FORUM

Increasing Sustainability of European Forests: Modelling for Security Against Invasive Pests and Pathogens under Climate Change

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Since few decades, European forests have been under unprecedented threat from the combined forces of climate change and large increases in the numbers of alien invasive pests and pathogens resulting from changes in patterns of global trade. Interactions between climate change, including possible changes in both mean temperatures and precipitation, will have serious impacts on the susceptibility of forest ecosystems to damage caused by pests and pathogens, and a large number of novel, unprecedented forest health problems are likely to occur in the near future. These problems will lead to reductions in primary production, with consequent losses in yields, biodiversity and other multi-functional roles of forests.

In the scope of these topics, the European Project entitled "Increasing Sustainability of European Forests: Modelling for Security Against Invasive Pests and Pathogens under Climate Change" (ISEFOR) was launched in 2010 under the 7. Framework Programme, Research theme "Food, Agriculture and Fisheries, and Biotechnology". The project has been coordinated by Dr Stephen Woodward from the University Court of the University of Aberdeen (UK), with participation of 30 scientists from Europe, Asia and USA, all gathered in common goal to better understand new emerging threats of forest ecosystems. Five scientists form Forest Research Institute in Sękocin Stary (Poland), Dr Justyna Nowakowska, assoc. professor (coordinator), Dr Tomasz Oszako, assoc. professor, Dr Lidia Sukovata, assoc. professor, Dr Tomasz Jaworski, Katarzyna Sikora, M. Sc, Jolanta Bieniek and Danuta Garbień-Pieniążkiewicz (secretary) have been as well involved in project achievement, dealing with detection and molecular identification of invasive organisms present in Polish forest.

The ISEFOR project is based on 6 workpackages oriented to the following main issues: 1) identification of key groups of potentially invasive alien organisms, 2) development of accurate, state-of-the art diagnostic methods to detect and quantify both known and unknown threats, 3) depth analysis of the plant nursery trade, the major poorly controlled pathway for distribution of alien pests and pathogens, and 4) development of modelling software enabling the prediction of geographical areas at risk of attack by alien invasive pests and pathogens under climate change scenarios.

The main scientific objectives of the project are:

- Defining the types of threats likely to impact on European forest ecosystems, based on current knowledge of the pest and pathogen organisms known as potentially invasive, and the host genera attacked by these organisms;
- The development, in conjunction with other EU-funded projects on parallel themes (e.g. PRATIQUE; QBOL), of state-of-the-art molecular systems for the detection and diagnosis of potentially problematic organisms at ports of entry, and along pathways of dispersal;
- To critically analyse plant nursery trade, the probable major pathway for dispersal of alien pests and pathogens, the plant nursery trade, so that a quantified approach may be used to draw up generic pest risk assessments for this pathway, propose an ISPM for plants for planting, and determine if post-entry quarantine for commodities within this pathway

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provides an effective step for reducing risks linked to cryptic or dormant pest organisms;
– Using the data obtained in the work outlined above to develop modelling software allowing the accurate prediction of the spread and impacts of alien pathogens which may become invasive under climate change conditions.

Moreover, the project includes substantial dissemination plans for the transfer of knowledge and techniques developed to the end-user community. It is expected that in the short term, the work will provide the plant health surveillance community with highly valuable and relevant diagnostic tools, readily useful for both fundamental and applied aspects of these important alien threats. This project will provide significant information on the potential of known quarantine organisms to cause damage in European forest ecosystems under climate change scenarios, and hence give the quarantine authorities additional ammunition for tackling increasing risks and threats from alien pests and pathogens. In addition, we expect to identify further potentially invasive pests and pathogens threatening the functioning of European forest ecosystems.

The main outcomes of this project will be:
– Databases of the alien invasive pests and pathogens threatening European forest productivity, and an information set on the biology and epidemiology of these organisms,
– Improved abilities to detect and diagnose alien invasive pests and pathogens at points of entry, at strategic points along pathways of invasion and in affected trees, based on state-of-the-art molecular techniques,
– Standardized protocols of molecular detection including the protocol sampling, processing of sample, DNA extraction, RNA extraction, amplification, tagging of samples, multiplexing, DNA primer choice, bioinformatics, error prediction, chimeras, contamination, validation, databases to verify identification, morphological cross checking between laboratories, long-term data storage, formatting,
– Detailed information on the major pathway for regional, national and international spread of potentially invasive pests and pathogens,
– Modelling software enabling potential and likely spread and impacts of alien invasive pests and pathogens in European forests within different climatic zones to be estimated,
– Models to predict the potential effects of climate change on the invasive potentials and impacts of alien pests and pathogens,
– Production of risk maps for key potentially invasive pests and pathogens in European forests under various climate change scenarios.

Additional outcomes will include relevant publications and other dissemination of knowledge on the importance of, detection and diagnosis of alien invasive plant pathogens, and the potential of these organisms to cause damage in European forest ecosystems under climate change.

Summing up, the ISEFOR research project aims at identifying pathways for the introduction of new diseases and pest into the EU. The Commission is currently working on a legislative instrument addressing the issues of invasive species and pests, which is one of six key objectives of the new EU 2020 Biodiversity Strategy. It is expected that the first legal proposal will be published in 2013. The legislation aims to be coherent with the already existing EU plant and animal health regimes. Stricter rules on trading with plant material would help to increase the trust of forest owners in the quality of forest regeneration plant material, and with this support the maintenance and establishment of healthy, vital and productive forests.