

SUMMER SCHOOL – ADVANCED LCA METHODOLOGIES AND TOOLS: UNCERTAINTIES AND VARIABILITY

5th – 9th June 2023

Mines Paris, Sophia Antipolis (France)

ORGANIZED BY ECOSD NETWORK

This course is open researchers and professionals working on environmental evaluation based on Life Cycle Assessment, with a priority given to PhD students from institutions belonging to EcoSD network. It is coordinated by the research team of the center Observation, Impacts, Energy of MINES Paris – PSL University, with the support of EcoSD network.

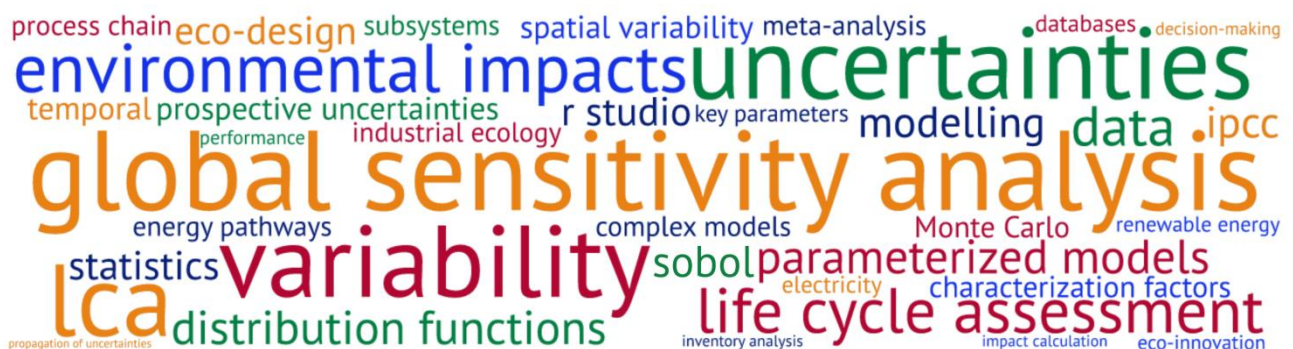


ECOSD

EcoSD (Eco-conception de systèmes durables, standing for Eco-design of Sustainable Systems) Network is a French association with the objective of encouraging collaboration between academic and industrial researchers to create and spread advanced knowledge in eco-design fields. This initiative aims at helping a global sustainable development process at national and international level.

ORGANIZERS

This course is partly funded by EcoSD. It is hosted by Mines Paris – PSL University at the site in Sophia Antipolis (close to Nice, in the French Riviera). It is validated by the Doctoral School in Engineering Sciences from MINES Paris and Arts & Métiers ParisTech.



PRE-REQUISITES

Basics on LCA methodology and practice of an LCA software (e.g. SimaPro, OpenLCA, Brightway, GaBi...)

Basics in Statistics

English

Basics in Python. If needed, resources can be found there:

- [Jupyter notebook](#) on basics of Python
- [Synthetic sheets](#) on basics of python
- [MOOC Python](#) on FUN website (in French)
- Jupyter Notebook [Tutorial video](#) for Beginners with Python (by Dave Gray)

OBJECTIVES

Life Cycle Assessment (LCA) is one of the most widespread environmental management tools and can provide relevant information for the debate on the concerns of certain technologies in diverse production sectors. Providing environmental information for policy makers is necessary to answer the questions on major concerns such as resource depletion, global warming or social acceptance.

However, LCA requires the collection of a large amount of data with different levels of reliability. These uncertainties are propagated to LCA results and may affect the interpretation and conclusions of the analysis. Moreover, real systems are affected by inherent variability as a result of geographical, temporal and technological specificities. It is thus important to characterize these variations and their effect on LCA results. Therefore, it is necessary to assess and understand the possible sources of uncertainty and variability and to rank them in order to highlight the priorities to minimize the environmental impacts of the evaluated technologies.

This PhD course is oriented towards a major key issue for LCA, namely understanding and handling uncertainties in LCA. Some of the key issues addressed during the course will be:

- Reminding statistics fundamentals essential to apply uncertainty and sensitivity analysis in LCA
- Distinguishing between UNCERTAINTY and VARIABILITY in LCA studies
- Parameterized models and reduced parameterized models applying Global Sensitivity Analysis (GSA) for energy pathways
- Uncertainties, spatial and temporal variations in LCA studies



This PhD training alternates theory (7 x 1h30 courses) and practice (3h workshop + 17h30 h work on case study). The theoretical fundamentals learned during the lectures will be applied to a case study on energy pathways. Python programming language and LCA-specific libraries Brightway2 and lca_algebraic will be used. The practical project will be developed in teams (2-3 people).

TEACHING STAFF

- Philippe BLANC (Full Professor at MINES Paris – PSL University)
- Raphaël JOLLIVET (Research Engineer at MINES Paris – PSL University)
- Mathilde MARCHAND LASSERRE (Researcher at MINES Paris – PSL University)
- Paula PEREZ-LOPEZ (Research Associate Professor at MINES Paris – PSL University)
- Joanna SCHLESINGER (Research Engineer at MINES Paris – PSL University)

CONTENT

1. Introduction to uncertainties and variability related to LCA
2. Reminder of statistics fundamental concepts
3. Sensitivity analysis: Definition and statistical tools
4. Uncertainty Analysis in LCA
5. Global Sensitivity Analysis (GSA) in LCA
6. Parameterized models & reduced parameterized models (simplified models) based on GSA
7. Spatial-temporal modeling – Sectorial scale
8. Workshop: example of implementation of a parameterized LCA model using Brightway2 and complementary lca_algebraic python library
9. CASE STUDY: Assessing the environmental impacts of energy pathways – Uncertainty and variability

TEACHING MATERIAL

All participants will receive:

- The lecture presentations in PDF format;
- A printed document presenting the case study;
- A jupyter notebook and supporting files for the case study plus a temporary access to an online computer server
- A bibliographic list of major scientific publications in relation to each module

Language: ENGLISH

LOCATION

MINES Paris – PSL University, Sophia Antipolis, France. The school is located at the technology park of Sophia Antipolis, in the commune of Valbonne. Access is detailed here:

<http://www.oie.mines-paristech.fr/Accueil/Informations-pratiques/>

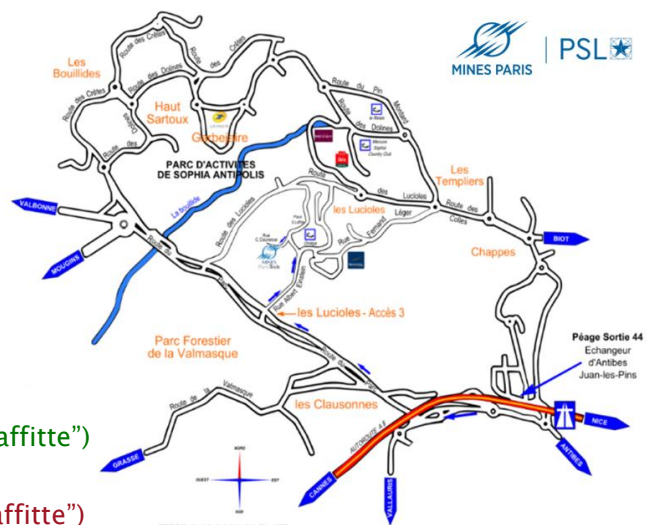
To get here by bus:

From Nice

- Line 630 Nice < Sophia (Bus stop “Sophie Laffitte”)

From Antibes

- Line A (Bus stop “Dugommier” to “Sophie Laffitte”)



ACCOMMODATION:

Accommodation and meals are not included in the registration. Some accommodation options:

In Sophia Antipolis:

- OMEGA hotel (3 stars): very close to Sophia Antipolis site of MINES Paris, 5 min walking. Convenient to get to MINES Paris School, but be aware that Sophia Antipolis is very quiet and has no public transportation options after 20:30.
- Némea (aparthotel): affordable accommodation, relatively close to MINES Paris, 5 min by bus or 30 min walking. Same limitations for transportation in the evening as OMEGA hotel.

In Antibes, more pleasant for social activities in the evening:

- Hotel de l'Etoile: you will have to take the bus (line A) to come to Sophia Antipolis site of MINES Paris. A special rate is available for MINES Paris, so please indicate that you are booking for MINES Paris to get the special rate.
- Alternative hotels: Modern Hotel, Le Relais du Postillon (A bit more expensive)

REGISTRATION & CONTACT

To register, fill in [this form](#) before 20th April, 2023. Participation confirmation will be given at the end of April.

Free registration for Academic researchers and EcoSD members.

For any question, you can contact :

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Ms. Joanna SCHLESINGER

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MORE INFORMATION

Please, visit the website of the Centre Observation Impacts, Energie (O.I.E.) to get more information on this training:

<http://www.oie.mines-paristech.fr/Formation/Doctorat/Cours-doctoral-ACV/>

USEFUL LINKS

MINES Paris: <https://www.minesparis.psl.eu/>

Centre O.I.E.: <https://www.oie.minesparis.psl.eu/>

EcoSD: <http://ecosd.fr/>

2020 PARTICIPANTS

Newcastle University (United Kingdom), CEREMA (France), CEA (France), Aarhus University (Denmark), Mines Paris (France), TotalEnergies (France), Institute Polytechnique de Grenoble (INP, France), RTE (France), Université Gustave Eiffel (France), Université de Technologie de Troyes (UTT, France), ENGIE (France)

ECOSD WEEK PLANNING – 5th to 9th June 2023

CDE 1	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
9h - 10h30	Introduction to uncertainties / Variability related to LCA Paula PEREZ-LOPEZ	Uncertainty Analysis in LCA Paula PEREZ-LOPEZ & Mathilde Marchand- Lasserre	Workshop: LCA modelling with lca_algebraic Team	Spatial-temporal modeling Sectorial scale Mathilde Marchand- Lasserre & Joanna SCHLESINGER	Case study completion (EP)
10h45 - 12h15	Reminder: Statistics fundamentals Philippe BLANC	Global Sensitivity Analysis (GSA) in LCA Philippe BLANC		Case study (EP)	Case study completion (EP)
13h45 - 15h15	Sensitivity analysis: Definition and statistical tools Paula PEREZ-LOPEZ	Parameterized models & simplified models based on GSA Raphaël JOLIVET	Case study (EP)	Case study (EP)	Presentation of the case study (EP) by groups & Discussion
15h30 - 18h00	Presentation of the Case study on Energy Pathway (EP) Team	Case study (EP)	Case study (EP)	Case study (EP)	--