metrics for a (Fuzzy) Case Based Reasoning approach to link in near real-time the weather information (short-term weather forecasting and telemetric data from HOA and NOA raingauge network) initially with the proper (a "similar") rainfall scenario stored in the database and then with the computed flood risk (**NTUA**, **ICL**, **IRPI-CNR**) [**high priority**]
12. Use of a short-term prediction methodology developed by ICL for improved real-time risk assessment on the basis of the scenarios (**ICL**) [**medium priority**]

Working Team
NTUA

- **Maria Mimikou** – Project Coordinator, who will work on the coordination of the NTUA team.

- **Christos Makropoulos** – Internal Project Coordinator, who will work on:
    - The integration of catchment modelling and urban modelling components
    - The generation of stochastic rainfall timeseries (covering events that range between recurrent events [T=2 years] and exceptional events [T=200 years] and considering climate change scenarios) from the historical timeseries
    - The development of representative rainfall scenarios based on rainfall with different characteristics
    - The setting up and running of the integrated (catchment and urban) model using rainfall scenarios and extended topographic and other relevant datasets
    - The generation of flood hazard maps for each rainfall scenario
    - The generation of flood risk maps for each rainfall scenario
    - The development of a set of fuzzy similarity metrics

- **Chrysoula Papathanasiou** – Civil Engineer, Hydrologist, flood modeler, who will work on:
    - The integration of catchment modelling and urban modelling components
    - The generation of stochastic rainfall timeseries (covering events that range between recurrent events [T=2 years] and exceptional events [T=200 years] and considering climate change scenarios) from the historical timeseries
    - The development of representative rainfall scenarios based on rainfall with different characteristics
    - The setting up and running of the integrated (catchment and urban) model using rainfall scenarios and extended topographic and other relevant datasets
    - The generation of flood hazard maps for each rainfall scenario
    - The collection and analysis of socioeconomic datasets for the inundated areas
    - The consideration of the ecological impact of floods
    - The generation of flood risk maps for each rainfall scenario
    - The development of a set of fuzzy similarity metrics

- **Nikolaos Mamassis** – Senior Engineer, Hydrologist, expert in Geoinformatics, who will work on:

- The development of representative rainfall scenarios based on rainfall with different characteristics
- The generation of flood hazard maps for each rainfall scenario
- The consideration of the ecological impact of floods
- The generation of flood risk maps for each rainfall scenario

- **Evangelos Baltas** – Senior Engineer, Hydrologist and flood modeler, who will work on:
  - The integration of catchment modelling and urban modelling components
  - The development of representative rainfall scenarios based on rainfall with different characteristics
  - The analysis of socioeconomic datasets for the inundated areas

- **George Zombanakis**, Civil Engineer, expert in Hydroinformatics, who will work on the development of the appropriate similarity metrics
  - The generation of stochastic rainfall timeseries (covering events that range between recurrent events [T=2 years] and exceptional events [T=200 years] and considering climate change scenarios) from the historical timeseries
  - The development of a scenario database with representative rainfall scenarios and their resulting flood risk and flood hazard maps
  - The development of a set of fuzzy similarity metrics

- **George Karavokiros** – Computer Scientist, expert in network modelling, who will work on:
  - The integration of catchment modelling and urban modelling components
  - The development of a scenario database with representative rainfall scenarios and their resulting flood risk and flood hazard maps
  - The development of a set of fuzzy similarity metrics

- **George Papoutsoglou** – Tech. Agronomist, responsible for the hydrometeorological stations of NTUA in the study area, who will work on:
  - The retrieval of historic rainfall datasets from the HOA and the meteorological stations of NOA
  - The collection and analysis of socioeconomic datasets for the inundated areas

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 all cooperate and work on:

  - The integration of catchment modelling and urban modelling components
  - The setting up and running of the integrated (catchment and urban) model using rainfall scenarios and extended topographic and other relevant datasets
  - The generation of flood hazard maps for each rainfall scenario
  - The generation of flood risk maps for each rainfall scenario
  - The development of a scenario database with representative rainfall scenarios and their resulting flood risk and flood hazard maps
  - The development of a set of fuzzy similarity metrics
  - The use of a short-term prediction methodology developed by ICL for improved real-time risk assessment on the basis of the scenarios

IRPI-CNR

- **Tommaso Moramarco** – Internal Project Coordinator, who will work on:
  - The integration of catchment modelling and urban modelling components
  - The consideration of the ecological impact of floods

- **Luca Brocca** – Environmental Engineer, Hydrologist, flood modeler, who will work on:
  - The integration of catchment modelling and urban modelling components
  - The generation of flood hazard maps for each rainfall scenario
  - The generation of flood risk maps for each rainfall scenario
  - The development of a scenario database with representative rainfall scenarios and their resulting flood risk and flood hazard maps

- **Silvia Barbetta** – Environmental Engineer, Hydrologist, flood modeler, who will work on:
    - The integration of catchment modelling and urban modelling components
    - The consideration of the ecological impact of floods
    - The development of a scenario database with representative rainfall scenarios and their resulting flood risk and flood hazard maps

- **Temporary Fellow Researcher** – Hydrologist, flood modeler, who will work on:
    - The integration of catchment modelling and urban modelling components
    - The generation of flood hazard maps for each rainfall scenario
    - The consideration of the ecological impact of floods
    - The generation of flood risk maps for each rainfall scenario
    - The development of a scenario database with representative rainfall scenarios and their resulting flood risk and flood hazard maps
    - The development of a set of fuzzy similarity metrics

Deliverables

The Implementation Action B.3 has two deliverables:

1. ***Flood hazard maps*** that have to be ready by **30/09/2014**
2. ***Flood risk maps*** that have to be ready by **30/09/2014**

The procedure for the production of flood hazard and flood risk maps is described in detail in the previous fields "Short description of the Action" and "Tasks".

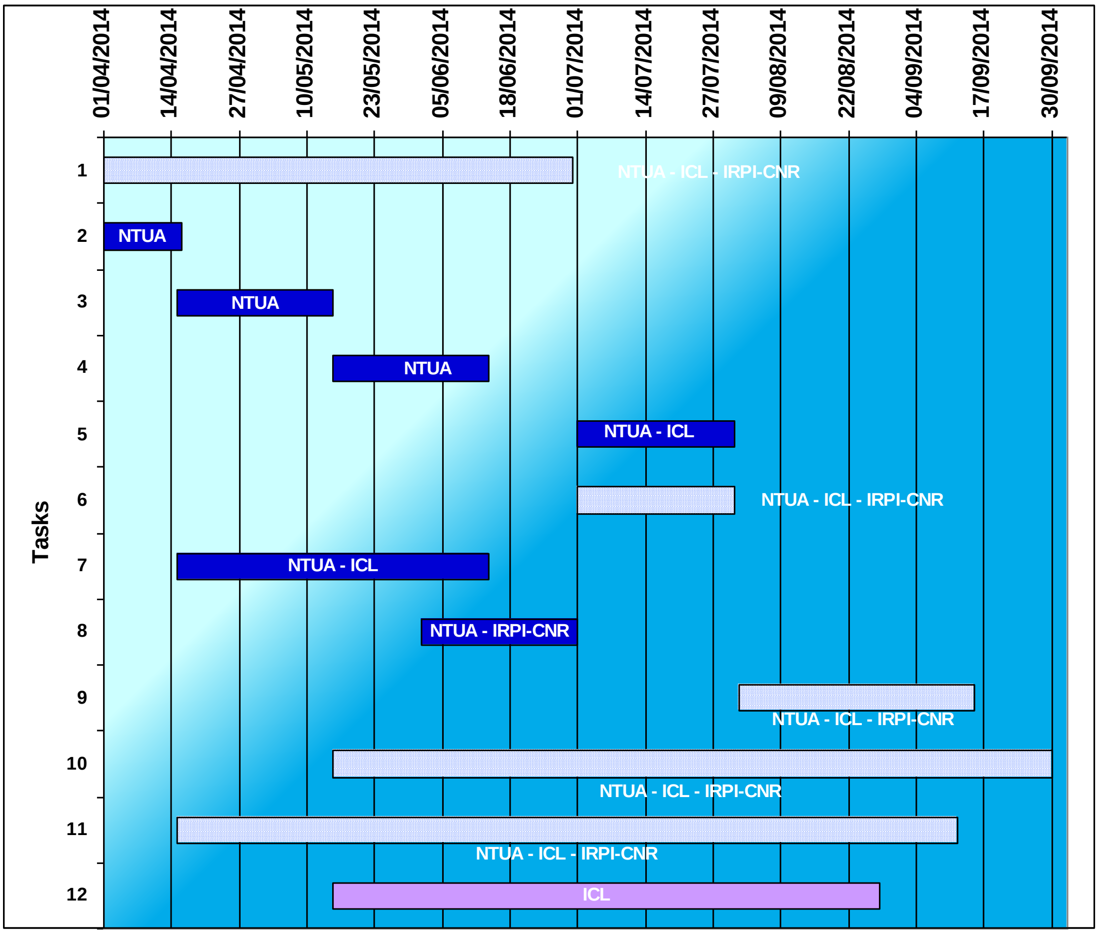
Milestones

The Implementation Action B.3 has two Milestones:

1. ***Availability of coupled catchment and urban models*** that has to be ready by **30/06/2014**
2. ***Completion of the scenario database*** that has to be ready by **31/07/2014**

Further details on both milestones are presented in the previous fields "Short description of the Action" and "Tasks".

Gantt-chart



Key references

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- Brocca, L., Camici, S., Tarpanelli, A., Melone, F. and Moramarco, T., (2011), Analysis of climate change effects on floods frequency through a continuous hydrological modelling, In: A. Baba et al. (eds.), Climate Change and its Effects on Water Resources NATO Science for Peace and Security Series C: Environmental Security, 3, 97-104, doi:10.1007/978-94-007-1143-3_11.
- Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (Text with EEA relevance), 6.11.2007 Official Journal of the European Union, L288/27 - L288/34.

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