## Record of the 36th International Conference of the System Dynamics Society 2018

Reykjavik, Iceland 7 - 9 August 2018

ISBN: 978-1-5108-7384-1

## Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2018) by System Dynamics Society All rights reserved.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact System Dynamics Society at the address below.

System Dynamics Society Milne Hall 300, Rockefeller College 135 Western Avenue University at Albany Albany, New York 12222 USA

Phone: (518) 442-3865 Fax: (518) 442-3398

office@systemdynamics.org

## Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA

Phone: 845-758-0400 Fax: 845-758-2633

Email: curran@proceedings.com Web: www.proceedings.com

- Aamir, Munaf with Robert Taylor and Marissa Ballantine *Strategic* facilities space management modeling for better decision support.....1
- Aiyetan, Olatunji with Dillip Das Mitigating skilled labour shortage challenges in Construction industry in South Africa....2
- Akhavan, Alireza with Paulo Goncalves and Ali Mashayekhi *Government Subsidies and Common-Pool Resources: A System Dynamics Model of Pistachio Production in Rafsanjan, Iran....*3
- Akkermans, Henk Shock therapy: Teaching supply chain dynamics to a non-SD audience in SCM....4
- Akkermans, Henk Securing Soft Landings: Strategic planning of a pilot workforce chain in response to a demand shock.....5
- Akoguz, Elif Cansu with Nefel Tellioglu and Yaman Barlas *The Dynamics of Food Waste in Relation to Consumption, Production, and Shopping Patterns....*6
- Aktas, Gizem with Yaman Barlas Modeling the Biological Mechanisms That Determine the Dynamics of Stress Response of the Human Body (Dana Meadows Award Winner & Lupina Award Winner).....9
- Alderman, Leigh with Karen Minyard Building Policymaker Capacity to Address the Opioid Epidemic Using Systems Mapping....12
- Almaguer Prado, Pedro Dagoberto with Ramiro Luis Almaguer Navarro Learning lab for the management of invasive species, using Stella Architect.....13
- Amal, Devita with Steven Hodges, Erin Webb, and Alejandro Salado *Exploring the System-wide Impacts of Supply Risk in the Biofuel Supply Chain: A Comparative Analysis.....14*

- Ansah, John with David Matchar and Amina Islam Systems modelling as an approach for understanding and building consensus on non-communicable diseases (NCD) management in Cambodia.....15
- Ansah, John with David Matchar and Lukas Schoenenberger *Mapping* the dynamic complexity of chronic disease care in Singapore: using group model building in knowledge elicitation....16
- Apostolopoulos, Yorghos with with Kristen Hassmiller Lich, Michael Lemke, Adam Barry, Alex Russell, and Jameisha Brown Alcohol-Impaired Driving in U.S. College Environments: Stakeholder-Based Causal Loop Analysis to Advance Policy Planning....17
- Apostolopoulos, Yorghos with with Kristen Hassmiller Lich, Michael Lemke, Adam Barry, Alex Russell, and Jameisha Brown *Collaborative Systems Thinking to Teach Old (And Young!) Dogs New Tricks: Triggering Better Decisions to Reduce Alcohol Misuse Among College Students.....18*
- Arora, Gurvinderpal Singh with Rizky Januar *Modelling Land Use in Megacities under Deep Uncertainty: A Case of Jakarta (Best Poster Award Winner).....*19
- Atzori, Alberto Stanislao with Eva Sevigne Itoiz, Lorenzo De Lucia, and Giuseppe Pulina *Spreadsheep: information technologies to overcome perception delays in a dairy sheep supply chain.....24*
- Atzori, Alberto Stanislao with Luis Tedeschi *Dynamics of global Dairy* Sector: model evaluation and new calibrations using FAOSTAT data.....25
- Auping, Willem with Jan Kwakkel and Erik Pruyt Exploring the Potential for Feeding a Changing World.....26
- Auping, Willem with Jan Kwakkel, Erik Pruyt, and Wil Thissen *Uncertainty and Model Development* .....27

- Bakken, Bjørn Tallak with Lars Thuesen and Corneliu Eftodi Seeing is Believing is Doing – How to effectively reduce violence against women using modeling and simulation technologies.....28
- Ballard, Ellis with Pratiti Priyadarshini and Kelsey Werner What is the status of a boundary object when filtered through multiple layers of translation?....29
- Bartelet, Henry *Urban Dynamics and Slums in the Developing World.....30*
- Bastan, Mahdi with Stefan Groesser and Elaheh Zadfallah *Model-Based Risk Assessment to Clinical Risk Management Policies.....31*
- Beckage, Brian with Louis Gross, Katherine Lacasse, Eric Carr, Sara Metcalf, Jonathan Winter, Peter Howe, Nina Fefferman, Travis Franck, Asim Zia, Ann Kinzig, and Forrest Hoffman *Modeling* spatial discordance in greenhouse gas emissions and climate impacts on future climate change.....43
- Beckman, Nicole with Steve Peterson *Chronic Pain in Women Aged 45-54 and the Opioid Epidemic.....44*
- Bello, Wasiu CSFs for Cost Performance Diagnostics Model in the Nigeria Construction Industry.....45
- Benabderrazik, Kenza with Birgit Kopainsky Assessing the resilience of horticultural growers in a country facing rapid environmental and socio-economic changes, the case of fresh tomato in Morocco.....46
- Benjamin, Peninah Improving AYUDA's Efforts and Knowledge of Type 1 Diabetes in the Dominican Republic.....48
- Bennich, Therese *Dynamics of change the transition to a bio-based economy in the Norrköping region.....49*

- Bidgoli, Danial with Mohammad Owlia, Mohammad Taghi Isaee, Mohammad Hosein Abooie, and Alireza Akhavan *The impact of customer knowledge on corporation performance.....50*
- Bleijenbergh, Inge with Monic Lansu and Pleun van
  Arensbergen *Gender inequality in science; a system dynamics model.....51*
- Block, Joachim A Hybrid Modeling and Simulation Approach for the Strategic Workforce Planning Problem....55
- Bobrova, Yekatherina with George Papachristos and Nici Zimmermann *A dynamic model of psychological fatigue in the* process of low carbon home retrofit.....61
- Boettcher, Kevin with Kim Warren Wind Tunneling Business Strategy.....64
- Bonham, Taggart with Steve Peterson Exploring Effects of Potential Pollution Tax Policies in Rural China.....71
- Booyens, Danie with Naledi Memela Arrays and Large Data Sets a Skills and Resources Case Study.....72
- Brady, Malcolm *A system dynamics funding model for universities.....73*
- Branscomb, Jane with Karen Minyard Facilitating policy development, decision-making and evaluation: Which tools to use when.....74
- Brockhaus, Friederike with Peter Sedlmeier *Iconic signs and stock flow* performance.....75
- Cafe, Patricia with Ricardo Matos Chaim *Dynamics of Taxation on Fuels.....78*
- Cai, Lin Analysis of China's Oil Supply, Demand, and Foreign Dependence.....79

- Cappuccio, Valerio with Nici Zimmermann, Catherine Willan, Esfandiar Burman, and Michael Davies *Organisational actors' motivations* and building performance traps: Evidence from case studies and modelling on interactions of reputation, identity and collaboration....80
- Carroll, Ed with Dana Grisham, Nancy Hayden, Sharon Trauth, Eliot Rich, Frank Salvatore, William Schindel, Chris Schreiber, Steve Jenkins, and Anne O'Neil *Principles of Model Based Engineering: An emerging manifesto.....86*
- Carter, David with Jonathan Moizer and Shaofeng Liu *Direct Action or Social Nudge: where are the effective policy levers for helping families select secondary (high) schools?.....87*
- Carvalho, Hamilton with José Mazzon and Joaquim Santos *The roots of Brazilian social holocaust.....92*
- Carvalho, Hamilton with José Mazzon and Joaquim Santos *The curse of low human development.....93*
- Carvalho, Hamilton with José Mazzon and Joaquim Santos *Modeling* social change: A tribute to Jorgen Randers.....94
- Castaneda, Monica with Sebastian Zapata Ramirez, Isaac Dyner, and Judith Cherni *Cautious feed-in-tariff for promoting PV* generation in the UK residential sector.....95
- Castaneda, Monica with Sebastian Zapata Ramirez, Maritza Jímenez, Isaac Dyner, and Carlos Franco Cardona *The growth spiral of rooftop solar PVs: where and when?.....96*
- Catalilna, María with Ignacio Perez and Joan Cruz Supply Chain Characterization for technology products depending on the price and exchange rate in Colombia for the gamer market under three sales channels: retail, portals and online.....97

- Ceballos, Yony Fernando with Ronald Ortiz and Julian Castillo Effects of the consumption of energy in development dynamics in isolated rural areas.....98
- Chaim, Ricardo Matos with Jorge Henrique Fernandes, Jonas Carvalho, Bruno Carvalho, Janaina Sallas, and Ana Luisa Oliveira da Nóbrega Costa Computational Simulation for Software Engineering Requirements Definition the case of arboviruses dynamics in Brazil (Supported by FAP-DF).....99
- Chia, Eng Seng with Jakkarin Sae-Tiew, Chi Shien Tay, Wei Xiang Tan, Aaron Lim, and Jaron Chan Skills Mismatch and Information and Communications Technology Manpower Shortage in Singapore (Best Poster Award Winner).....100
- Chia, Eng Seng with Yi Ming Liu, Chong Wei Goh, Zhi Wei Ling, and Silvester Chin *Curbing Dengue in Singapore Using Wolbachia.....102*
- Clancy, Timothy with Oleg Pavlov, Bland Addison, and Khalid Saeed *Resolving the Sageman-Hoffman Debate on Terrorist Radicalization (Best Poster Award Winner).....103*
- Clifford-Holmes, Jai with Shane Carnohan, Carolyn Palmer, Sharon Pollard, and Jill Slinger *Modelling as Bricolage.....104*
- Copin, Stephane with Tamim Hammadi and Selmin Nurcan System

  Dynamics Applications in Emergency Department for Waiting

  Time Improvement.....105
- Corredor, Giovanni with Luis Rabelo, and Edgar Gutierrez-Franco Roadmap for the formulation of space politics of a developing country using system dynamics.....106
- Cunico, Giovanni with I-Chun Huang and Sebastiaan Deuten *Local*Cooperation, Local Prosperity: Insights of Participatory System

  Dynamics Modeling within a Degrowth Community.....107

- Curram, Stephen OSCAM: 22 years of making better operating and support estimates of fleets of ships and aircraft for the US Navy.....124
- Cvetkovic, Dragana with Ljiljana Cvetkovic and Vladimir Kostic *Robust*Stability Measures in Ecology via Pseudospectra....126
- Daradzeika, Aliaksandr with Nuno Videira and Krystyna Stave *Sustainability of surplus food redistribution* systems.....127
- Das, Dillip with Debasish Sahu Exploring the potential of development of Information Technology industry in a South African city.....135
- de Gooyert, Vincent with Rick Aalbers and Andreas Groessler *The Dynamics of Related Acquisitions; Downsizing Magnitude, Timing, and Employee Engagement.....138*
- Deuten, Sebastiaan with Jonatan Gomez Vilchez *Understanding*Feedback in the Transition to Electric Vehicles: Insights from the
  Markets in Norway and the Netherlands.....140
- Dianati, Kaveh with Nici Zimmermann and Michael Davies London's Housing Crisis A perspective based on the role of financial markets and the UK's economic growth model.....142
- Diller, Tim Optimizing stock management at the Blood Bank of Iceland.....144
- Dowidowicz, Anthony "Kiss Up and Kick Down": The Effects of Destructive Leadership on Healthcare Organizations.....145
- Drmola, Jakub with Tomas Hubik Stochastic modeling: power laws and terrorism.....146
- Đula, Ivan with Andreas Groessler *Fairness in the Beer Distribution Game (Best Poster Award Winner).....147*

- Du Plooy, Corne with Naledi Memela A System Dynamics Approach to Water Quality: Initial Conceptualization.....152
- Duminy, Lize with Jonas Matheus and Monika Pichler *Modelling state* failure in Somalia: a sustainability perspective.....153
- Duminy, Lize with Josephine Musango, Benjamin Batinge, Ian Taverner, Martin Viljoen, and Suzanne Smit From model results to implementation in practice: the case of Mohair Value Chain Sustainability Project.....154
- Duminy, Lize with Marie Brechbühler Peskova *The synthesiser role of expert modellers in multidisciplinary research projects: a practical guideline.....155*
- Eckert, Alec with Amanda Karapici *Testing Development Roadmaps:*Portugal's Crescimento Verde.....160
- Edali, Mert with Mustafa Baydogan and Gönenç Yucel *Classification of Fundamental System Dynamics Model Outputs.....175*
- Eker, Sibel with Gerhard Reese and Michael Obersteiner *Meat or vegetarian? A model-based analysis of the global diet change dynamics.....176*
- El Hachem, Wissam with Pietro De Giovanni *Transition to Alternative Fuel Vehicles: A Distributive Justice Perspective.....180*
- El Misaoui, Safae with Souhail Maazioui, Saad Benjelloun, Abdelkrim Lachgar, Charles Jones, and Travis Franck *Developing an Agricultural Land and Policy Simulator to Promote Climate-Smart Policy.....182*
- Els, Sharon Delivering Critical Projects & Programs.....185
- Ercil, Yavuz with Cigdem Baskici Analysis of Dynamic Strategic Evaluation Decisions.....193

- Faezipour, Misagh The Empowered Patient Wants Shared Decision Making – How can System Dynamics Modeling Help?....194
- Fazeli, Reza with Brynhildur Davidsdottir, Hlynur Stefansson, Ehsan Shafiei, Eyjólfur Ingi Ásgeirsson, and Bjarnhéðinn Guðlaugsson *System Dynamics model as a decision support tool:* Stakeholder Engagement step and MCDA.....196
- Ferreira de Oliveira, Leonardo with Carlos Denner dos Santos Júnior *Public Value Through Open Data Innovation.....197*
- Fisher, Diana System Dynamics Models Created by Secondary School Students: 1990 – 2010.....198
- Flower, Kelsey Bush, Hussein, and Coupled Cognitive Biases in the Lead-Up to the Iraq War.....199
- Fowler, Patrick with Katherine Marcal, Saras Chung, Melissa Jonson-Reid, and Peter Hovmand Scaling Up Services within the Child Welfare System: Policy Insights from Simulation Modeling.....200
- Frerichs, Leah with Ozgur Araz, Larissa Calancie, Terry Huang, and Kristen Hassmiller Lich *A dynamic age-structured model for understanding long-term trends in US obesity prevalence.....201*
- Froese Buzogany, Raquel with Paulo Goncalves and Hugo Yoshida Yoshizaki *Policy Analysis of Material Convergence Challenges During Disasters.....202*
- Gallati, Justus with Matthias Mueller, Eva Blozik, Corinne Chmiel,
  Matthias Waechter, and Oliver Kessler Simulation Model for a
  Needs-Based Health Care Planning in Switzerland: the Example
  of Coronary Heart Disease.....204
- Gallen, Hannah Deconstructing Social Entrepreneurship: Exploring Impact and Efficiency Across Strategies.....205

- Gambardella, Pascal with John Hayward, Erika Palmer, and Dana Ilmari Polojarvi *Approximating Network Dynamics in the Classic Maya Collapse.....206*
- Garvin, Jennifer with Michael Smith, Virginia Yazzie, Paige Benally, Charnetta Brown, Natalie Kelly, Jose Nativi-Nicolau, Salim Virani, Charlene Weir, and Laura Petersen Beta Blocker Titration in Heart Failure at the Point of Care: A Causal Loop Analysis.....210
- Gencer, Busra with Patricia Ochoa Regulators Facing Renewable Targets: A Policy Analysis.....211
- Glazner, Christopher with Sarah Beebe, Mark Zimmermann, Evan Elsaesser, and Daniel Chudnov *Loopy for Analysts: A Systems Thinking Tool for Intelligence Analysts.....212*
- Gomez Vilchez, Jonatan Exploring the Battery Market for Electric Cars.....213
- Goncalves, Paulo Competing for scarce resources during humanitarian emergencies.....214
- Gonzalez, Cleotilde with Nalyn Sriwattanakomen Valence Matters in Judgments of Stock Accumulation Over Time: An Intervention to Improve Blood Glucose Control and Other Global Problems.....215
- Gorgulu, Berk with Gönenç Yucel and Mert Edali Efficient Parameter Exploration and Behavior Mapping for System Dynamics Models.....218
- Gozluklu, Burak with John Sterman and Nelson Repenning A Flight Simulator for Product Development and Decision-Making BOT Seeking Optimum Strategies.....219

- Gudbrandsdottir, Ingunn with Gudrun Olafsdottir, Anna Olafsdottir, Harald Ulrik Sverdrup, and Sigurður Bogason *The case of Arctic char land based aquaculture production in Iceland.....221*
- Gunnarsdóttir, Ingunn with Brynhildur Davidsdottir, Sigurbjorg Sigurgeirsdottir, and Birgitta Steingrimsdottir *Use of qualitative* information in the development of sustainability indicators; usefulness in system dynamics modeling.....222
- Hafezi, Mehdi with Oz Sahin and Rodney Stewart Assessment of the health and resilience of coral reefs and the associated benefits to the community well-being in a changing climate.....223
- Halbe, Johannes with Jan Adamowski *Bridging technical, ecological* and social knowledge in systems design.....224
- Halbe, Johannes with Stefan Gausling and Jan Adamowski Vision

  Modeling and Assessment Using System Dynamics Application
  to a Sustainable Energy System Based upon Power-toGas.....225
- Happach, Maximilian with Meike Tilebein *How to (not) succeed in the German energy transition: Some insights from modeling electrical storage technologies.....226*
- Haraldsson, Hördur with Deniz Koca and Veasna Kum *Introduction to* generic optimization of policy strategies for textiles- A case study of the Swedish National Waste Plan 2018 (working paper).....231
- Harder, Deane with Lize Duminy A structural model on how gamification can leverage intrinsic motivation in education....232
- Hartvigsson, Elias with Fabio Riva, Emanuela Colombo, and Jimmy Ehnberg *The merry-go-round of electrification programmes:*

- potential pitfalls when only using electricity access as indicator for electrification.....233
- Hayden, Nancy Transforming the Conflict Trap: From Theory to Practice.....234
- Hayden, Nancy with Asmeret Naugle and Mark Smith *Autonomy and* the Future of Work.....240
- Heffernan, Mark with Andrew Page, Jo-An Atkinson, Geoff McDonnell, and Ante Prodan Informing local suicide prevention through codesign of a system dynamics model in Greater Western Sydney (Australia).....241
- Hettesheimer, Tim Improving decision making for strategic production planning in markets with high dynamics and complexity by combining system dynamics and multi-criteria decision making.....242
- Hillen, Stefanie *The impact of local communities on school*development—a case study examining expectations and inclusion
  on a systemic level....243
- Horvat, Andrijana with Vincenzo Fogliano and Pieternel
  Luning Understanding adoption of food innovations: The case of
  insect-based products in the Netherlands (Best Poster Award
  Winner)....244
- Houlder, Dominic with John Morecroft *Using Feedback Systems Thinking and Simulation in Core Strategy Teaching.....245*
- Hovmand, Peter with Ellis Ballard Moving from Mental Models to Technological Rules for Evaluating Impact.....261
- Hovmand, Peter with Jill Kuhlberg, Ke Zhou, Shih-Ying Cheng, Autumn Asher BlackDeer, Katie Chew, Sarah Pritchard, and Patrick Fowler *Relationship and Sexual Violence Prevention....286*

- Howe, Caroline Community Education in System Dynamics for Sustainability.....298
- Hu, Bo with Pascual Cravaack and Martin Gawliczek Drawing Insights from a Small Model and Statistical Data of the US

  Economy.....299
- Huang, Jiaoling with Qin Zhu Can health disparity be eliminated? the role of family doctor played in Shanghai, China....300
- Huebner, Julia How Might Consumer Choice Precipitate an Electricity
  Death Spiral? (Best Poster Award Winner).....301
- Iturriza, Marta with Leire Labaka and Jose Mari Sarriegi *Analyzing the effects of awareness in the city resilience building process.....302*
- Jajal, Priyanka with Trupti Mishra and Chandra Venkataraman *Climate Change Mitigation from Brick Industry in India.....305*
- Jalali, Mohammad with Michael Siegel and Stuart Madnick Decision Making and Biases in Cybersecurity Capability Development: Evidence from a Simulation Game Experiment.....306
- Jalali, Mohammad with Navid Ghaffarzadegan *A Model-Based*Criticism of Optimal Thresholds for PTSD Diagnosis.....307
- Johnson, Jennifer Assessing the Effectiveness of Systems Thinking and the Individual Learner: Improve Understanding of Socio-Ecological System Complexity.....308
- K V, Vishnu with Sabu K and D. Bijulal *Stress Dynamics- A Psychological Study in Police Officers.....309*
- Kampmann, Christian Erik *Circular-economy dynamics in the Danish construction industry.....310*

- Kanak Rajah, Eliarani Understanding the value and effectiveness of participatory system dynamics interventions in cross-cultural contexts: Proposal for a realist review.....320
- Kanungo, Shivraj with Sarah Culbertson *Metrorail: Getting on Track.....321*
- Kapmeier, Florian with Paulo Goncalves Wasted Paradise? Policies for Small Island Developing States to Manage Economic Growth while Preserving Environmental Quality: The Case of the Maldives.....322
- Karapici, Amanda with Stefan Groesser Reshaping the labor market: understanding the dynamics of a skill-biased technological change from the business and engineering education perspective.....324
- Kasperidus, Hans with Peter Biber Systems thinking and systems dynamics skills inquiry in an international master's program in Sustainable Resource Management.....325
- Katz, Stefan with Stefan Groesser Building confidence in Simulation Models using automated analyses.....327
- Keith, Bruce with Mary Keith, Cody Akers, Amanda Ramirez, and Patrick Wall *Dynamics of Migration: Population Growth, Food* Security, and Water Resource Management in the Nile River Basin.....335
- Kenzie, Erin with Wayne Wakeland Presenting interactive causal-loop diagrams in Kumu: Lessons from a concussion recovery model.....336
- Khan, Aima with Birgit Kopainsky, Carmen Lee, Emmy Farha Alias, and Lucia Avila *Best Publishing Practices for Non-System Dynamics Journals: Questionnaire Design.....337*

- Kibbe, Debra with Emily Vall and Karen Minyard How a Childhood Obesity Systems Model Impacted State Policy and Strategy.....338
- Kikuchi, Hiroki with Atsushi Fukuda and Noriyasu Tsumita *Modelling* and Simulation of Adaptation Policies for Flood Event on Land Use and Transportation Fields: The Case of Khon Kaen Area, Thailand.....339
- Kim, Dongha with Benjamin Chang-Kwon Chung, Jihyun Lee, and Seunghyun Yoo Structural Analysis of Urban Walking and Health Promotion: Systems Thinking Approach Focused on Korean Case.....341
- Kim, Gi Joo with Seo Hyung Choi, Seung Beom Seo, and Young-Oh Kim Development of a Shared Vision Planning Model for Participants' Consensus: Application in South Chungcheong Province, South Korea.....342
- Kim, Hyunjung with Sarah Mostafavi and Navid Ghaffarzadegan Strategy for Launching Data-Intensive Services: A Tipping Point for Market Adoption.....343
- Kim, Min with Jinhyung Chon Wetland City Planning for the Controversy Surrounding Water Levels.....345
- Kivuti-Bitok, Lucy with Ddembe Williams, Richard Kikwai, and Abiodun Suleiman Momodu Participatory System Dynamics Simulation Modeling to Improve the Operations of Radiotherapy Department of a Public National Referral Hospital in Kenya....346
- Kleemann, Max Why Not Tit-for-Tat: Dynamics of mutual trust.....347
- Klein, Raphael with Jill Slinger *Integrating flood safety simulation and policy beliefs.....348*

- Kliem, Daniel with Alexander Scheidegger *Transition management in the swiss construction industry.....349*
- Kovalevskii, Dmitrii with Maria Manez, Claas Teichmann, and Lola Kotova Assessing Adaptation Options for Water-Constrained Economy with System Dynamics Hydroeconomic Model.....350
- Krejci, Igor with Jana Poláková and Pavel Moulis *Investigating the dynamics of animal production the case of small holders in the Czech Republic.....351*
- Kuijer, Michel with Arjen Ros and Frits Dankers *A reviewing tool for innovations in coastal care.....352*
- LaVigne, Anne with Lees Stuntz System Dynamics in Primary and Secondary Education.....353
- Landers, Glenn with Karen Minyard and Jane Branscomb *Using Causal Loop Diagrams as an Evaluation Tool: A Case Example of Collective Impact.....372*
- Lane, David with Elke Husemann, Darren Holland, and Abdul Khaled Getting A Handle On Norovirus Foodborne Transmission Mechanisms: A study for the Food Standards Agency.....373
- Lee, Andy with Benjamin Zukowski Modeling Andean bear livestock depredation, local risk perception and tolerance in northern Ecuador.....377
- Lee, Seulbi with Moonseo Park and Hyun-Soo Lee Robustness
  Estimation of the Seismic-Damaged Electric Power System in the
  Context of Failure Propagation.....378
- Lee, Tsuey-Ping Improving Qualitative Social Scientists' Confidence in System Dynamics Case Studies.....380
- Lerch, Christian with Cornelius Moll, Angela Jäger, Tim Hettesheimer, and Djerdj Horvat *Grounding Simulations on Firm-Level Data*

- Sets An extended approach for evidence-based policy design.....389
- Li, Jianbing A Simple System Dynamics Model to Examine the Impacts of Operating Parameters on Organic Waste Composting....390
- Li, Tianyi Will Talented Outliers Help Improve Team Performance?

  The Significance of Feedback Learning.....391
- Liu, Chang with Chang Liu, Xiaojing Jia, Qin Zhu, and Feng Lei *The Feedback Loop Delay Analysis of Socio-Economic System Based on Stock & Flow In-Tree Modeling and Simulation....394*
- Lokhande, Nitin with Haripriya Gundimeda Is 'rural employment guarantee' effective in providing sustainable livelihood? An Analysis using a System Dynamic Model.....395
- Lungwitz, Vivien Comparing online with paper pencil testing mode when solving stock flow problems using different problem solving strategies.....396
- Luzuriaga, Diego with Mariana Ameri A Social Integration Case.....403
- MacAskill, Stefen Enhancing Affordability Outcomes for Low Income Households Through Green Building Policy in Australia: An Integrated System Thinking Approach.....404
- Malczynski, Leonard *Modeling is dead; Long live Modeling: regime* change in model construction.....405
- Manez, Maria with Dmitrii Kovalevskii Participatory System Dynamics Modelling for Adaptation to Extreme Hydrological Events under Conditions of Climate Change.....414
- Mansouri, Mojdeh System dynamics modeling of Locomotive's supply chain networks—Iranian Railways.....417

- Marcal, Katherine with Patrick Fowler, Kenneth Wright, Peter Hovmand, and Saras Chung Capability Traps Impeding Homeless Services: A Community Based System Dynamics Evaluation.....418
- Martinez, Lina with Manuel Garcia-Perez and Michael Wolcott *A*System Dynamics Approach for the Design of Alternative Jet

  Fuel and Co-Products Supply Chains in the Pacific

  Northwest.....419
- Martinez, Mauricio with Jorge Andrick Parra Valencia and Laura Cardenas *A model for understanding the highway construction, deterioration and maintenance......420*
- Martinez-Moyano, Ignacio with Jessica Trail *Understanding Time*varying Correlation in Dynamic Systems.....421
- Mathur, Mihir with Kabir Sharma, Ankila Hiremath, Abi Vanak, Nirav Mehta, Ramya Ravi, Ovee Thorat, Madhura Niphadkar, and Swati Shresth *Modeling Coupled Human and Natural Systems in Banni Grassland, India, for Multi-Stakeholder Engagement and Consensus Building.....422*
- Mathur, Mihir with Kabir Sharma, Ovee Thorat, Ramya Ravi, Swati Shresth, Ankila Hiremath, Abi Vanak, Nirav Mehta, and Madhura Niphadkar *Understanding Changes in Governance Systems of Banni Grassland, in India.....423*
- Mathur, Mihir with Kelsey Werner, Ellis Ballard, and Pratiti Priyadarshini Socio-Ecological Approach to Livelihood: From Theory to Proof of Concept.....424
- Mathur, Mihir with Barath Mahadevan, and Adithya Subramanian *Modelling Impacts of Climate Change Risks and Adaptation Responses in Oil Refineries in India.....425*

- Memela, Naledi An Expansion of the Long Term Impact of Renewable Wind Technology Implementation in South Africa.....426
- Minato, Nobuaki A business ecosystem modelling for a socio-technical R&D project.....433
- Mindila, Agnes with Joseph Muliaro Wafula Last Mile Vaccine Stock Management Dynamic Model for Low and Medium Income Countries (LMICs).....434
- Mirhanoglu, Adnan with Ali Kerem Saysel Sustaining Groundwater Irrigation in Mardin Kiziltepe Plains of South East Turkey.....435
- Moghadam Manesh, Mehdi with Gholamreza Eslamifar A system dynamics model to investigate the effect of mismanagement on Iran's oil and gas projects: A case study of South Pars field.....436
- Mohammadifardi, Hamed with Andre Unger and Mark
  Knight Development of an asset management planning tool for
  integrated wastewater collection and treatment systems (Best
  Poster Award Winner).....439
- Morrison, J. Bradley *Expressions of Resilience in the Emergency Department.....467*
- Moxnes, Erling Expert advice on climate policy and effects of fake advice.....468
- Moxnes, Erling with Sergey Naumov *Analysis of dynamic models by optimization....489*
- Mulyukin, Alexey with Ivan Perl Executing system dynamics models on GPU.....492
- Muthu Elandy, Kasturi with Owen Conlan *Modelling Behavioral Impacts: The Case of Publishing School League Tables.....493*

- Muthu Elandy, Kasturi with Owen Conlan Exploring The Effects Of
  Mass Dissemination Of Performance Data: The Case Of School
  Performance Tables.....494
- Namin, Amir with Mohammad Jalali, Vahab Vahdatzad, Sagar Kamarthi, and Jacqueline Isaacs *Adoption Dynamics of Patient-Specific Knee Implants.....495*
- Naumov, Sergey with David Keith and Charles Fine *The Effect of Autonomous Vehicles on Demand for Driving: Is Pooling the Solution to Avoiding Traffic Gridlock?.....496*
- Naumov, Sergey with Rogelio Oliva Refinements on Structural Dominance Analysis: Interpretation of parameter elasticities.....497
- Nichols, Jonathan with Anaely Aguiar Rodriguez and Birgit Kopainsky *A Tale of Two Managers: testing mental models of an intractable business problem.....498*
- Nishi, Nobuo with Nayu Ikeda, Takehiro Sugiyama, Kayo Kurotani, and Motohiko Miyachi *A simulation study to shorten a long-term care period and to reduce national medical care expenditure in Japan.....502*
- Nordby, Anders with Harald Ulrik Sverdrup and Havard Vibeto *System Thinking for Gamification Design.....505*
- Nordby, Anders with Harald Ulrik Sverdrup and Havard Vibeto Games are systems! teaching Game Design with System
  Thinking.....506
- Nordby, Anders with Harald Ulrik Sverdrup, Ulrik Sverdrup, and Kristine Øygardslia *The best Schooldays Ever: Using systems* based pervasive games for teaching in Norway.....507
- Novik, Alina with Iryna Lukianenko *The impact of migration on the economic stability in Ukraine.....508*

- Ntonyane, Lungile with Naledi Memela Effects of leakage on air heater thermal performance.....509
- Ntsoane, Mapule with Naledi Memela Simulating the Water Usage at a Coal-Fired Power Station.....512
- Odoemena, Kelechi with Jeffrey Walters and Olubunmi Alawode *The Drivers of Livestock Productivity in Nigeria.....513*
- Olafsdottir, Anna with Ingunn Gudbrandsdottir, Harald Ulrik Sverdrup, Gudrun Olafsdottir, and Sigurður Bogason *On modelling the* price of beef and salmon using a fully dynamic approach.....520
- Olaya, Camilo with Juliana Gomez-Quintero, Laura Guzmán, Ivonne Natalia Hernández, Maria Alejandra Victorino Jimenez, Andrea Navarrete, Alejandro Astaiza, and Juan Sebastián Guerrero Naffah *Designing Systemic Policies: Zombies in the* Classroom.....524
- Oliveira, Igor Modelling a climate-related causal story on the emergence of the Darfur War in Sudan.....526
- Oostdijk, Maartje Sequential exploitation, macro and micro-drivers of global fisheries expansion....531
- Ortiz, Daniel with Adalberto Prada, Luis Rabelo, and Edgar Gutierrez-Franco *Estimation of the demand of cars, utility vehicles and pick up in Megacities through system dynamics and agent-based simulation.....532*
- Österlin, Carl with Peter Schlyter *Different worldviews as impediments* to integrated nature and cultural heritage conservation management.....533
- Paich, Mark with Pia Ramchandani and Kyungha Lim *AI Adoption in Subscription Business Model.....537*

- Papachristos, George Analytical sociology for sociotechnical transition research: Bridging case study and system dynamics.....538
- Papachristos, George The low carbon transition in the UK building sector must make financial sense: a hybrid system dynamics-bottom up modelling framework.....562
- Papachristos, George with Esfandiar Burman, Nishesh Jain, Nici Zimmermann, Dejan Mumovic, and Michael Davies *Towards the* low carbon transition in the construction industry: A multimethod framework of project management operations and total building performance.....584
- Papachristos, George with Nishesh Jain, Esfandiar Burman, Nici Zimmermann, Dejan Mumovic, and Michael Davies *Project management operations and building performance in the construction industry: A multi method approach applied in a UK public office building.....604*
- Pargar, Farzad with Jaakko Kujala, Kirsi Altonen, and Sampsa Ruutu *Value Creation Dynamics in Project Alliance.....625*
- Parra Valencia, Jorge Andrick with Adriana Rocío Lizcano Dallos and Eliecer Pineda Ballesteros *Mechanism for Promoting Motivation, Confidence and Autonomy Through Synchronic Communication Sessions in Virtual Learning Environments.....626*
- Parra Valencia, Jorge Andrick with Adriana Rocío Lizcano Dallos and Eliecer Pineda Ballesteros Strategic Dynamic Thinking to Manage Public Order in Colombia: A Framework to Improve Post-Conflict´s Security.....627
- Peng, Bo with Ying Qian, Lei Xu, and Liping Kuai *A Study on Combat Process Simulation and Casualty Forecasting.....628*
- Pérez, Jairo J. with Manuel Betancur A social simulation to understand driver's conduct changes in emerging countries: Can

- technological interventions from pedestrians accelerate respect at permitted crossings?.....629
- Perl, Ivan with Alexey Mulyukin Application of System Dynamics for Real-time Cloud Environment Monitoring and Management.....630
- Perl, Ivan with Olga Kalyonova Multi-modal data approach as a new way for presentation and understanding of System Dynamics models.....631
- Peterson, Steve Teaching a System Dynamics Approach (in a wide variety of "educational" contexts).....632
- Pfaffenbichler, Paul with Astrid Guehnemann, Guenter Emberger, and Simon Shepherd Simulating transport and societal effects of automated vehicles (Best Poster Award Winner).....642
- Picchione, Katherine An Explanation of Oscillating Cashflows

  Experienced by Ugandan Smallholder Farmers: The First Use of
  a Model to Simulate the Effects of Trader Business Strategies on
  Farmer Livelihoods.....645
- Polojarvi, Dana Ilmari with Erika Palmer Descriptive System Dynamics Modeling: Using system dynamics modeling as a bridge between disciplines.....648
- Prasad, Pooja with Milind Sohoni Farmponds for Horticulture: Boon or Curse? Analysing Impact on Farm Profitability, Resource Sustainability and Social Welfare (Barry Richmond Award Winner).....649
- Pruyt, Erik Migration Models for Policymakers.....653
- Pruyt, Erik with Stefan Wigman, Erin Bartholomew, Reza Hesan, Connor McMullen, Shajeeshan Lingeswaran, Andreas Yunus, Mohammad Ammar Faiq, Mikhail Sirenko, and Willem

- Auping Tackling Grand Challenges with Multi-Scale System Dynamics Modelling and Simulation.....654
- Qi, Liang with Cleotilde Gonzalez Mathematical knowledge is related to Stock-Flow task performance and the use of correlation heuristic for highly educated Chinese participants.....655
- Qian, Ying with Fang Yu, and Bo Hu A System Dynamics Model for Developing Small Towns with Characteristic Features.....656
- Qorbani, Davood with Stefan Groesser *The impact of Industry 4.0* technologies on production and supply chains.....657
- Rahmandad, Hazhir with Shayne Gary Impact of Delays and Noise on Strategies and Performance.....658
- Raman, Krishnan Modeling of Beliefs-Attitudes-Behavior.....662
- Randers, Jorgen Lessons from seven attempts at "saving the world".....663
- Randers, Jorgen with Ulrich Goluke and Beniamino Callegari *The* causal structure of the MODCAP model of a modern capitalist economy.....671
- Reitinger, Lindsey Towards Environmental Justice: Balancing Urban Greenspace and Gentrification.....673
- Rey, Andrés with Jorge Andrick Parra Valencia and Laura Cardenas *Dynamic of Transparency in Open Government Data Ecosystems.....674*
- Rich, Eliot with Carmine Bianchi and Luis Luna-Reyes *Collaborative Governance: A Research Agenda.....675*
- Richardson, George with David Andersen, Colin Eden, and Fran Ackermann Stakeholder Interaction Theory: Merging Goal Mapping, Stakeholder Analysis, and Feedback Mapping.....676

- Rill, Wim with Johannes Halbe *The System Dynamics model-of-the*field used as a Tool for Strategy Implementation Design, Control and Performance Evaluation.....677
- Riva, Fabio Investigating and modelling endogenous socio-economic dynamics in long-term electricity demand forecasts for rural contexts of developing countries.....678
- Rockart, Scott with Shayne Gary Relating Policy Differences to Behavior Differences across Family Members.....690
- Rodriguez, Luz-Angélica with Enrique Estupinan *Public Policy Impact* in the Life Cycle of the Electrical and Electronic Equipment Waste. Colombia exemplifies Latin America Status.....691
- Rodriguez, Luz-Angélica with Enrique Estupinan and Omar Andrés Parra Urrego *Associativity and Risk Attitude in Cundinamarca-Colombia Dairy Farmers Conditions.....692*
- Ros, Arjen with Michel Kuijer and Eize Drenth *Predictive Asset Management Model Case Study 'Bruggenmodel'.....693*
- Ryzhenkov, Alexander Shedding Light on the Harvesting Control Rules in Abstract Bioeconomic Models.....694
- Rúa, Diego with Monica Castaneda and Isaac Dyner *Simulating the* efficient diffusion of photovoltaics: an urban metabolism approach.....716
- Saarinen, Lauri *Innovation opportunities emerging from* responsiveness and co-located manufacturing.....717
- Saeed, Khalid Circumscribing system dynamics modeling and building confidence in models A personal perspective.....723
- Saeed, Khalid with Elisabeth Ryder and Amity Manning Cancer as a system dysfunction.....728

- Sahin, Oz with Rodney Stewart, Mehdi Hafezi, and Brendan Mackey *An Accessible Robust Integrative Dynamic approach for an ecosystem-based risk assessment in Small Island Developing States.....732*
- Sahin, Özge with Feyyaz Sentürk, Yaman Barlas, and Hakan Yasarcan *Modeling the Pharmacodynamics of Doping Drugs and Analysis of False Negative Tests.....733*
- Sarriegi, Jose Mari with Marta Iturriza and Leire Labaka *Lessons* learned in modeling processes within research projects.....736
- Schaffernicht, Martin with Stefan Groesser Making Mental Models of Dynamic Systems Comparable.....737
- Schoenberg, William with Pal Davidsen *Understanding Model Behavior Using Loops That Matter.....738*
- Schoenenberger, Lukas with John Ansah, David Matchar, and Salman Ahmad Emergency Department Crowding in Singapore: Ways to Restore the Balance between Demand for and Supply of Emergency Medicine.....739
- Schrunk, David with K.C. Tran *The Science of Laws.....740*
- Schölvinck, Odilia with Nteniz Kalenter and Erik Pruyt *Riparian water* disputes in the Volta Basin, due to new irrigation practices in Burkina Faso?.....741
- Schölvinck, Odilia with Nteniz Kalenter, Bastiaan Manintveld, and Erik Pruyt *Health issues (schistosomiasis) due to new irrigation* practices in the Volta Basin.....742
- Selvakkumaran, Sujeetha with Erik Ahlgren Determining the causal loops in a local energy transition process: the Dalsland case.....746

- Senge, Peter Systems thinking and collective learning: Reflections from three decades in the field.....747
- Shafiei, Ehsan with Brynhildur Davidsdottir, Reza Fazeli, Hlynur Stefansson, Eyjólfur Ingi Ásgeirsson, and Jonathan Leaver Simulating the impact of fiscal incentives on electromobility transition and prospects for Icelandic energy-economic system.....756
- Sharma, Kabir with Mihir Mathur, Ankila Hiremath, Abi Vanak, Nirav Mehta, Madhura Niphadkar, Ovee Thorat, Ramya Ravi, and Swati Shresth *Modelling Dynamics of Prosopis juliflora in Banni, India, using a Land-Biomass Simulation Model.....757*
- Shiboub, Itad with Gabriel Assaf Development of a Recycling System Policy for Construction and Demolition Waste Materials with Applications in Libya toward Sustainable Development.....758
- Shyr, Oliver with Simon Shepherd, Chun Man, Han-Liang Lin, Yiya Hsu, Chien-Hung Tu, Chieh Kuo, Yao Hsu, Chung Chen, and Pei Wu *Tourism, Transport, and Land use: A Dynamic Impact Assessment for Kaohsiung's Asia New Bay Area.....765*
- Shyr, Oliver with Simon Shepherd, Kaida Chen, Pengbo Li, Han-Liang Lin, Hsaioting Wang, Yanciao Sie, Weihsuan Lo, Xiaoyue Wang, and Chun Man *A Spatio-temporal Industry Dynamic Simulation of Taoyuan Aerotropolis in Taiwan.....766*
- Slinger, Jill with Floortje d'Hont Flipping the Advanced System Dynamics classroom.....769
- Smith, Zander Insurance Dynamics.....770
- Song, Kihwan with Jinhyung Chon and Nam Hee Choi Analysis of the Social-Ecological System of the Four Major Rivers Project and Resilience Improvement Plan with a Focus on the Ecosystem Services of the Nakdong River....771

- Sooknanan Pillay, Nalini with Josephine Musango and Alan Brent *Drivers Impacting Battery Electric Vehicle Monthly* Repayments.....772
- Spittler, Nathalie with Ehsan Shafiei and Brynhildur
  Davidsdottir Geothermal resource dynamics and implications
  for energy system development.....775
- Steinmann, Patrick with Stefan Wigman Subscript-Based Geospatial Migration Dynamics.....776
- Stjernquist, Ingrid with Peter Schlyter Stakeholder group modelling as a participatory tool to identify and reduce barriers for comanagement of multifunctional landscapes.....778
- Stroud, Hannah with Paul Kirshen and Georgia Mavrommati Sea Level Rise in Coupled Human and Natural Systems: A case study of East Boston....781
- Suprun, Emiliya with Oz Sahin, Rodney Stewart, Kriengsak Panuwatwanich, and Yaroslav Shcherbachenko *To innovate or not to innovate: A Russian case of the construction industry.....782*
- Sverdrup, Harald Ulrik with Anna Olafsdottir, Vala Ragnarsdottir, and Deniz Koca Developing the WORLD6 integrated global model; causally linking natural resource use, population, energy, commodities, health, governance and the economy.....798
- Tadesse, Aklilu Tilahun Framework for Designing an Online Interactive Learning Environment for Complex Dynamic Systems.....802
- Takahashi, Yutaka Rethinking of Continuous Models with Approximate Discrete Calculations in Simulation Software.....807

- Taylor, Cameron with Tiru Arthanari Simulation for Evaluating a Proposed Systems Architecture for Enabling Supply Chain Coordination in Disaster Relief.....810
- Tellioglu, Nefel with Yaman Barlas Estimating Causal Relations of Dynamic Models from Real-Life Data.....811
- Testa, Ginevra with Bent Erik Bakken A comparative, simulation supported study on the diffusion of battery electric vehicles in Norway and Sweden.....812
- Thompson, Grace Hosting the Olympics: Opportunity or Catastrophe? Introduction....816
- Torres, Julian with Harald Ulrik Sverdrup and Arnaud Diemer Sustainable Resource Management in European Steel Supply Chains.....817
- Toyokawa, Satoshi with Sachiko Iijima, Takehiro Sugiyama, Nobuo Nishi, and Yutaka Takahashi *A side effect of fall prevention for inpatient elderlies.....826*
- Trailer, Jeff with Si Cheng *A Temporal Study on the Profitability Growth Relationship.....827*
- Ulli-Beer, Silvia with Daniel Hug Causal Process Models for Efficient Energy Project Consultation and Strategy Development.....828
- Valcourt, Nicholas with Jeffrey Walters Evaluating Dynamic Processes of Rural Water Service Delivery Schemes in Sub-Saharan African Communities to Inform Development Policy.....832
- van Arensbergen, Pleun with Monic Lansu, Inge Bleijenbergh, and Etiënne Rouwette; *The power of group model building; a micro level analysis of social interaction during group model building....833*

- Vogt, Simeon with Meike Tilebein *Modeling neodymium material* flows in Germany with the purpose of establishing a recycling chain....837
- Voyer, John with Eric DeLuca and Jordyn Dorval Revenue Growth in Worker's Compensation Insurance: The Role of Safety Training.....840
- Voyer, John with Zakariah Vanderlaan, Michael Kelley, Rachel Brower, and Daniel LeVasseur *Balancing Growth and Service Quality In an Online Veterinary Services Business.....841*
- Waimbo, Korinus Nixon with Dragan Savic and Fayyaz Memon Water-Food-Energy Nexus Investigation for Human Development.....842
- Wakeland, Wayne with Erin Kenzie Computational Model for Traumatic Brain Injury.....843
- Wakeland, Wayne with Takuro Uehara and Yoko Nagase *Ecological Economic System Modelling with a Focus on Endogenous Innovation and Resilience.....844*
- Wasserbaur, Raphael with Tomohiko Sakao Extending environmental impact assessments of consumer products with System Dynamics.....845
- Wheat, David with Marianna Oliskevych *The Canonical New Keynesian Monetary Policy Model: A System Dynamics Translation....846*
- White, Ann Marie with Kristen Hassmiller Lich Learning about shared risk and protective factors to promote comprehensive and collaborative approaches to prevent suicide and other risk-related forms of premature death by injury.....849
- Wieck, Gian Dynamic Analysis of the Lionfish Diffusion in the Caribbean Sea and Development of a Policy Game.....850

- Wieck, Gian with Alec Eckert Dynamics of Institutional Change.....853
- Wieck, Gian with Andres Montellano Zuna Analysis of the Dynamic Developments in the Local Lodging and Rental Housing Market in Lisbon.....854
- Woodham, Emma with Siôn Cave and Alison Gray *Simulation of the management and disposal of Low Level Radioactive Waste in the United Kingdom.....858*
- Yararbas, Ulkem with Emre Goktepe Systems Thinking in Education in Turkey First 5 Years.....872
- Yoon, In-Seok with Hyun-Soo Lee and Moonseo Park *Analysis of Korean Housing Policy Based on Policy Mechanism.....879*
- Yucel, Gönenç with Mert Edali *A Comparative Analysis of Alternative Designs for Automated Clustering SD Model Output.....881*
- Zapata Riveros, Juliana with Merla Kubli and Silvia Ulli-Beer *The best defense is a good offense: Prosumer communities as a business strategy for electric utilities.....882*
- Zeijlemaker, Sander with Jorge Daniel Uriega Silva and Guzay Pasaoglu *Malware dynamics: how to develop a successful antimalware defense reference architecture policy.....884*
- Zelinka, David with Bernard Amadei *A new insecure-secure diffusion* archetype to model complex anthropocentric systems.....885
- Zhang, Robert Zhenping with Haiyan Yan, Jiayin Qi, and Enzo Bivona Framing alternative policies to achieve university mission: a case study of a Chinese regional university.....886
- Zhang, Robert Zhenping with Yin Yi Rachelle Yang Exploring the Dynamics of Market Share in High-Tech Companies in Taiwan.....888

Zhao, Wang with Khaled Mohamed Soliman Gaafar *Procrastination*Dynamics: A Study of Delay Tactics and Their

Implications.....889

Zhu, Quan with Henk Akkermans Towards Condition Based Maintenance for Electro Mechanical Components.....910