

Evaluation of pluvial risk in urban areas under future climate change scenarios

Sperotto A.², Torresan S.^{1,2}, Gallina V.^{1,2}, Furlan E.², Critto A.^{1,2}, Marcomini A.^{1,2}

1 Centro-Euro Mediterraneo sui Cambiamenti Climatici (CMCC),
2 Department of Environmental Sciences, Informatics and Statistics, University Ca' Foscari Venice.



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Target groups Relevance to the case-study requirements

➤ Local/Regional Authorities	Extreme weather events (i.e. heavy precipitations, storms, floods), together with increasing exposure and vulnerability patterns and changing climate, are expected to cause more severe impacts to coastal societies and ecosystems.
➤ Private Stakeholders	In urban areas the probability of pluvial flood is particularly high and damages are significant therefore an assessment of pluvial flood risk for future climate scenarios is necessary in order to define adaptation plans and increase cities resilience to climate change.
➤ Civil protection authorities	

The approach

A Regional Risk Assessment (RRA) methodology was developed and applied to the territory of the municipality of Venice (North Adriatic coast, Italy) in order to produce climate risk and adaptation services for local stakeholders and decision-makers. The RRA methodology is based in 4 main phases (figure 1) and was performed with the support of the GIS based DSS 'DESYCO' providing maps and statistics which allow the identification and ranking of areas that are likely to be affected by pluvial flood risk in future climate change scenario.

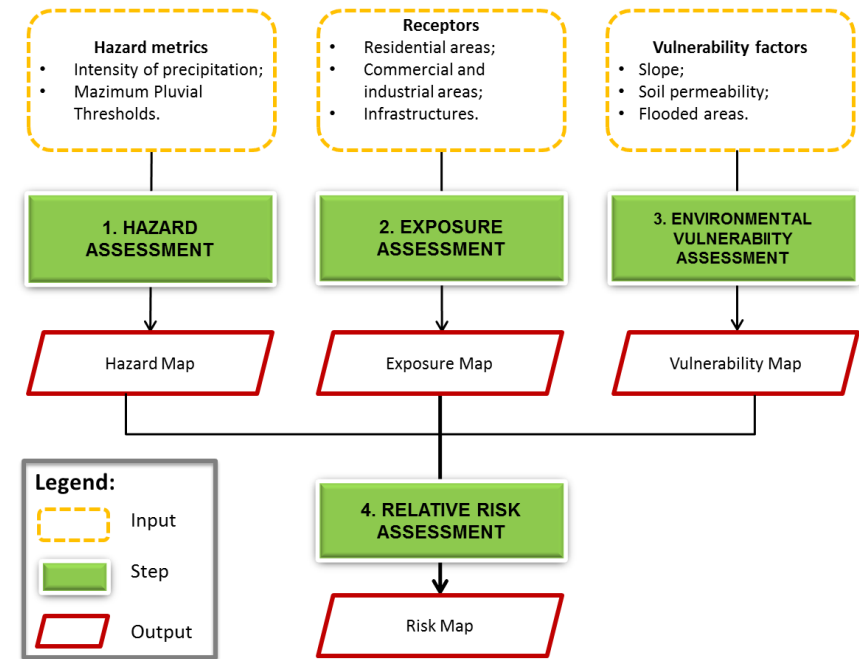


Figure 1: Main steps of the RRA applied for the evaluation of pluvial risk in urban areas.

1. Hazard assessment:

- allows to identify areas that could be affected by potential hydraulic emergencies for the future scenario 2041-2050;
- precipitation data from the RegCM4 model, forced by the RCP 8.5 emission scenario (Giorgi F. et al., 2012), were used to define future climate change scenarios;
- hydraulic emergencies are calculated comparing the total daily precipitation with the Maximum Pluvial Threshold defined by ARPAV (Regional Agency for Environmental Protection and Prevention of the Veneto) based on a previous analysis of the state of the soil (WET/DRY) (ARPA Piemonte, 2004).

2. Exposure assessment:

aimed to identify, select and localize receptors (i.e. elements at risk) that could potentially be in contact with the pluvial floods hazard and exposed to losses in flooded zones.

3. Vulnerability assessment:

aimed to evaluate the degree to which the receptors could be affected by pluvial flood hazard based on site-specific territorial information (i.e. vulnerability factors).

4. Risk assessment:

integrates information about the pluvial flood hazard with the territorial exposure and vulnerability assessments in order to identify and ranking areas at risk of flooding for the selected future scenario.

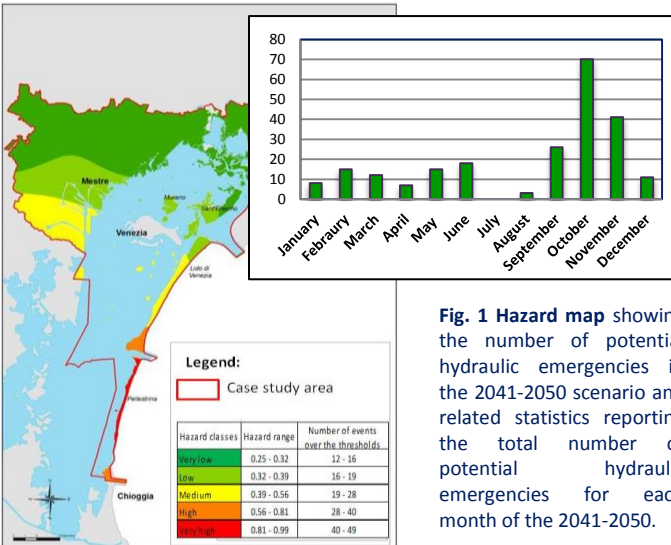
References:

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The products

How much climate change will affect the occurrence of hydraulic emergencies due to heavy precipitations?



Where are localized targets exposed to a potential pluvial flood event?

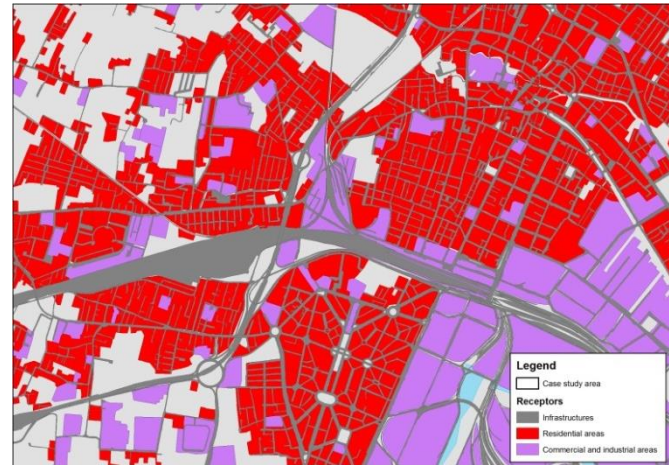


Fig. 2 Exposure map for the receptor commercial and industrial areas, residential areas and infrastructures.

Which environmental factors (e.g. land use, permeability, slope) contribute to increase the vulnerability to climate change?

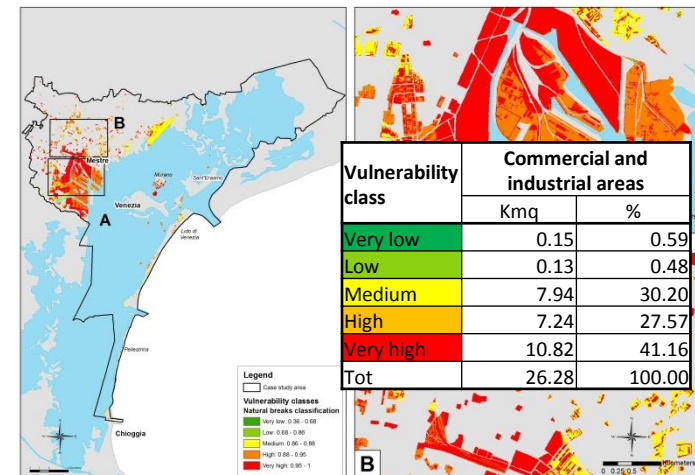


Fig. 3 Vulnerability map and related statistics showing the distribution of the percentage of surface associated with each vulnerability class for the receptor commercial and industrial areas.

Where are localized areas at higher risk of urban floods due to heavy rains?

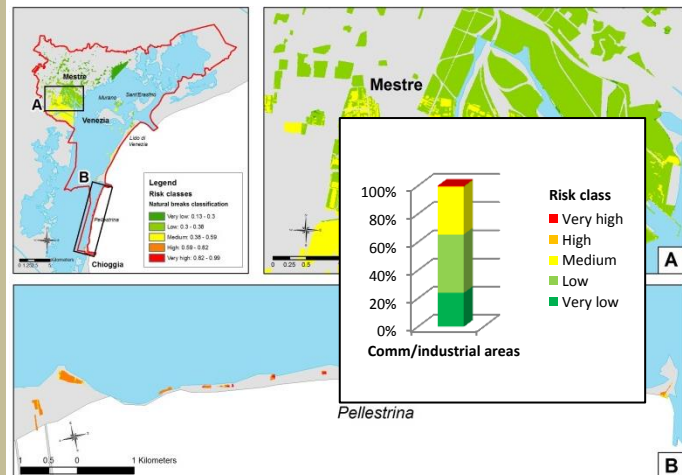


Fig. 4 Risk map and related statistics showing the distribution of the percentage of surface associated with each vulnerability class for the receptor commercial and industrial areas.

Making the product usable

The developed product should be considered as screening risk product useful as first-pass assessment of critical vulnerabilities associated to pluvial floods events. Cooperation with local stakeholders is required in order to improve this product with a more detailed analysis taking into account high resolution territorial data (i.e. existence and localization of urban drainage systems, presence of basement in buildings).

The product can also be applied to other receptors (i.e. people, cultural heritage, agricultural areas) according to specific stakeholders' request and easily be up-scaled to a broader regional/sub-national scale.

*Contact: silvia.torresan@cmcc.it

Further information: www.climrun.eu

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