

PLURISK

Forecasting and management of extreme rainfall induced risks in the urban environment

DURATION OF THE PROJECT
01/05/2012 – 30/04/2016

BUDGET
992.563 €

KEYWORDS

Urban floods, Rainfall, Forecasting, Modelling, Socio-economic risk, Ecotechnologies

CONTEXT

Extreme local rain storms might induce severe floods and related socio-economic impacts on the urban environment (Belgian cities). While floods along rivers have been studied already extensively, quantification, forecasting, control and management of inundations along sewer systems and urban rivers have to face particular difficulties. They need fine-scale (local, short duration) rainfall estimation and nowcasting (=short-term forecasting in real time). They also require involvement of local authorities, which typically have low capacity in setting up risk quantification, forecasting, control and management systems.

WP2: Two-dimensional fine-scale modelling, mapping and nowcasting of inundations in urban areas

The fine-scale rainfall estimates and forecasts will be simulated in the sewer network models of case studies. The improvement in the hydraulic simulation results will be analysed. The hydraulic sewer model will be extended to allow 2D modelling and mapping of surface inundations. Also quantification of uncertainties on these inundation quantifications will be made.

WP3: Socio-economic risk quantification for (historic) urban areas

A survey will be conducted among Belgian households that have already been affected by urban pluvial flooding to collect primary urban flood data and information on how people evaluate social pluvial flood impacts, on the pluvial flood risk reducing effects of risk awareness, warnings and private precautionary measures, on the relationship between urban pluvial flood characteristics and material damage and on the damage to cultural heritage.

WP4: Risk communication and warnings for urban flood risks

A warning system will be set up for extreme rainfall and urban pluvial floods based on fine-scale flood and flood risk predictions.

WP5: Risk reduction by both prevention/management (blue – green urban water infrastructures)

New management strategies will be developed by better interfacing between spatial planning, eco-management and urban water management, e.g. green – blue water; role of landscape architecture; restoration of biodiversity in urban areas incl. ecotechnologies on buildings and very dense urbanized areas, and considering the services of biodiversity for human population.

PROJECT DESCRIPTION

Objectives

This research project aims to support the local authorities in the quantification, forecasting, warning, control and management of pluvial floods. Methodologies and software tools will be developed for:

1. Nowcasting of fine-scale extreme rainfall
2. Two-dimensional fine-scale modelling, mapping and nowcasting of inundations in urban areas
3. Socio-economic risk quantification, incl. material and immaterial (social, ecological) damage assessment, quantification of risk perception (awareness), coping capacity and recovery capacity, and impacts on built heritage
4. Risk communication and flood risk warning based on the nowcasting results
5. Risk reduction by both prevention/management and real-time control actions

Methodology

WP1: Nowcasting of fine-scale extreme rainfall

An operational real-time system will be developed for fine-scale rainfall nowcasting (short-term forecasting), using advanced techniques for storm cell tracking and integrating national (C-band) and local (X-band) radar technology, numerical weather prediction and lightning detection; quantification of the uncertainty in this nowcasting.



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INTERACTION BETWEEN THE DIFFERENT PARTNERS

The fine-scale rainfall nowcasting system will be developed by IRM with the help of KU Leuven – Hydraulics for the integration with the X-band radar data. KU Leuven – Hydraulics will develop 2D urban inundation modelling and mapping tools for the case-studies and simulate the rainfall nowcasts to obtain urban inundation results. HIVA will conduct the socio-economical risk analysis in close cooperation with the R. Lemaire International Center for Conservation and the Unesco Chair on Preventive Conservation, monitoring and maintenance of monuments and sites, for the impacts on the cultural heritage. HIVA will also cooperate with KU Leuven – Hydraulics for the interfacing between the risk quantification and the hydraulic model simulation results. Risk communication will be studied in close cooperation between HIVA and RMI. Gembloux Agro-Bio Tech will quantify the ecological risks in cooperation with HIVA, and will develop and analyse sustainable management strategies. The impacts and effectiveness of these strategies will be simulated in the hydraulic models by KU Leuven – Hydraulics.

LINK INTERNATIONAL PROGRAMMES

For the Leuven case, the use of X-band radar data and the 2D urban surface inundation modelling, close cooperation will be established with the Interreg NWE IVB project RainGain, in which the Hydraulics division of KU Leuven and the PLURISK Follow-up Committee member Aquafin are involved. Also joint Follow-up Committee meetings will be organised with that project.

EXPECTED RESULTS AND/OR PRODUCTS

The fine-scale rainfall nowcasting system of WP1 will be a nation-wide system such that all Belgian cities can make use of these rainfall forecasts. The methodologies and software tools developed in the other WPs will be applicable to any Belgian city, but will be demonstrated and tested in the PLURISK project to 3 case studies (3 selected Belgian cities) only. Urban areas in Leuven, Gent, Brussels and/or Liège are proposed as case studies. At the end of the project, training will be provided to all Belgian cities on the methodologies and software developed in the PLURISK project.

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Follow-up Committee

For the complete and most up-to-date composition of the Follow-up Committee, please consult our Federal Research Actions Database (FEDRA) by visiting <http://www.belspo.be/fedra> or

