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DOCKSIDE  
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**WORKSHOP 1**

**Computational Modeling of Natural Resources and Maritime Issues**

**Trainers:**

*Thomas Vallée (UN),  
Murat Yildizoglu (University of Bordeaux),  
Pauline Pedehour (UN)*

This course will describe how computational tools, like agent based model or graph theory, can be used in order to model the behavior of relevant bio-economic or maritime issues. That is, the objective of the workshop is to allow the participants to understand, through the design of specific bio-economic models that allow to take in account both economic and natural resources dynamics, the potential conflicts between natural resources and economic objectives and their potential conflicts.

Keywords: Bioeconomic modelization, agent-based model, numerical simulations

**Content - Key areas:**

- Introduction to Bioeconomic Modelization
- Introduction to agent-based modeling
- Applications in fishery management

**Outcome of the course:**

This course will train the participants to first understand the concept of bioeconomic modelization applied to fishery resource management with a particular attention paid to simulations in Excel. Then principles of agent/individual-based modeling and corresponding introduction to NetLogo Software will be taught. Simple examples from water and fishery management will be provided. At the end, following the hands-on sessions, the participants should be able to demonstrate an understanding on how to build simple agent-based simulations tools to analyze environmental and natural resources management issues.

It is expected that after finishing this training, the participants will be able to:

- Understand Bio-Economic and maritime issues.
- Use the theory and concepts to highlight interactions and conflicts.
- Learn to model computationally bioeconomic dynamics by
  - Creating a simulation program
  - Analyzing the results of the simulations

**Teaching methodologies:**

The training course has both theoretical and practical perspectives on maritime and bio-economic issues. The lecture will be delivered in English and will follow the styles of active learning rather than traditional pedagogical styles. Therefore, all participants need to actively take part in group works, discussions and presentations in class (to strengthen the participants' ability to use the risk management tools on real-life cases studies). Hands-on sessions on computers will be part of the course, and the students will be required to come with their computers.

**Target participants:**

MSc and /PhD students, staff from universities, researchers.

**Prerequisites:**

- Basic understandings on Excel
- Installation of NetLogo<sup>1</sup> before the workshop
- It is expected that the participant should have some basic understanding of programming and mathematical optimization concepts.
- It is also expected that, during the training workshop, the participants will have to discuss potential applications of the methodologies learned either for research opportunities or for potential reports.

**Reading materials and lesson plan:**

Pre-reading materials and the lecture plan will be send to all participants (via email or Dropbox) at least 2 weeks prior to the course. Participants are requested to read the documents before the training. Additional background readings will be provided during the training if necessary.

The participants will also be invited to install some free software on their computers before coming to the workshop (see above the prerequisites).

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<sup>1</sup> <http://ccl.northwestern.edu/netlogo/>

<b>Date</b>	<b>Time</b>	<b>Activities</b>	<b>Lead person</b>	<b>Readings</b>
<b>October 2, 2018  (Tuesday)</b>	<b>MORNING SESSION</b>			
	8.15-8.45	Welcome, self-introductions from the all trainers and participants, an overview on schedule, group formation and discussion on the practical issues	Murat Yildizoglu Thomas Vallée Pauline Pedehour	
	8.45-9.45	1.1 Introduction to BIO ECONOMIC Modeling	T. Vallée	Reading list #1
	9.45-10.15	Tea-break		
	10.15-11.30	1.2 BIO ECONOMIC Modeling	T. Vallée	Reading list #1
	<b>AFTERNOON SESSION</b>			
	13.45-15h15	1.3 BIO ECONOMIC Modeling : Excel Exercises	T. Vallée	Exercices Set #1 (distributed in class)
	15.15-15.45	Tea-break		
	15.45-17.00	2.1 Introduction to Multi-Agent Modeling	Murat Yildizoglu	Reading list #2, [W], chap. 0-1

Date	Time	Activities	Lead person	Readings
<b>October 3, 2018</b>  <b>(Wednesday)</b>	<b>MORNING SESSION</b>			
	8.15-9.45	2.2. Multi agent Modeling with Netlogo 1	Murat Yildizoglu	[NL] Tutorials
	9.45-10.15	Tea-break		
	10.15-11.30	2.3. Multi agent Modeling with NetLogo 2	Murat Yildizoglu	[NL] Programming manual
	<b>AFTERNOON SESSION</b>			
	13.45-15h15	2.4. Multi agent Modeling: Application 1	Murat Yildizoglu	Reading list #2 – [MSM] Application 1 description
	15.15-15.45	Tea-break		
	15.45-17.00	2.5. Multi-Agent Modeling: Application 1 +2	Murat Yildizoglu	Application 2 description

Date	Time	Activities	Lead person	Readings
<b>October 4, 2018  (Thursday)</b>	<b>MORNING SESSION</b>			
	8.15-9.45	2.6. Multi-Agent Modeling: Application 1 +2	Murat Yildizoglu	Application 2 description
	9.45-10.15	Tea-break		
	10.15-11.30	Multi agent Modeling : Water Management illustration	Pauline Pedehour	Reading list #3
	<b>AFTERNOON SESSION</b>			
	13.45-15h15	Multi-Agent Modeling: Working class on case study for presentation	Murat Yildizoglu Thomas. Vallée Pauline. Pedehour	
	15.15-15.45	Tea-break		
	15.45-17.00	Multi-Agent Modeling: Working class on case study for presentation	Murat Yildizoglu Thomas. Vallée Pauline. Pedehour	

**Link for the readings** (if the link does not work, please let us know):

### **Reading List #1**

Colin W. Clark, The Economics of Overexploitation, Science, New Series, Vol. 181, No. 4100. 1973, pp. 630-634.

[https://www.researchgate.net/publication/6103453\\_The\\_Economics\\_of\\_Overexploitation](https://www.researchgate.net/publication/6103453_The_Economics_of_Overexploitation)

H. Scott Gordon , The Economic Theory of a Common-Property Resource: The Fishery, The Journal of Political Economy, Vol. 62, No. 2 (Apr., 1954), pp. 124-14

<https://econ.ucsb.edu/~tedb/Courses/Ec100C/Readings/ScottGordonFisheries.pdf>

R. Q. Grafton, T. Kompas, R. W. Hilborn, Economics of Overexploitation Revisited, Science 07 Dec 2007, Vol. 318, Issue 5856, pp. 1601, DOI: 10.1126/science.1146017

<http://science.sciencemag.org/content/318/5856/1601.long>

<https://pdfs.semanticscholar.org/af06/8d1cf63bc719c88c1bcf1a8bf4b80b604441.pdf>

Garrett Hardin , The Tragedy of the Commons, Science, New Series, Vol. 162, No. 3859 (Dec. 13, 1968), pp. 1243-1248.

<http://science.sciencemag.org/content/sci/162/3859/1243.full.pdf>

### **Reading List #2**

[GV] V. Grimm and S. F. Railsback. Individual-based Modeling and Ecology. Princeton University Press, 2005.

[MSM] Moustakas, A., W. Silvert, A. Dimitris Manolakis, 2006, A spatially explicit learning model of migratory fish and fishers for evaluating closed areas, Ecological Modelling, 192, 245-258.

<https://www.sciencedirect.com/science/article/pii/S0304380005003406>

[W] Wilensky, Uri, & Rand, William. 2015. An introduction to Agent-based Modeling. Modeling natural, social, and engineered complex systems with NetLogo. MIT Press.

[NL] NetLogo Documentation: <https://ccl.northwestern.edu/netlogo/docs/>

### **Reading List #3**

For a better theoretical comprehension of the model the part 2. “A formal statement of the problem” can help:

AMBEC, Stefan, SPRUMONT, Yves, *et al.* *Sharing a river*. Université de Montréal, Centre de recherche et développement en économique, 2000.

Link : <https://papyrus.bib.umontreal.ca/xmlui/bitstream/handle/1866/332/2000-08.pdf>