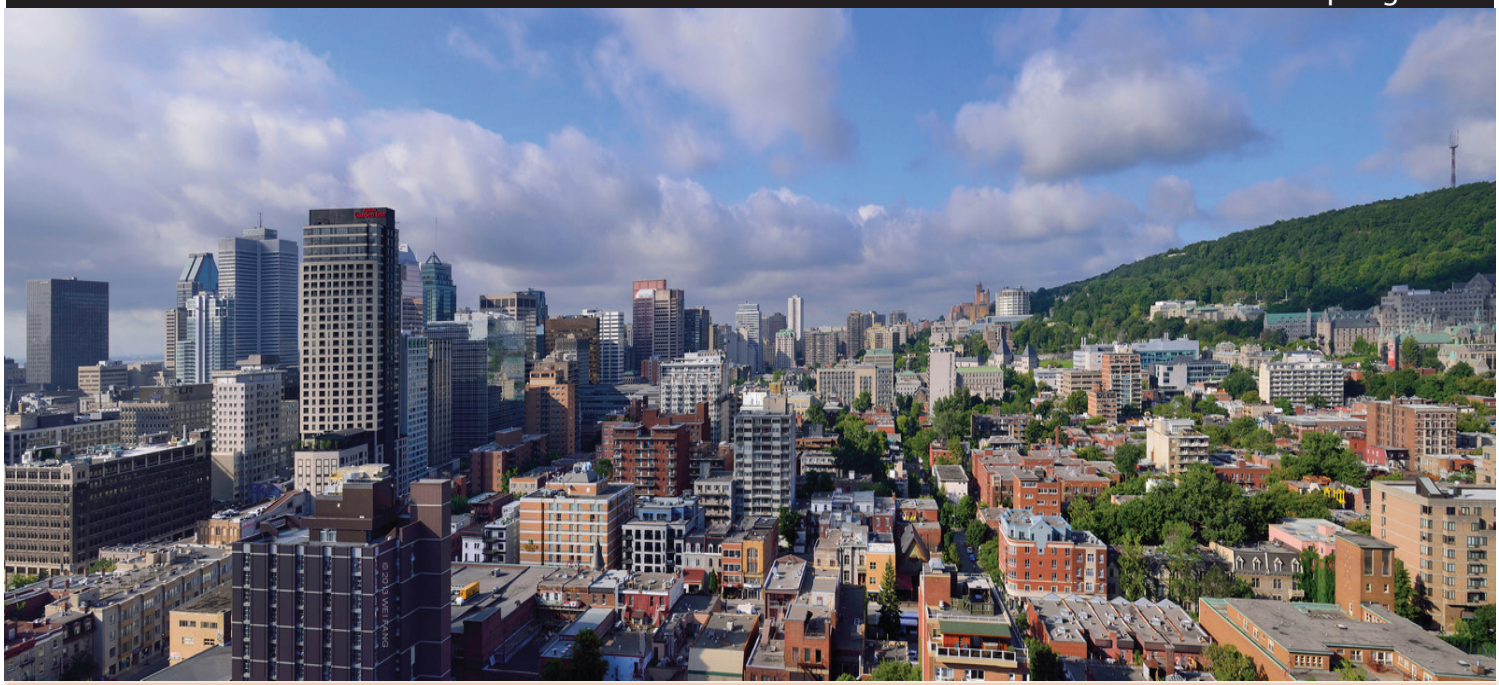
RMA

The Resource Modeling Association is an international association of scientists working at the intersection of mathematical modeling, environmental sciences, and natural resource management. We formulate and analyze models to understand and inform the management of renewable and exhaustible resources. We are particularly concerned with the sustainable utilization of renewable resources and their vulnerability to anthropogenic and other disturbances.

RMA Newsletter Spring 2019



#WCNRM 2019 Montréal

Please join us to attend the ***World Conference on Natural Resource Modeling*** held on May 22-24, 2019 in Montréal, Canada and hosted by HEC Montréal. The 3-days conference will be a stimulating mix of social and scientific events to promote interdisciplinary and international exchanges between scientists interested in the modeling and the sustainable management of ecosystems and socio-ecosystems.

Regarding social events, the conference will draw on the fact that Montréal is a fascinating city, an island in the heart of the Saint-Lawrence River, with over twenty classic museums, many theaters and countless performance halls to suit every taste. Montréal is home to 35 well-established cultural communities, with restaurants that serve food from all over the planet. The scientific program of ***#WCNRM 2019*** will put forward a multidisciplinary content and will pay attention to combine contributions of junior and senior scientists from all around the planet. It will particularly rely on four keynote speakers.

Dr. Ussif Rashid Sumaila (Director of the Fisheries Economics Research Unit at UBC, Canada).

Prof. Debbie J. Dupuis (HEC Montréal, Canada).

Dr. Ir. Florian Wagener (Associate Prof. at the University of Amsterdam, Netherlands).

Prof. Jerzy Filar (Director of Centre for Applications in Natural Resource Mathematics in the ***University of Queensland, Australia).***

Inside

PRESIDENT'S COLUMN

by Luc DOYEN

I take advantage of the first RMA newsletter of the year 2019 to recap the different activities engaged by the Resource Modeling Association regarding interdisciplinary research at the interface of ecology, economics, mathematics and computer sciences and mainly aiming at the sustainable management of ecosystems and renewable resources.

In that respect, our annual World Conference on Natural Resource Modeling is a crucial event. I am very happy to know that the upcoming conference #WCNR2019 to be held at Montreal on May 22-24 is already successful with many submissions from all around the world, arising from many disciplines and with a fruitful mix of senior and junior scientists. Thus I would like to sincerely thank the conveners of the conference, Michèle Breton, Baris Vardar, Georges Zaccour together with the GERAD (Group for Research in Decision Analysis) at HEC Montréal for the great work already realized. The central theme of the conference namely "Uncertainty and risk in natural resource modelling" as well as the keynote speakers including Prof. Jerzy Filar (University of Queensland, Australia), Dr. Ussif Rashid Sumaila (University of British Colombia, Canada), Prof. Debbie J. Dupuis (HEC Montréal, Canada) and Dr. Ir. Florian Wagener (University of Amsterdam, The Netherlands) have strongly contributed to the attractiveness of the conference. The awarding of both the Rollie Lamberson Medal and the prize of best student presentation during the conference also reinforces the appeal of the conference and more generally of the association RMA. Moreover the fact that Montréal is a very famous and well-equipped city for tourist activities is another important ingredient to explain the success of the conference. We should kept this in mind when preparing future WCNRMs.

To foster the interest of the biannual RMA newsletter, the editorial team still continue to sustain its scientific content. In particular, this spring version 2019 contains a stimulating note by Jeffrey Peterson (USA, University of Minnesota) on 'Innovation as a Policy Strategy for Natural Resource Protection'. This note derives from the outstanding key lecture offered by Jeffrey Peterson in China during the last conference #WCNRM 2018. The underlying modeling framework exemplifies the interest of linking dynamic systems and optimal control to address environmental challenges.

Following discussions in Guangzhou last year during the board meeting 2018, RMA creates new officer positions to integrate within the RMA board a representative for every continent including Asia, North-America, Australia, Europe. It is my pleasure and honor to announce the appointment of Encarna Esteban (University of Zaragoza, Spain, past Lamberson award) for Europe and Yiming Liu (SCAU, Guangzhou China) for Asia; consequently two short biographies introduce them in this newsletter. Montréal will be a good opportunity to identify representatives for North and South America and Oceania. Candidatures are welcome.

I also remind that RMA is keen to disseminate far and wide scientific information relating to the management and modeling of natural resources through our electronic networks such as ResearchGate, LinkedIn and Twitter; such information includes new academic positions, conferences, workshops, books or papers. Do not hesitate to use these networks with the following links:

- ResearchGate: https://www.researchgate.net/project/Resource-Modeling-Association
- Linkedin group: https://www.linkedin.com/company/resource-modeling-association

• Facebook: https://www.facebook.com/Resource-Modeling-Association

• Twitter: https://twitter.com/ResModelAsso

In that perspective of dissemination, you can also contact Vanessa Trijoulet <vanessatrijoulet@google-mail.com>, Oliver Schoettker <oliver.schoettker@b-tu.de>, or Yi-Hsiu Chen <yihsiu0402@gmail.com>.

In the same vein, our website leaded by our webmaster Harry Gorfine can also publish online these news.

In this newsletter, Shandelle Hanson, the Editor in Chief of our journal NRM (Natural Resource Modeling) published by Wiley, also outlines a recent special issue dedicated to Suzanne Lehnart (USA). Suzanne strongly contributed and still contributes to natural resource modeling and the advancement of the scientific approach to conservation and resource management and regularly participated to RMA activities. She mainly works in partial differential equations and mathematical biology. She is a Chancellor's Professor of mathematics at the University of Tennessee, an associate director for education and outreach at the National Institute for Mathematical and Biological Synthesis, and a part-time researcher at the Oak Ridge National Laboratory. Suzanne was also president of the Association for Women in Mathematics in 2001–2003. She was elected as a fellow of the American Association for the Advancement of Science in 2010, and became a Chancellor's Professor and SIAM Fellow in 2011.

This newsletter also contains an introductive text to the conference #WCNRM2020 by the organizers Pedro Gajardo (Professor at UTFSM, Valparaiso, Chile) and Héctor Ramírez (Professor at CMM, Santiago, Chile). For the first time in South America, the 25th World Conference on Natural Resource Modeling will indeed be held on January 8-10, 2020 in Valparaiso, Chile, hosted by Universidad Técnica Federico Santa María. The theme of the conference is "Decision support methods for natural systems at risk". The conference focuses on how quantitative applied research from diverse disciplines can assess different levels of risk, support decisions aimed at minimizing them, and propose approaches for operationalizing sustainability. Special attention is devoted to fishery, ecology, biodiversity, wildfire, water, pollution mitigation.

This president's column is also an opportunity for me to send a warm welcome to all new RMA members, especially those that have joined us for the upcoming conference in Montréal. I will end up this column by saying how grateful I am to Anne-Sophie Masure and Sébastien Lavaud for the great work they do behind the scene for the edition of RMA newsletters.

Luc Doyen
President RMA,
Senior Scientist CNRS,
GREThA, University of Bordeaux

A Focus on
IPBES' 2019 Global Assessment Report on Biodiversity and Ecosystem Services

ipbes
Science and Policy for People and Nature

About IPBES

Often described as the 'IPCC for Biodiversity', IPBES is the global science-policy forum tasked with providing the best available evidence to all decision-makers for people and nature.

With 132 member Governments, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is the global body that assesses the state of biodiversity and nature's contributions to people, in response to requests from decision-makers, and outlines options for the future based on different socio-economic choices.

The mission of IPBES is to strengthen policy and decisions through science, for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development.

The IPBES Secretariat is hosted by the German Government and located on the United Nations campus in Bonn. More than 1000 scientists worldwide contribute to the work of IPBES on a voluntary basis. They are nominated by their Governments or organisations and selected by the IPBES Multidisciplinary Expert Panel.

About IPBES' 2019 Report

A definitive new global synthesis of the state of nature, ecosystems and nature's contributions to

people (the first such report since the landmark Millennium Ecosystem Assessment published in 2005, and the first ever that is inter-governmental) will be presented to representatives of 132 Governments for consideration of approval in May 2019.

Prepared by 150 leading international experts from 50 countries, balancing representation from the natural and social sciences, with additional contributions from a further 250 experts, working with the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), the Global Assessment of Biodiversity and Ecosystem Services will inform better policies and actions in the coming decade.

The report will be discussed, finalized and considered for approval at the seventh session of the IPBES Plenary , held in Paris, 29 April – 4 May 2019.

A detailed 'Summary for Policy Makers' of the report, highlighting key messages, findings and options, is scheduled for public launch at UNESCO world headquarters, Paris, Monday, 6 May 2019.

Three years in development, the IPBES Global Assessment draws on nearly 15,000 references, including scientific papers and government information. It is also the first global assessment ever to systematically examine and include indigenous and local knowledge, issues and priorities.

The report will offer an integrated overview of where the world stands in relation to key international goals, including the Sustainable Development Goals (SDGs), the Aichi Biodiversity Targets and the Paris Agreement on climate change. It examines causes of biodiversity and ecosystem change, the implications for people, policy options and likely future pathways over the next three decades if current trends continue, and other scenarios.

Important aspects of the Global Assessment

Building upon earlier IPBES assessment reports, especially the recently-released Land Degradation and Restoration Assessment and the Regional Assessment Reports for Africa, the Americas, Asia-Pacific and Europe and Central Asia (March, 2018), the Global Assessment :

• Covers all land-based ecosystems (except Antarctica), inland water and the open oceans.

• Evaluates changes over the past 50 years and implications for our economies, livelihoods, food security and quality of life.

• Explores impacts of trade and other global processes on biodiversity and ecosystem services.

• Ranks the relative impacts of climate change, invasive species, pollution, sea and land use change and a range of other challenges to nature.

• Identifies priority gaps in our available knowledge that will need to be filled.

• Projects what biodiversity could look like in decades ahead under six future scenarios: Economic Optimism; Regional Competition; Global Sustainability; Business as Usual; Regional Sustainability and Reformed Markets.

• Assesses policy, technology, governance, behaviour changes, options and pathways to reach global goals by looking at synergies and trade-offs between food production, water security, energy and infrastructure expansion, climate change mitigation, nature conservation and economic development.

Structure of the Global Assessment

The Summary for Policymakers (SPM) of the Global Assessment will be based on a set of six chapters, which provide all the technical support for the key messages of the SPM:

1. Providing a road map and outlining key elements in the relationships between people and nature.
2. Highlighting the current status and trends in nature, nature's contributions to people and drivers of change.
3. Assessing progress towards meeting the Aichi Targets, SDGs and the Paris Agreement.
4. Exploring plausible future scenarios for nature and people to 2050.
5. Focusing on the scenarios, pathways and options that lead to a sustainable future.
6. Showcasing opportunities and challenges for decision makers at all levels and in a range of contexts.

Expected impacts

The IPBES Global Assessment will:

• Provide an agreed, evidence-based knowledge base to inform policy making for the decade ahead.

• Contribute an analysis of the implications of the loss of biodiversity for achieving the Paris Climate Agreement, global biodiversity targets, the Sustainable Development Goals and other major world objectives.

• Offer a multidimensional valuation of common global assets and how to sustain them.

• Recognize and emphasize the role each actor has in improving conditions for nature and ecosystems, and the importance of aligning efforts.

• Raise awareness of the importance of transformational multi-sectoral policies and governance structures, including the effects that policies and other indirect drivers have at a global scale and options to improve trans-regional policy-making.

• Be a starting point for in-depth analyses of the role of actions and their global implications.

Reviewers and audiences

• Scientists and decision-makers (including Governments), practitioners and the holders of indigenous and local knowledge.

• The assessments will be presented with the widest spectrum of decision-makers in mind, including government and business leaders, civil society groups, indigenous peoples and communities.

• To ensure the highest-possible levels of accuracy, credibility and policy-relevance, the IPBES Global Assessment has been extensively reviewed, twice, through an open and transparent process, by hundreds of external experts, including government and business leaders, civil society groups, indigenous peoples and communities.

Presentation from Guangzhou conference:

Innovation as a Policy Strategy for Natural Resource Protection

by Professor Jeffrey M. Peterson ,

Water Resources Center and Dept. of Applied Economics, University of Minnesota

Agriculture has widespread impacts on the environment globally, including long-term effects on water resources. Continuing increases in food production are placing major strains on water resources worldwide, including quality impairments in some regions and heightened water scarcity in others. A large volume of literature models these impacts in the traditional market failure paradigm, in which policies target the externalities from agricultural production. The resulting policy typically reduces private gains from agricultural production for the benefit of improved resource conditions. With a few exceptions, studies in this paradigm assume that technology is fixed. Here, I explore the role of changing technology, and in particular the role of public investments in innovation to generate technologies that mitigate the environmental harm from production.

This model considers a globally small (price-exogenous) agricultural region where farm profits depend on a continuously applied input, Z, that degrades local water supplies. Let Q(t) represent the quality of the regional water resource at instant t. From an initial state of $Q(0) = Q_0$, Q evolves according to :

$$\dot{Q} = f(Z, Q) \quad (1)$$

Society incurs monetary damages of D(Q) each period, where D(Q) is positive if Q is below a quality threshold.

First consider the traditional model of environmental policy with fixed technology. A social planner seeking to maximize discounted welfare over an infinite horizon would solve:

$$\max_{Z,Q} \int_0^\infty [\Pi(Z) - D(Q)]e^{-rt}dt,$$

subject to (1) and the initial state Q_0, where $\Pi(Z)$ is farm profits each period, and r is the discount rate. Figure 1 illustrates the steady-state optimal solution to this problem. This and all subsequent analyses assume a linear-quadratic specification, such that Π and D take on quadratic forms and all equations of motion are linear. The optimal steady-state level of input, Z^E, occurs where marginal profits, $\Pi'(Z)$ are equal to the steady-state

costate variable associated with water quality, μ^E_Q. By comparison, the steady state level of input in an unregulated setting would be Z^0, where marginal profits are zero.

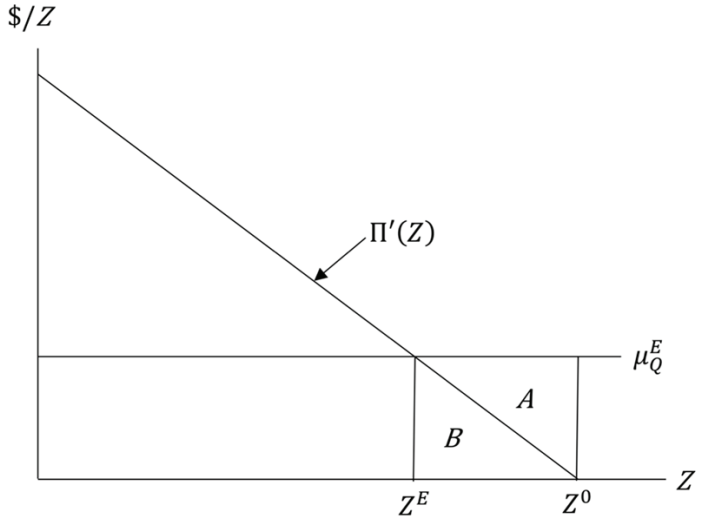


Figure 1. Steady-state welfare in environmental vs. no-policy scenarios

Environmental policy reduces farm profits by B while generating social benefits (in the form of reduced damages) of A + B, yielding an overall welfare gain of B.

Now consider the case of a pure technology policy, where no attempt is made to regulate Z directly. Instead, public funds invested in research and innovation will alter the profit function. Now introducing a second state variable, K measures research progress and represents the amount of new knowledge generated since t = 0. K evolves according to:

$$\dot{K} = g(K, R), \quad (2)$$

where R(t) is public research activity in period t.

New knowledge generates technologies that have two effects on the farm profit function, now denoted $\Pi(Z;K)$. First, the *productivity effect* boosts profits by a fixed amount independent of the level of input (Z). Second, the *efficiency effect* reduces the profit-maximizing level of input. These two effects mean that farmers could earn higher profits while applying less input. Technology policy, allows farmers to maximize profits each period without any environmental regulation. The social planner's role is to select level of research that maximizes welfare under these conditions. Let $\Pi(K)=\max_Z \Pi(Z;K)$ measure farmers' optimized profits in each period.

The planner's problem for technology policy can be written :

$$\max_{R,K,Q} \int_0^\infty [\Pi(K) - C(R,K) - D(Q)]e^{-rt}dt,$$

subject to (1), (2), and the initial conditions for Q and K, where C(R,K) is the cost of research.

The steady-state solution to this problem is depicted in Figure 2. Compared to a baseline of no policy, technology policy impacts steady-state welfare in three ways:

- Farm profits change from the two effects noted above. The productivity effect is a fixed amount depicted as box E. The efficiency effect is illustrated by the downward shift of the marginal profit function, with technology reducing optimal input use from Z^0 to Z^T. This reduces profits somewhat because the area under the marginal profit function shrinks by B +C+D. The net increase in farm profits is E – (B+C+D), which can be positive or negative depending on model parameters.
- Social benefits arise from reduced environmental damages of A + B.
- Social costs arise from research costs, depicted as area F.

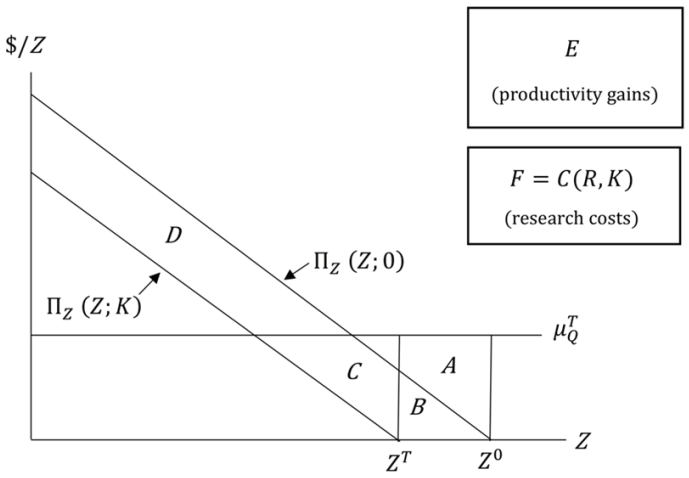


Figure 2. Steady-state welfare in technology vs. no-policy scenarios

Combining these effects gives an overall welfare gain of A – D – C + E -F. The overall effect is ambiguous and would need to be resolved with empirical research. Nevertheless, the analysis here reveals that technology policy can plausibly provide a win-win solution in which farmers benefit

while environmental damages are reduced. If the efficiency effect is strong enough, it is even possible that the technology induced level of inputs (Z^T) is less than the input level induced by environmental policy and fixed technology (Z^E from Figure 1).

Finally, consider the case of jointly optimized policies. In this case the planner selects research investments while also regulating agricultural inputs, solving:

$$\max_{Z,R,Q,K} \int_0^{\infty} [\Pi(Z,K) - C(R,K) - D(Q)]e^{-rt}dt,$$

subject to (1), (2) and initial conditions. The solution to this problem produces an unambiguous welfare gain from any of the previous scenarios because restrictions on Z, R, or both have been removed.

Importantly, even with existing environmental policies, there is still a gain from investments in research that can further reduce environmental harm while also raising farmers' profits. Overall, the key implication for research managers is that research and innovation is a beneficial public policy investment. Beneficial technologies can alleviate the perception that industry and environmental advocates are trapped in a win-loss setting. This perception has led to strong and divergent incentives for opposing policymakers – a friction in the political marketplace at times has been resolved in favor of less stringent environmental policies. If technology and environmental policies can co-exist, more bargaining space is created for policymakers to reach welfare-improving outcomes.

Introducting the RMA Continental Officers

Encarna Esteban,

Europe Officer

Encarna Esteban is an Associate Professor in the Department of Economic Analysis at the University of Zaragoza (Spain). Encarna holds a PhD in Economics from the University of Zaragoza and a MSc in Agricultural and Natural Resource Economics from the University of Connecticut (USA). Her research interest covers the study of water resources analyzing both quality and quantity issues, natural resource modeling, and political economy applied to natural resources. She currently works on issues related to the governance of water resources and the implementation of political economy models to evaluate lobbying capacity of stakeholders involved in natural resources' management. Dr. Esteban has published numerous articles on environmental economics, water resources management, and optimal control, as well as book chapters. Some of her publications have appeared in Ecological Economics, Environmental & Resource Economics, Natural Resource Modeling, and Journal of Environmental Management. Her work has been presented at many national and international conferences such as the European and the American Associations of Environmental and Resource Economists, the Natural Resource Modeling Association, or the International Water Association.

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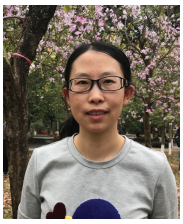

Yiming Liu,

Asia Officer

Yijing Zhang is a lecturer in College of Economics and Management, South China Agricultural University, Guangzhou, China. Yijing's fields of expertise are strategic management of forest enterprises, internationalization process of paper and pulp firms, forest products trade and marketing. The ongoing research projects include forest enterprises strategic choices under the environmental policy constraints, as well as collaborative project on the topic of the impact of habitat regulatory policies on ecological protection and rural livelihoods in giant panda nature reserves. She was one of the main organizers on WCNRM2018 held in Guangzhou.

Introduction to #WCNRM2020

Valparaiso - Chile , January 8-10, 2020

by Pedro Gajardo[a] and Héctor Ramírez C.[b], Associate Professors,

a: Universidad Técnica Federico Santa María, Valparaiso, Chile
b: Center for Mathematical Modeling, University of Chile

Emerging countries' economies and communities, notably in South America, strongly depend on their natural resources. A sustainable development based on their exploitation is a major challenge that must reconcile the development of communities and the conservation of the resources and their environments. So, trade-offs in what constitutes sustainability must be made. Due to different and complex reasons, several resources are now at risk.

For the first time in South America, the 2020 World Conference on Natural Resource Modeling will be held on **January 8-10, 2020** in Valparaiso, Chile, hosted by Universidad Técnica Federico Santa María.

The theme of the conference is "**Decision support methods for natural systems at risk**". The conference focuses on how quantitative applied research from diverse disciplines can assess different levels of risk, support decisions to minimize these risks, and propose modelling approaches for operationalizing sustainability.In terms of application, special attention is devoted to fishery, ecology, biodiversity, wildfire, water, pollution mitigation.

The three-day scientific program features four keynote speakers:

- ***Prof. Suzanne Lenhart*** is a Chancellor's Professor in the Mathematics Department at the University of Tennessee, Knoxville (US), Associate Director for Education and Outreach at the National Institute for Mathematical and Biological Synthesis (US), and was Part-time Researcher at the Oak Ridge National Laboratory (US) for 22 years. She is a recognized expert in optimal control and partial differential equations, with modeling applications to populations, natural resources, and diseases. She has authored more than 200 journal articles, as well as two texts, Optimal Control applied to Biological Models and Mathematics for the Life Sciences. She was elected as a fellow of the American Association for the Advancement of Science, SIAM, and the American Mathematical Society. In 2017, she was selected as a fellow of the Association for Women in Mathematics, an association in which she was President between 2001 and 2003.

- ***Prof. Alejandro Maass*** is Director of the Center for Mathematical Modeling (Chile), Full Professor at the University of Chile, and Associate Researcher of the Center for Genome Regulation (Chile). During his professional career he has assumed different scientific responsibilities in Chile: President of the National Council of Sciences from 2006 to 2008; responsible of the Chilean-French cooperation program ECOS-CONICYT since 2007, among others. His work in stimulating the scientific cooperation with France was recognized with the distinction "Chevalier de l'Ordre Na-

tional du Mérite" in 2007. He is an applied mathematician with a broad research scope, including dynamical systems, bioinformatics and systems biology. He has specialized in the application of genomic techniques to mining, fishery, avian and winery sectors. In recognition for his remarkable contributions on these areas, in 2009 he obtained the Latin American and Caribbean Mathematical Union Prize.

• ***Dr. Eva Plaganyi-Lloyd*** is Senior Research Scientist at CSIRO CMAR (Australia). She leads research on the development of models to support the sustainable management of marine systems. She is an international expert in stock assessment modeling, ecosystem modeling and management strategy evaluation. Her research interests focus on the biological modeling of marine and other renewable biological resources, and on the application of quantitative approaches to addressing general ecological questions. She has 15 years experience in the field of quantitative fisheries stock assessment, where her work focuses on developing an ecosystem approach to fisheries that ensures the sustainability and welfare of the entire ecosystem impacted by fishing activities.

• ***Prof. José L. Torero*** is the Head of the Department of Civil, Environmental and Geomatic Engineering at University College London (UK). He was Director of the Center for Disaster Resilience at the University of Maryland (US) and Head of the School of Civil Engineering at the University of Queensland (Australia). He works in the fields of fire safety, combustion, environmental remediation and sanitation where he specializes in complex environments such as developing nations, complex urban environments, novel architectures, and critical infrastructure, among others topics. He has studied major environmental problems such as oil-spills or large underground coal fires where he has developed unique approaches towards impact mitigation. He is co-inventor of STaR, a technology for soil remediation that has been extensively commercialized and also extended to sanitation and the efficient management of wastewater.

Valparaiso is Chile's principal port (90 km from Santiago's airport) and second-largest city. It is Chile's most distinctive city and one of South America's most intriguing. Occupying a narrow strip of land between the waterfront and the nearby hills, its convoluted center has distinctive, sinuous cobbled streets, and is overlooked by precipitous cliffs and hilltop suburbs, which are accessed by funicular railways and stairway footpaths. It is conducive to maze-like strolls and rides on the funicular, and its natural history, fine arts and maritime museums are justly famed.
The most interesting part of Valparaiso is the old section, where one can find colonial buildings, churches, and museums, like one of the Pablo Neruda's houses.

The Universidad Técnica Federico Santa María (UTFSM) is the Chilean's largest engineering school with more than 17,000 students registered in undergraduate and graduate programs on basic sciences and engineering specialties. The WCNRM2020 conference will be held in the main UTFSM campus located in Valparaiso, covering most of the front area of Los Placeres hill. The site faces the Pacific coast and it is visible from many parts of the bay of Valparaiso.

The website of the conference will be launched just ***after the WCNRM2019 in Montreal*** and the deadline for submitting abstracts will be by the **end of October 2019.**

Editor's Column

Are You Interested in Guest Editing a Special Issue?

by Shandelle M. Henson,

Editor -in-Chief of Natural Resource Modeling

Editors-in-chief of journals agree that one of the best ways to obtain quality papers, increase diagnostic factors, and boost submissions is to run special issues. A special issue can consist of a collection of papers presented at a conference, a set of papers that address some particular topic within the scope of the journal, or a group of papers submitted in honor of a particular scholar.

For example, a recent issue of Natural Resource Modeling (Volume 31, Issue 4), is a special issue devoted to one of the great names in mathematical biology: Suzanne Lenhart, Chancellor's Professor of Mathematics at the University of Tennessee. It was edited by three of Dr. Lenhart's former students, professors Wandi Ding, Rachel Leander, and René A. Salinas. You can find the issue at https://onlinelibrary.wiley.com/toc/19397445/2018/31/4 and read the editorial dedication to Suzanne Lenhart at https://onlinelibrary.wiley.com/doi/10.1111/nrm.12198.

Dr. Lenhart is a fellow of the American Association for the Advancement of Science, a fellow of the American Mathematical Society, a fellow of the Society for Industrial and Applied Science, and a fellow of the Association for Women in Mathematics. She has edited two special issues of Natural Resource Modeling and served on the Editorial Board from 2008 to 2011.

Professor Lenhart is a leading expert in the theory of differential equations and optimal control and their application to problems in natural resource management. She has published over 200 papers in optimal control, at least 13 of which appear in Natural Resource Modeling. The guest editors note in the dedication that, "The breadth of her research is truly extraordinary, addressing problems in medicine, ecology, economics, natural resources, epidemiology, and agriculture via the application of diverse techniques applied to discrete, continuous, stochastic, integro-differential, integro-difference, and infinite-dimensional systems." Furthermore, the edit ors highlight the fact that Dr. Lenhart is more than a theoretician. She cares about "solving real-world problems: visiting wildlife managers or dairy farmers to gain first-hand knowledge of a problem is all in a day's work for Suzanne."
Also in the dedication, the guest editors spotlight Dr. Lenhart's life-long dedication to making mathematics and STEM fields diverse, inclusive, and accessible. They describe the legendary care and mentoring she gives students and her tireless work for underrepresented groups, those with disabilities, and early-career scholars.

The papers in this special issue are authored by a number of well-known established and early-career scientists and mathematicians and are dedicated to Professor Lenhart with great respect and affection.

Two papers address natural resource management in the context of diseases that affect humans.

In "Methods for prophylactic management of West Nile virus using a stage-structured avian host-vector model with vaccination, larvicide, and adulticide", authors Schaefer, Caillouët, and Robertson use genetic algorithms to suggest that vaccination of avian nestlings is the best strategy if budgets are amenable.

Yakubu and Ziyadi in "A discrete-time anthrax model in human and herbivore populations" show that is possible for anthrax to invade a population consisting of herbivores and humans when the disease does not invade either the herbivores or humans in isolation, implying the need for more anthrax surveillance in mixed populations of herbivores and humans.

Three papers address theory that illuminates important management themes such as disturbance regimes, harvesting, and removal of invasive species.

Cantrell and Cosner in "Effects of harvesting mediated by dispersal traits" show that if a non-harvested population responds to disturbances caused by

the harvesting of another population by increasing the rate of its random dispersal of individuals, the non-harvested population can go extinct.

In "Optimal spatiotemporal effort allocation for invasive species removal incorporating a removal handling time and budget", Baker, Diele, Marangi, Martiradonna, and Ragni introduce a reaction-diffusion partial differential equation to model the spatiotemporal dynamics of an invasive species. They use optimal control theory to determine optimal management subject to a budget constraint.

Miller, Hsing, Roxburgh, Fisher, and Shea in "Impacts of altered disturbance regimes on community structure and biodiversity mediated by fecundity–tolerance interactions" show that differing fecundity–tolerance strategies can mediate coexistence in disturbance-prone deep-sea environments, but that small changes to the disturbance regime can alter community composition and result in species extirpation, highlighting the need for impact studies for all communities that face planned disturbances.

Another paper explores the implications of Allee effects, an important topic in theoretical ecology. In "Cooperative hunting in a predator–prey system with Allee effects in the prey", Jang, Zhang, and Larriva use continuous-time predator-prey models to explore the possible results of Allee effects in the prey and cooperative hunting in predators on population interactions.

Two big-picture papers bring novel theoretical advances or illustrate the impact of theoretical development in model building.

Kwessi, Elaydi, Dennis, and Livadiotis in "Nearly exact discretization of single species population models" propose a novel discretization method that preserves equilibria, stability, and bifurcation characteristics independent of step size. The authors note that populations often are intrinsically discrete, and that model discretization is usually required to tie models to data, and hence propose the NED method as a useful tool in developing models as scientific hypotheses.

Sims, Horan, and Meadows note that many bioeconomic models suggest that the rate of return to conservation is increased by a risk premium that may lower conservation incentives for more random populations, but that this depends on howthe stochasticity of resource growth is modeled.

In "Come on feel the noise: Ecological foundations in stochastic bioeconomic models", they show the importance of basing stochasticity on ecological considerations and point out that not all sources of ecological stochasticity imply that conservation is risky.

Would you like to guest edit a special issue in honor of a mentor, or would you like to edit a collection of papers from a conference special session or from a particular area of natural resource modeling? I welcome your ideas!

Please write to me at henson@andrews.edu

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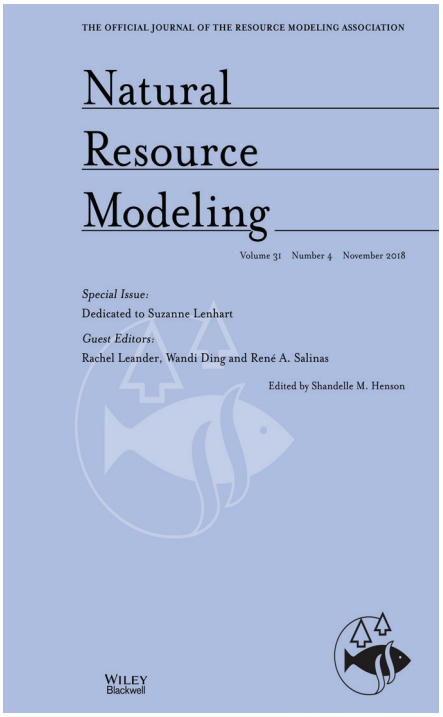

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