ONE Planet

ENVIRONMENTAL RISK ASSESSMENT OF PESTICIDES: TRANSITIONING TO A SYSTEMS-BASED APPROACH

Summary

The use of regulated products (such as pesticides) is subject to an environmental risk assessment (ERA) and regulatory approval in most jurisdictions worldwide. While substantial progress has been made in achieving environmental protection with single product-based assessments, such assessments are perceived to have fallen out of step with the latest scientific knowledge. Further advancing the ERA of regulated products will contribute to supporting the UN Sustainable Development Goals and EU Green Deal ambitions to safeguard the environment (including biodiversity and ecosystems). In this thematic session, we will explore: (1) the scientific merits and shortcomings of the current ERA paradigm; (2) changes needed to advance the ERA of pesticides; (3) opportunities and challenges associated with the transition to/implementation of a more integrated ERA framework for pesticides; and (4) policy implications. Through the formulation of recommendations, the session will provide feedback to EFSA, other EU agencies, EU Member States and international partners on current challenges and future development opportunities for the transition towards a systems-based approach for the ERA of pesticides.

Vision

New scientific approaches, tools and data – along with new ways of engagement, cooperation and collaboration among relevant stakeholders – are needed to address complex environmental challenges that impact on human well-being and ecological health. Future environmental risk assessments (ERAs) of regulated products such as pesticides will require the use of a more inclusive and integrated (systems-based) approach to account for relevant scientific developments, risk assessment challenges, new policy targets and societal demands for a cleaner, greener future and more sustainable food systems. Changes needed to facilitate the transition to/implementation of more inclusive and integrated ERAs will be explored at various levels (covering science, regulatory science, policy and society), together with opportunities and challenges.

Background – Challenges and opportunities

Europe is pursuing its ambition for: (1) improved protection of the EU's biodiversity and resilience of its ecosystems; (2) a toxic-free environment; and (3) a more sustainable future. The European Commission's Green Deal provides an important step in this direction. Reducing the use and risk of pesticides, and reversing the

decline of biodiversity are two of the various urgent "calls-to-action" embedded, respectively, in the Green Deal's Farm to Fork and Biodiversity Strategies. In line with the Green Deal, the Chemicals Strategy strives for a toxic-free environment, where chemicals are produced and used in a way that maximises their contribution to society, while avoiding harm to the planet and current and future generations. Further advancing the ERA of regulated products (such as pesticides) will contribute to supporting the European Commission's mission to safeguard the environment (including biodiversity and ecosystems).

In line with sectoral legal requirements, the ERA of regulated products is typically performed on a single substance or product basis, for a specific type of use. While the EU has made substantial progress in achieving environmental protection within the existing ERA paradigm, the adequacy of current ERA frameworks of single substances or products are increasingly challenged by the scientific community and society. Such frameworks are perceived to have fallen out of step with the latest scientific knowledge. Moreover, they are not always aligned with current policy targets and societal demands that call for a cleaner, greener future and more sustainable food systems.

New scientific approaches, tools and data – along with new ways of engagement, cooperation and collaboration among relevant stakeholders – are needed to achieve sustainable solutions to protect the environment. Addressing new and complex environmental challenges requires transdisciplinary and systems-based approaches that: (1) formulate ERA issues/problems and associated protection goals holistically; (2) address cumulative effects due to exposure to multiple regulated substances or products in combination with other environmental stressors; (3) connect prospective and retrospective ERAs via monitoring and surveillance; (4) analyse upstream and downstream life-cycle implications; (5) evaluate a range of alternative solutions; (6) involve cooperation with a broad range of stakeholders; and (7) use interdisciplinary scientific approaches.

Scope and objectives

The accelerating and unprecedented loss of biodiversity globally has prompted concern about the adequacy of current ERA frameworks for regulated products to achieve the desired level of environmental protection. Building on the growing body of scientific evidence and in the light of new policy targets and societal demands, the thematic session will address key issues pertaining to the adequacy of the current ERA paradigm. Subsequently, the session will explore the necessary changes to further advance the ERA of pesticides. Special emphasis will be given to the use of a systems-based approach.

The main objectives of the thematic session are to:
- Present the scientific merits and shortcomings associated with the current ERA paradigm, and drivers for a paradigm shift;

- Explore the necessary changes required for advancing the ERA of pesticides;
- Discuss opportunities and challenges associated with the use of a systems-based approach for the ERA of pesticides at various levels (covering science, regulatory science, policy and society);
- Formulate recommendations facilitating the transition towards and regulatory uptake of a systems-based approach for the ERA of pesticides.

People behind the session

Session Coordinator: Yann Devos (EFSA)

Chairpersons: Vanessa Mazerolles, French Agency for food, environmental and occupationnal health and safety (ANSES); Silvia Pieper, German Environment Agency (Umweltbundesamt, UBA)

Moderators: Frédéric Simon, Euractiv

Rapporteurs: Domenica Auteri, European Food Safety Authority (EFSA); Lorenzo Benini, European Environment Agency (EEA); Yann Devos, European Food Safety Authority (EFSA); Agnès Rortais, European Food Safety Authority (EFSA)

ONE Planet – Session affiliate profiles

ENVIRONMENTAL RISK ASSESSMENT OF PESTICIDES: TRANSITIONING TO A SYSTEMS-BASED APPROACH

Domenica Auteri, European Food Safety Authority (EFSA)
Rapporteur

Domenica Auteri is graduated in biology with a post-graduate degree in (eco)toxicology. She has been working in the field of environmental risk assessment of pesticides for more than 25 years, particularly within the European legislative framework related to the approval of pesticides. She joined the European Food Safety Authority (EFSA) in 2008 as ecotoxicologist. Before joining EFSA, she used to work at International Centre for Pesticide and Health Risk Prevention (ICPS), an Italian public health institute, where she was involved in research and analysis related to the prospective risk assessment of pesticides as well as on project associated to the management of the use of pesticides such as, for example, the implementation of risk mitigation measures, the prioritisation of substance for monitoring purposes. In EFSA, she is currently working in the Pesticide Peer Review Unit and, since 2011, she has been leading the team responsible for the evaluation of the risk to non-target organisms and for the development of guidance documents. Among her team's activities, it is worth to mention the review of the risk assessment for bees of three neonicotinoid active substances, the development of the joint ECHA-EFSA guidance document to identify endocrine disruptors, the ongoing revision of guidance document for risk assessment of Birds and Mammals and of the guidance document for Bees.

Agnès Rortais, European Food Safety Authority (EFSA)
Rapporteur

Agnès joined the European Food Safety Authority (EFSA) as a senior scientific officer in the Methodology & Scientific Support Unit (MESE) and Preparedness Team in 2008. She is an ecologist (PhD from JCU in Australia) by training and before joining EFSA, she worked 7 years as a postdoc at the National Centre of Scientific Research

(CNRS, France) on various projects related to bee ecology. At EFSA, she develops methodologies and tools on holistic and systems-based environmental risk assessment. The current focus of this work is on insect pollinators and non-target arthropods. She coordinates EFSA's large project MUST-B on the development of a holistic approach to the environmental risk assessment of multiple stressors in honey bee colonies. This includes the development of an agent-based model called ApisRAM outsourced by EFSA and developed by Aarhus University (Denmark) for predictive and post-authorisation risk assessment of pesticides. It also involves stakeholders' engagement with the establishment of the EU Bee Partnership (EUBP) and a platform to promote harmonised data collection and sharing on insect pollinators in Europe. The platform is outsourced by EFSA and developed by BeeLife, a member of the EUBP.

Yann Devos, European Food Safety Authority (EFSA)
Rapporteur

Yann Devos is a senior scientific officer and lead scientist operating in the Chief Scientist Office of the European Food Safety Authority (EFSA; Italy) where he is involved in co-shaping new approaches for the environmental risk assessment of regulated products and the development of risk assessment guidelines. He coordinated the scientific program development of the ONE - Health, Environment & Society Conference. He is employed by EFSA since 2008, and previously worked at the Biosafety and Biotechnology Division of the Scientific Institute of Public Health (now Sciensano; Belgium). Through his professional career, Yann has gathered extensive experience in the environmental risk assessment of genetically modified organisms (GMOs). He authors peer-reviewed articles and reviews in the field of GMO biosafety. Yann has a MSc in Biology (ecology) and supplementary degree in Environmental Sciences from the University of Antwerp, and a PhD in Applied Biological Sciences from the Ghent University. In his spare time, Yann enjoys spending time with his family.

Karin Nienstedt, European Commission
Panellist

Dr. Karin M. Nienstedt leads the Sector Pesticides - Placing on the Market in the Unit Pesticides and Biocides, European Commission (Directorate General for Health and Food Safety, Unit Pesticides and Biocides). Before joining the European Commission, she worked for the European Food Safety Authority and as a researcher in the areas crop protection, ecotoxicology, and biological control.

Anne Alix, Corteva Agriscience

Panellist

Anne Alix worked in the area of plant protection products risk assessment for 22 years. She earned a PhD in Integrated Pest Management at the University of Rennes, and joined the French National Institute on Research in Agronomy (INRA) as an ecotoxicologist in the scientific unit for the risk assessment of crop protection products. Anne then joined the French Agency on the safety of Food (AFSSA, now ANSES), where she was nominated head of the Environment and Ecotoxicology risk assessment unit. At AFSSA she initiated regular scientific collaborations with the pesticide unit of EFSA. Anne then joined the French Ministry of Agriculture as the deputy head of the Section for Regulation of Plant Protection Products and fertilizers, in charge of the implementation of risk mitigation measures for pesticides and of post registration monitoring. Anne joined Dow AgroSciences, now Corteva Agriscience, in 2011, and is Regulatory Affairs and Risk Management Leader for Europe, Middle East and Africa.

Jeroen P. Van Der Sluijs, University of Bergen
Speaker

Jeroen P. van der Sluijs is professor at the Centre for the Study of the Sciences and the Humanities at the University of Bergen, Norway. His work focusses on the process of co-creation of actionable knowledge that inform societal responses to pressing issues such as the climate crisis and the biodiversity crisis. Originally trained as a natural scientist (MSc in chemistry with major in theoretical ecology form Leiden University 1990, and PhD on uncertainty in climate risk assessment form Utrecht University, 1997) he developed a research interest in actionable knowledge for risk governance in a context of scientific uncertainty and controversy. Over the past 15 years he has been studying amongst other the emerging science-policy interface around pollinator decline, insect decline and insect conservation, as well as risk assessment and risk governance of neonicotinoid insecticides. He leads the case-study on bees and pesticides of the European H2020 project "REconciling sCience, Innovation and Precaution through the Engagement of Stakeholders (RECIPES)". He (co-)authored more than 100 peer reviewed publications and is in the top 2% of the most cited scientists in the world (Stanford list). He ranked regularly high in "The Sustainable 100", a list of the most influential Netherlands persons contributing to sustainable development, by daily newspaper Trouw.

Title of talk: Broadening the scope of future ERAs of pesticides: lessons from the neonicotinoids case

Abstract of talk

For the last 65 years we have been on a pesticide merry-go-round: successive generations of pesticides are released and subsequently banned a decade or two later once the environmental harm they cause becomes evident. While pesticides are typically replaced by new ones, this new generation of chemicals often raises new and unanticipated risk concerns. Risks that in retrospect required precautionary action have been systematically overlooked as a result of blind spots in overly reductionist risk assessment protocols. Knowledge about risks that do not fit into such protocols (e.g. academic scientific studies in the peer-reviewed literature and knowledge regarding end-points not covered by the protocols) is often downplayed, marginalised or ignored. Too often, coalitions of concerned scientists and societal actors have needed to step in and 'break the script' of routinised assessment and management processes in order to recognise key uncertainties and the potential for serious harm to human, animal and environmental health. Based on the results of the EU-funded project 'REconciling sCience, Innovation and Precaution through the Engagement of Stakeholders' (RECIPES), we can learn important lessons for the necessary reforms of environmental risk assessment frameworks and beyond. The case of the re-evaluation of neonicotinoids in the EU is illustrative of how different bodies of knowledge were taken into account, enabling the implementation of precautionary measures. It shows the need for a reform of the regulatory system, so that it becomes more agile and responsive and allows externally-produced knowledge to influence and modify routinised assessment processes. Explicit and transparent problem scoping in risk assessment is essential to address the right questions, to avoid overlooking relevant aspects and dimensions of the issue and to define problem boundaries in the assessment of uncertain risks as widely as possible to include the concerns of those affected by risks and risk regulation. A further lesson from ongoing debates on Europe's pesticide regulation and risks to bees is that the precautionary principle can be undermined if it is replaced by a limited set of overly specific protection goals. A broader knowledge base that includes knowledge from 'non-standardised' studies and involves non-standard knowledge holders in a more open and holistic way (less restricted by pre-defined end-points) is strongly recommended in risk assessment.

Martin Dermine, Pesticide Action Network (PAN) Europe
Panellist

Martin Dermine is a veterinarian and holds a Ph.D in pathology. He is also is a consultant in beekeeping.
Martin joined PAN Europe in 2012. During 5 years, Martin acted as honey-bee project coordinator, campaigning to obtain a ban on neonicotinoids in the EU and gained expertise in pollinators (bee guidance document, bee-toxic pesticides). Since 2017 Martin has acted as a Health and Environmental Policy Officer (with a profound knowledge on European pesticide policies) as well as a representative of the NGO

stakeholders in the EFSA stakeholder bureau. Since 2021, Martin ensures the coordination of PAN Europe.

Martin has scientific expertise in apidology, ecotoxicology, epidemiology and beekeeping management practices. With his multilingual skills (French, Spanish, English, and Dutch), Martin enjoys connecting science and people and outreach campaigns. Last but not least, Martin has an experience in coordinating actions/projects and loves participating in scientific meetings and discussing with politicians.

Sandrine Charles, University Claude Bernard Lyon 1
Speaker

Professor Sandrine CHARLES, PhD, leads the team "Predictive Modelling and Ecotoxicology" within the laboratory of Biometry and Evolutionary Biology at the University Lyon 1. Her research activities lie within the scope of quantitative risk assessment in ecotoxicology through the development of mathematical and statistical methods aiming at identifying potentially hazardous substances, at defining concentration thresholds acceptable at the different levels of biological organisation, at drawing up indices of environmental quality, and also at characterising causal links between toxicity and ecological impact. Ecotoxicology comes up today against theoretical and methodological barriers linked to changes in temporal, spatial and demographic observation scales (in vitro, in natura, closed, open, individual population ecosystem). Through an approach that is interdisciplinary, integrative, and associated to the development of predictive mathematical and statistical models, Sandrine Charles's research activities thus attempt to answer the key question of up-scaling, that is, of the link between the scale at which effects are observed and the scale of the levels of biological organisation to protect (individual, population, community, ecosystem).

Title of talk: NAMs and models in ecotoxicology and their usefulness for regulatory ERA

Abstract of talk
The use of new approach methodologies (NAMs) in human and environmental health assessments shows great promise for us being able to rely more on in vitro and in silico data, and less on data derived from in vivo animal testing. Model-based NAMs are key in being able to better describe, understand and more realistically predict what happens to non-target organisms (NTO) when they are exposed to multiple chemicals and environmental stressors (such as global warming, pathogens). NTO exposure to multiple chemicals and environmental stressors is likely to impair life-history traits, with subsequent impacts on population dynamics

and ecological interactions within communities (this means having to account for direct effects on each interacting species and indirect effects on inter-species relationships). A recent EFSA scientific opinion recommends the increased use of modelling, especially toxicokinetic-toxicodynamic (TKTD) models in the environmental risk assessment (ERA) of pesticides. Accounting for time-variable exposure profiles, TKTD models help to refine the regulatory assessment of potential adverse effects of pesticides on aquatic organisms. TKTD models are in fact species- and compound-specific and enable us to predict (sub)lethal effects of pesticides efficiently, even under non-previously tested exposure conditions (such as environmentally-realistic scenarios of agricultural practices). To promote endorsement of such models and their regulatory uptake, an easily and freely accessible integrative TKTD workflow must be established globally, while all the necessary decision criteria underlying such models should be provided and reported in a sufficiently clear, transparent and statistically sound manner, in line with regulatory ERA requirements. This integrative TKTD workflow must address: (1) calibration of TKTD models fitted to standard experimental data; (2) model validation using external data collected under refined experimental conditions; and (3) prediction of 'margins of safety' of acceptable effects under newly intended exposure profiles. As such, TKTD models will undoubtedly ease the transition towards a Next Generation ERA (NGERA) and a definition of operational objectives for adapting current protocols to our future needs. This talk will showcase the online MOSAIC tool that offers all relevant ERA services within a turnkey all-in-one web platform. The tool provides, for example, easy calculations of bioaccumulation metrics and facilitates the fulfilment of the EFSA workflow on TKTD models.

Violette Geissen, Wageningen University and Research (WUR)
Speaker

She is a specialist in the physicochemical degradation of soils, focussing on mechanisms of soil degradation by (organic) pollutants from different sources and on land management strategies. From 1988 to 1992, she studied soil science and soil ecology at the University of Bonn, Germany, also completing her PhD. Prior to this she gained Masters diplomas from the Universities of Giessen and Göttingen. She has published more than 120 academic publications, achieving an H factor of more than 30 in terms of productivity and citation impact. She has also been involved in the coordination of large-scale Horizon 2020 projects including SPRINT (sprint-h2020.eu) and MINAGRIS (minagris.eu). From 2014 until 2016, she worked as Professor for Soil Degradation and Land Management in the Soil Physics and Land Management (SLM) department at Wageningen University. From 2009 to 2014, she served as Senior Scientist at Wageningen Research Institute. Prior to this, she worked from 2002 to 2008 as Professor for Soil Science at ECOSUR, Mexico, and

from 1993 to 2001 as a postdoctoral researcher at the Institute for Soil Science at the University of Bonn.

Title of talk: SPRINT (Sustainable Plant Protection Transition): a global health approach

Abstract of talk

SPRINT is a horizon 2020 funded project that stared in 2020 for a period of 5 years. Here, we present the concept and first results.

The overall aim of SPRINT is to develop, test, validate and deliver a Global Health Risk Assessment Toolbox for the integrated assessment of the impacts of (mixtures) of pesticide (residues) on terrestrial and aquatic ecosystems, plant, animal and human health. Three main attributes for the health status are examined: resilience, reproduction/productivity and manifestation of diseases, while transition pathways towards sustainable use of PPPs are identified in a multi-actor approach. The prime output of SPRINT will be a Global Health Risk Assessment Toolbox that combines fate and exposure of PPPs with health risk assessments. The Toolbox will be made available online through the IPCHEM platform for use by EFSA and other interested stakeholders.

In 2021, we assessed pesticide residue concentrations in 11 case study sites across Europe and Argentina from all ecosystem compartments, animals and humans and related health state covering integrated (I) and organic (O) farming systems.

Based on the outcomes of this assessment we select the most important pesticide residues and test their combined effects on ecosystem, animal and human health. Therefore we develop and validate targeted laboratory analysis test strategies for the integrated effects of PPP residue mixtures on ecosystem, animal and human health, which can be used for pre-market evaluation of new PPP compounds, and assess effects of those already present in the environment.

The results of these tests will be used as input data for the Global Health Risk Assessment Toolbox for risk and impact assessment of pesticide residue mixtures linking exposure to residue mixtures to direct and indirect health impacts, considering a range of endpoints, and use the Toolbox for risk and impact assessments at both, case study site and European level for I-O farming system.

Martin Hojsík, European Parliament
Panellist

Martin Hojsik has been actively involved in nature and animal protection for over 25 years. Since 2019, he serves as a Member of the European Parliament (MEP) for Slovakia in the Renew Europe Group, working to avert the climate threat, protect environment, biodiversity and animals, with a specific focus on pollinators.

Furthermore, he strives to regulate dangerous chemicals, including pesticides, and promote safe and wholesome food. and is involved in the . He is the European Parliament´s official contact point for the European Chemicals Agency (ECHA). He is an active MEP in three committees - ENVI (environment, public health and food safety), ITRE (industry, research and energy), BUDG (budget). In the ENVI committee, he is among others involved in the discussion over upcoming Soil Health Law, sustainable use of pesticides, risk assessment of chemicals vis-à -vis pollinators and access to justice in environmental matters. In the past, he served as a Program Director of the animal protection organization Four Paws, working in global corporate and public policy campaigns for Action Aid, Greenpeace International and communication campaigns for Greenpeace national offices. He studied genetics at the Comenius University in Bratislava.

Annette Aldrich, Federal Office for the Environment (FOEN)
Speaker and Panellist

Dr. Annette Aldrich is currently a member of the Biocides and Plant Protection Products Section at Switzerland's Federal Office for the Environment (FOEN), where she works as an ecotoxicological risk assessor for the authorization of plant protection products. Previously, she served as the deputy leader of the group ecotoxicology at Agroscope, the Swiss Federal Centre of Excellence for Agricultural Research. With twenty years of experience in the regulatory science of prospective environmental risk assessment (ERA), Annette has collaborated with EFSA since 2015 by participating in the working groups on amphibians and reptiles and on transition metals. Since 2018 she is a member of the EFSA Panel on Plant Protection Products and their Residues (PPR). In recent years, her focus has been the development of new approach methodologies that address gaps and advance the current ERA. Her collaboration with the European Partnership for ERA (PERA) and European Partnership for the Assessment of Risks from Chemicals (PARC) have played a major role in this respect. She is also part of the core group of the COST Action PERIAMAR to propose innovative strategies for implementing ERA schemes for amphibians and reptiles. In Switzerland, Annette has contributed to the development of the scientific framework for risk mitigation measures, especially for terrestrial amphibian stages in agricultural landscapes and she liaises with the retrospective risk assessment of surface water monitoring.

Title of talk: Why is there a need for a paradigm shift in the ERA of pesticides?

Abstract of talk
A paradigm shift is a major change in a process, implying that the current approach is no longer applicable. Why is this the case for ecological risk assessments (ERAs) of pesticides?

Organiser   **Co-organisers**

In the current dual EU approval process, active substances demonstrating safe use are approved at EU-level. Subsequently, products are authorised for single use (one crop and one pest) at Member-State-level, where mitigation measures can be implemented for individual exposure paths or groups of non-target organisms. Historically, the system has developed from a hazard assessment based on a few vertebrate species to a risk assessment based on a set of surrogate species including invertebrates. However, it still has a long way to go to be able to assess the impact on biodiversity and the ecosystem as required under Regulation (EC) No 1107/2009.

In light of new scientific knowledge, the ERA framework has been improved over the years by EFSA. While the current framework provides ERAs based on sound scientific principles, it has become an increasingly complex and resource-demanding process. Moreover, such ERAs are perceived as not fully achieving the required level of protection. This is due to the unprecedented multicausal biodiversity loss, which has contributed to a dwindling public trust in the regulation of pesticides. Due to increasing complexity, an optimisation of the current ERA framework can no longer be achieved by simply amending the current system. A new paradigm is needed. Today, we have a significant amount of data collected from ERAs and monitoring studies. We also have an advanced understanding of ecological processes and the technological capacities to simulate such processes. We must address the fact that organisms in an agricultural landscape are stressed by multiple pesticides and other stressors simultaneously. We can use this knowledge and new technologies to create a new ERA system. Numerous frameworks and strategies address the same environment, such as the Water Framework Directive (WFD) or Sustainable Use (SUR), without much alignment between them but offering possibilities to reduce or compensate the adverse effects of pesticide use. This situation calls for a systems-based and holistically-framed approach, where interdependencies between species and stressors, as well as interactions between regulations, can be addressed. The ERA needs to have an ecological perspective considering the context of both the ecological and the production system, and it needs to be aligned with high-level EU strategies to fully achieve its purpose.

Stephanie Bopp, Joint Research Centre (JRC)
Speaker

Stephanie Bopp is a scientific project leader at the European Commission Joint Research Centre (JRC) in Ispra (Italy). She works in the Chemical Safety and Alternative Methods Unit, which develops, evaluates, harmonises and promotes innovative methods for the regulatory safety assessment of chemicals used in a variety of sectors, with the additional aim of protecting animals used for scientific purposes. Stephanie is leading the activities related to combined exposures to multiple chemicals and related to the Information Platform for Chemical Monitoring

(IPCHEM). Furthermore, she is interested in the interface between food safety and sustainability, e.g. in relation to the sustainable use of pesticides. Before, she worked in the European Food Safety Authority (EFSA) on pesticide environmental risk assessment, at the JRC in the area of environmental toxicogenomics, and at the University of Basel on biological monitoring, ecotoxicology and passive sampling. She has degrees in Geoecology/Environmental Sciences (University of Bayreuth) and a PhD in Environmental Toxicology and Chemistry (Helmholtz Centre for Environmental Research UFZ/University of Rostock).

Title of talk: Tools and monitoring/surveillance data to assess the impact of multiple pesticides

Abstract of talk

Multiple pesticides are typically applied at different points in time in agricultural landscapes. Environmental risks resulting from pesticide use are assessed during the pesticide approval process. Such assessments are based on predicted environmental concentrations. A way to advance the assessment of impacts of multiple pesticide uses on the environment is to look retrospectively into exposure and effects through monitoring/surveillance. A wide range of occurrence data of chemicals for various media in Europe and beyond are made available in the Information Platform for Chemical Monitoring (IPCHEM; https://ipchem.jrc.ec.europa.eu/), run by the European Commission in collaboration with EU Agencies and many other partners, data providers and data users. IPCHEM hosts monitoring data for environmental media (water, soil, air, biota), chemical occurrences in food and feed, indoor air and humans. It currently comprises more than 450 million concentration measurements covering more than 3000 substances, including many pesticide active substances. Such data could help to refine exposure estimates and account for exposure to multiple chemical pesticides in future risk assessments. The Land Use/Cover Area frame statistical Survey Soil (LUCAS Soil; https://esdac.jrc.ec.europa.eu/projects/lucas) is an ongoing large EU monitoring campaign performed in 3-4 year intervals. Since 2018, it includes the analysis of a wide range of pesticides across a large set of soil samples collected from all over Europe. Exposure and toxicity data can then be combined to calculate risks of single or multiple pesticides to soil (micro)organisms at EU-wide level. Relationships with other stressors and impacts can also be explored, as e.g. genetic biodiversity is measured in a subset of the soil samples. Monitoring data also enable verification of exposure models for pesticides. A recent modelling exercise conducted by the JRC estimated use quantities of virtually all active substances presently authorised in the EU market. Based on the estimates and using a spatially explicit, GIS-based model, predicted environmental concentrations could be computed in EU soils and rivers. Concentrations can be combined to further compute indicators of the potential cumulative toxic effects, such as sums of toxic units. The comparison of computed

and measured concentrations as available from the monitoring data increases our understanding of the fate and transport of pesticides at the continental scale.

Vanessa Mazerolles, French Agency for food, environmental and occupationnal health and safety (ANSES)
Chair/Co-chair

Vanessa Mazerolles is the head of the Ecotoxicology and Environmental Fate Unit for fertilisers and plant protection products in the Regulated Products Directorate at ANSES (French Agency for food, environmental and occupational health and safety). She is a senior regulatory risk assessor in ecotoxicology with 18 year experience in risk assessment of pesticides and fertilisers.
She has been involved in method development for risk assessment in ecotoxicology, particularly related to risk assessment for birds and mammals. She participated in projects related to EFSA data call, e.g. "Data collection for the estimation of ecological data (specific focal species, time spent in treated areas collecting food, composition of diet), residue level and residue decline on food items to be used in the risk assessment for birds and mammals" published in 2018. Vanessa participated regularly in Pesticides Peer Review Expert Meetings in ecotoxicology since 2006 as expert from EU member state, and as chair since 2021.

Silvia Pieper, German Environment Agency (Umweltbundesamt, UBA)
Chair/Co-chair

Silvia Pieper leads jointly with a colleague the section Ecotoxicology and Environmental Risk Assessment of Pesticides at the German Environment Agency. She is a biologist and ecotoxicologist with a focus on terrestrial ecosystems. Silvia Pieper has been involved with EFSA since 2011 and is currently member and vice-chair of the EFSA Panel on Plant Protection Products and their Residues (PPR). She has contributed to the development of the risk assessment approaches regarding non-target terrestrial organisms when exposed to pesticides. Silvia has a particular interest in exploring the impact of chemicals on biodiversity and the consequences of biodiversity loss for ecosystems. Her recent work has focused on the needs for a systems perspective in environmental risk assessment approaches, linking prospective assessment of regulated chemicals with environmental monitoring. Silvia is part of the group developing the Roadmap for next-generation, system based Environmental Risk Assessment (PERA).

Christopher John Topping, Aarhus Universitiy
Speaker

Chris Topping is a Full Professor of Ecological Modelling at the Department of Bioscience at Aarhus University, and leader of the Social-Ecological Systems Simulation Centre (SESS). Trained as an agricultural zoologist and obtaining a PhD in Ecology from the University of Newcastle upon Tyne, UK, he has been working in Denmark for 25 years. He is the originator and coordinator of ALMaSS, a landscape-scale simulation system. ALMaSS operates in 11 European countries and provides detailed simulations of landscapes, farming, agent- and subpopulation-based modelling of animals, and pesticide impacts. He is the developer of the forthcoming EFSA honey bee model â€˜ApisRAM' as well as other models covering non-target organisms from insects to mammals and people. Research is focused on modelling methodology, the integration of social science and processes into ecological simulation, and understanding complex systems with a view to support management and policy.He has been working with EFSA on working groups for 15 years and is currently vice-chair of EFSA's Pesticide Products and Residues Panel. Editor in Chief of the new Food and Ecological Systems Model Journal.

Title of talk: Simulation to support systems-based ERA: capabilities and possibilities

Abstract of talk

When we start to think of simulation to support systems-based ERA, we take a significant step from simple general models to models that realistically represent systems to understand the impacts of stressors more deeply. This change expands focus from measures of exposure and toxicity to a much wider representation of the ecological systems. It also brings new technologies in regulatory risk assessment to the fore. These new technologies are related to the use of powerful computing systems and computing algorithms, in particular artificial intelligence. This broader scope requires a much broader data feed than previously required, and a broader understanding of the system as a holistic whole, rather than broken down into disconnected silos. The benefit of this is that we can then take decisions considering the environmental, ecological and perhaps social contexts in which the regulated stressors are used in. Considering this view, what can systems simulation do to support this now, and what is needed or even already on the way for the future? I focus on the new technical, hardware and policy aspects. Unlike general models, these simulations are not created from abstract representations, but are developed from detailed mechanistic interactions. For example, in the honey bee model, an adult worker bee can select from 13 different behaviours depending on its current context. This type of individual behaviour operates in a detailed landscape, where farmers carry out realistic activities on their fields daily, where vegetation grows and provides bee resources (where applicable), and the fate of realistically applied pesticides can be tracked at a 1-m resolution. Future advances include fully interconnected systems and services. These include carbon sequestration/emissions related to landscape and management conditions,

economics implemented in the farm management, and complex species interactions such as modelling pests dynamically with multiple predators. This will be supported by powerful new AI approaches to the development and testing of these models, and relies on the availability of HPC facilities, which are in focus in policy. A further key point here is that we simulate real areas of landscape. When all the key metrics are included, this means that pesticide regulation is only one of the policies that can be tested; the interactions with other policies such as CAP subsidy, Water Framework Directive, Habitat Directive and Sustainability Directive can all be considered simultaneously.

Frédéric Simon, Euractiv
Euractiv

Frédéric Simon is editor at [EURACTIV](#), the leading online media specialised in EU affairs. Frédéric joined EURACTIV in 2003 as a reporter and has since covered every aspect of EU policy, ranging from telecoms to economic and financial affairs, agriculture, transport, energy and climate legislation.
Frédéric joined the company's management in 2008 as managing editor, then as publisher overseeing editorial teams in Brussels, Paris, and Berlin as well as the company's IT department. Since 2017, he has returned to journalism, leading EURACTIV's coverage on energy and environment.
For ten years, Frédéric was also Brussels correspondent for France24, the 24/7 international TV channel. Mr Simon graduated in journalism from Brussels University (ULB) in 1998 and holds a Master's degree in EU politics from the Institut d'Etudes Européennes (IEE) in Brussels.

- Since 2003: EURACTIV.com
- 2008-2018: Brussels correspondent, France24
- 2002: Master's degree, Institute of European Studies (IEE), Brussels
- 1998: Degree in journalism and communication from the Université Libre de Bruxelles (ULB)

Lorenzo Benini, European Environment Agency (EEA)
Rapporteur

Lorenzo Benini is an environmental scientist holding a Ph.D. in management and protection of natural resources obtained at the University of Bologna, with a dissertation on sustainability indicators, environmental management and decision making. He has carried out research in academia in the area of agriculture, land use and water management scenarios as well as on methods and tools for assessing sustainability and supporting decision making. He joined the Joint Research Centre

of the European Commission between 2012 and 2016 where he worked on life cycle assessment methods and models for impact assessment, with application to systems of production and consumption at the EU scale. Since 2016 he is in force at the European Environment Agency where he works as an expert in systems and sustainability assessments. He has authored several technical and scientific reports, policy briefings and scientific articles, including chapters of the EEA flagship product 'The European Environment, State and Outlook report' 2020.