

OASIS+

FUTURE DANUBE

SUPPORTED BY CLIMATE-KIC



BACKGROUND

Flooding in Europe is a peak peril that has the potential to cause losses of over €14 billion in a single event. Most major towns and cities are situated next to large rivers with large amounts of assets accumulated in flood prone areas. Flood defence structures promise protection against flooding for a design level usually equal to or below the 1 in a 100 years flood discharge. This limitation of protection by design and the possibility of failures in flood defence schemes pose a considerable risk to these assets and society. Triggered by the implementation of the EU Floods Directive and initiatives of the insurance industry, risk models and provision of loss data under current climate conditions have improved and became more widespread, but their availability is still limited in many areas in Europe and especially in Eastern European countries. **When looking at hazard and loss data for future climate projections, hardly any solid information is available.**

In response to this, the OASIS Future Danube Initiative has setup a large-scale flood risk model for the Danube River and its major tributaries considering today's and future climate conditions. The Danube is Europe's second-longest river, covering major parts of Central and Eastern Europe with a catchment area of 817 000 km². About 83 million people live in the catchment.

The accumulation of major events in Central Europe over the last decade serves as a reminder to many sectors affected, not only the insurance and reinsurance industry but also the public sector, companies considering investments and industries with vulnerable supply chains: hydrological extreme events (floods, droughts, inland floods, flash floods) are peak perils which may become more damaging and prevalent as climate patterns change. Thus, well founded adaptation planning is urgently required but currently reliable data and models are lacking which could facilitate investments from both public and private actors and enable robust cost-benefit analyses.

The Oasis+ consortium provides an open and transparent modelling suite to learn the risk of climate change on your business with the unique added value of using future, long-time climate projections and trans-boundary assessment with the option to customize for your application case or plug-n-play your model.

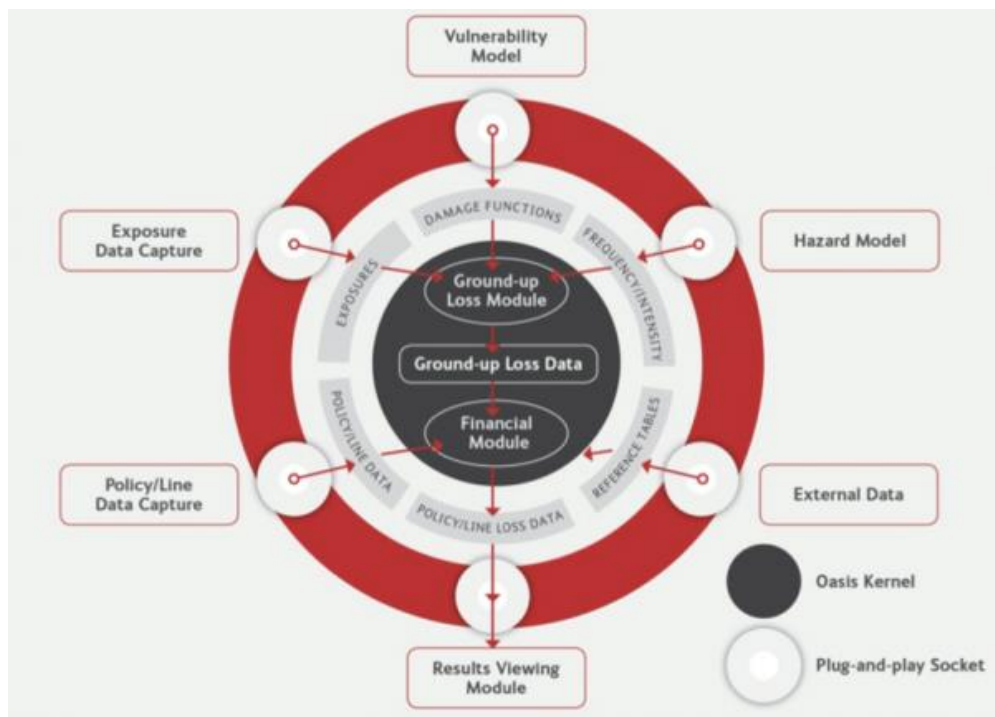
THE OASIS FLAGSHIP

The current generation of catastrophe models generally relies on stationary climate conditions and does not take into account climate change effects. Climate change is therefore challenging not only the business model of insurance and reinsurance companies but also particularly the public sector, citizens, companies and industries which all have a stake in longer term adaptation planning.

This led to the creation of Oasis+, a Pan-European consortium of reinsurance, insurance, catastrophe and climate modelling companies, academic and research institutions that have been working together since 2012 to improve societies understanding of catastrophe and climate risk. Growing from the insurance sector, the consortium is looking for other scopes of application too, hence several demonstrations have been launched. Future Danube is one of the demonstration activities. These demos have been investigating different application areas, focusing either on a geographical location (like in the case of Danube) or some specific fields (such as forest fires or adaptation planning for cities). With expanding the scope of applications, the initial program has grown to the Oasis Flagship.

As one major result of this collaboration, an open source software, the Oasis Loss Modelling Framework (Oasis LMF), has been developed that enables the plug and play of hazard, vulnerability, damage, exposure and financial models and can crunch data and models to provide ground-up loss data and financial damage of event scenarios. The framework provides an 'open source tool' for risk assessment calculations, which can accommodate most data and models thus enabling the direct comparison of modelled results, leading to increased accuracy in data and models used for risk assessment.

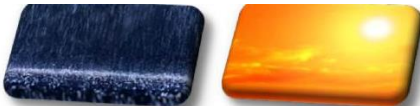




For more information please visit: www.oasislmf.org



In 2017, the Oasis Flagship will also be launching an open access, e-marketplace for models, tools and services to bring the modelling and associated community together with end-users, the Oasis Hub. The Oasis Hub acts as a gateway through which both free and commercial scientific data, models and tools can become focused and actionable, to meet the market demand for climate risk assessment and adaptation strategies. It has been developed to answer recognized needs for a central, open access, data hub that acts as a library and a window to global natural hazard data and models and enables the innovation of the data and models either free or through paid for licenses. Tools to manipulate the data for specific results will also be marketed through the Oasis Hub, as will a range of commercial services linked to assisting users to interpret the data in specific areas. In addition, we are also creating a crowd sourcing function to help end users or intermediaries source required data, tools or services or for academia and the modelling industry to offer novel data, tools or products for investment. A prelaunch version of the eMarket is available on www.oasishub.eu

FUTURE DANUBE

The main focus of the Future Danube is the development of a multi-hazard, multi-risk catastrophe and future climate change model for the whole Danube Basin. The current phase of funding covers the development of specialized models for the Hungarian part based on a modelling suite of different modules. The modules of the Future Danube model have been developed by the partners and are linked in such a way that output from one module can be used standalone (such as heavy precipitation from the weather module) or fed into subsequent modules, e.g. into the hydrology module, to simulate flooding, and from there into the risk module, to simulate hydraulic processes and losses. This way, stakeholders can estimate risks from multi-perils, but also feed output from the modules into their own simulation tools, if needed, or vice versa. The graphical interface is a user-friendly web GIS interface allowing for data analysis and extraction.

	Weather and climate module: Stochastic generation of weather extremes under current and future conditions (precipitation, heat waves)
	Hydrological module: Modelling of hydrological extremes (floods, inundation, droughts) and water management (reservoirs, hydropower)
	Risk module: Modelling of flood damages in selected locations, to be extended to larger areas and other sectors
	Adaptation module: Toolbox for adaptation to hydrological and weather extremes
	Visualization module: Graphical interface for visualization of hazards and risk and analysis of outputs

Details about the models used are available in separate document upon request.

The following unique and novel qualities of this modular system are created by innovating stochastic modelling techniques that can model future risks:

- consistent risk assessment in the area under current conditions and **impacts of future climate projections** on floods and other extreme hydrological events;
- **long-term continuous simulation approach using stochastic event sets** which improves robustness of return periods for risk assessment and takes spatio-temporal sequencing of storms, catchment state and interactions within the river-network explicitly into account;
- **spatially detailed consideration of return periods** instead of spatially uniform return periods;
- **process based model chain** which enables the analysis of changes to flood risk from climate change scenarios and flood mitigation measures acting on catchment characteristics, flood wave propagation or precaution;
- **flood risk directly derived from extreme value statistics of flood damage** yielding a more realistic representation of flood risk in contrast to using probability of discharge as a proxy for the probability of damage;
- consistent large-scale flood risk assessment and harmonised flood hazard and flood risk mapping which enables the **implementation of trans-boundary flood risk management plans** taking the solidarity principle effectively into consideration;
- potential **financial cost and damage results, and own model plug-n-play** through use of Oasis LMF.

This initiative, as part of the Oasis Flagship, aims to grow a knowledge economy using professional catastrophe models as an aid for decision-making. The outcomes of current activities will be used by Municipality of Budapest and its water and sewage utility companies to create a more resilient water supply and flash flood defence.

COOPERATION OFFER

Demonstrating this framework in a number of different contexts is now essential to increase confidence in the system. Hence, Oasis+ aims to provide municipalities, industry and the financial sector with models, tools and services to assist climate adaptation and disaster resilience planning, risk transfer and the accurate underwriting of risk through insurance and reinsurance sector. Using existing (re)insurance methodologies of assessing risk through detailed catastrophe and climate models, the consortium seeks to improve the availability of these tools to other sectors through increasing the access and transparency of models and their underlying assumptions by working towards a recognized standard for assessing this type of risk and the potential costs of damage associated with climate risks.

Until now the Future Danube project focused on the basins in Germany, Austria and Hungary but it aims to extend to other regions in the Danube basin on demand basis. The hydrological model setup already covers the entire basin.

We have identified 3 basic ways of cooperation, nevertheless, in case of interest we are open to realize joint actions in other ways too.

1. Application of the Oasis+ modelling suite to elaborate further case studies and perils such as droughts, heat waves and heavy precipitation. We are keen to work together with different sectors to investigate their recent and future climate vulnerability and adaptation options, including:
 - water authorities on climate impact of flood scenarios/projections to generate harmonised flood risk assessment on large-scale to support the elaboration of Flood Risk Management Plans on catchment level, enabling transboundary considerations and accounting for the solidarity principle (anchored in the EU Floods Directive), as well as help implementation of the EU Floods Directive with emphasis on future climate change impact;
 - climate risks assessment for industries with vulnerable supply chains, such as ones using agriculture based inputs;
 - energy sector to assess hydro energy and cooling water (for nuclear/thermal energy plants) scenarios/potentials under different future climate conditions;
 - regional/local municipalities/governments to develop evidence-based adaptation and resilience planning methods;
 - companies to create climate vulnerability assessment for large scale investments based on EU guidelines;
 - insurance and reinsurance sector to update and increase accuracy of insurance disaster risk assessment on state of the art and transparent hazard and loss models;
2. Oasis LMF offers plug-n-play interface option, thus depending on the quality, it may also be possible to test existing models that your organization have developed through the framework to check their comparability to our models and framework. This will have the impact of providing increased certainty around the potential of future extreme events in the Danube Region.
3. We are intending to license the model so that the model can grow and be maintained sustainably in the future through the market and end-user partners, and in doing so provide a tool for consultancies, local authorities and businesses.

We are seeking to build a larger partnership across the region with municipalities and businesses looking to develop their climate adaptation and disaster resilience strategies. We are looking for future partners beyond Hungary, including regions and municipalities at high risk and industries likely to be affected by increasing extreme events.

In case of interest for cooperation or for more information please visit the Oasis Danube website at <http://oasisdanube.eu/> and contact:

- Miklós Gyalai-Korpos, PANNON Pro Innovations Ltd., miklos.gyalai@ppis.hu
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- Tracy Irvine, Imperial College London, t.irvine@imperial.ac.uk

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- H2020 Insurance Project, starting Spring 2017.



Members of the Oasis+ consortium:



Oasis LMF has 44 global reinsurance and insurance members.