ADVANCED LCA METHODOLOGIES AND TOOLS: UNCERTAINTIES AND VARIABILITY

16th – 20th April 2018
MINES ParisTech, Sophia Antipolis (France)
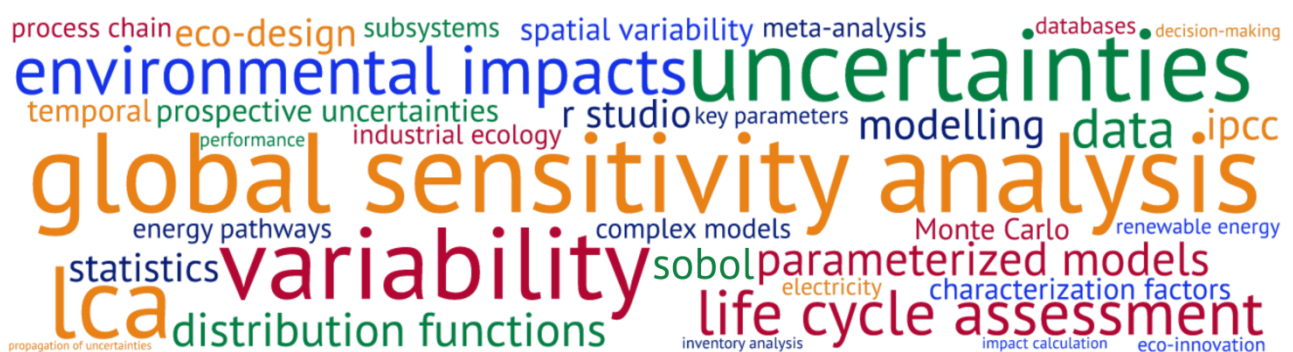
ORGANIZED BY ECOSD NETWORK

This course is open to PhD students from institutions belonging to EcoSD network. It is supervised by Pr. Isabelle Blanc, administrator of EcoSD and professor at MINES ParisTech.

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 in order to create and spread advanced knowledge in eco-design fields. This initiative aims at helping a global sustainable development process at national and international scales.

ORGANIZERS

This course is funded by EcoSD. It is hosted by MINES ParisTech at the site in Sophia Antipolis and co-organized by MINES ParisTech and the University of Nantes. It is validated by the Doctoral School in Engineering Sciences from MINES ParisTech and Arts & Métiers ParisTech.

PRE-REQUISITES

Basics on LCA methodology and practice of an LCA software

Basics in Statistics

English

Familiarization with the programming language R: Please, **install the software environment R and related tool R Studio . Next, download the folder "Introduction to R" and execute the file "Tutorial – Introduction to R.R" in R Studio**.

Introduction to R

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:

- Distinguishing between UNCERTAINTY and VARIABILITY

- Sensitivity analyses: a review of statistical tools

- Spatial variations

- Modeling of uncertainty of impact characterization

- Meta-analysis: meta-models applied to LCA

- Parameterized models and reduced parameterized models applying Global Sensitivity Analysis (GSA) for energy pathways

- Prospective uncertainties

This PhD training alternates theory (11 x 1h30 courses) and practice (7 x 1h30 case study + 8 h personal work). The theoretical fundamentals learned during the lectures will be applied to a case study on energy pathways. A statistical tool (R Studio) will be used. 4 sessions of 2 h are scheduled for the personal project that will be developed in teams (2-3 people).

TEACHING STAFF

- Isabelle BLANC (Professor at MINES ParisTech)

- Lynda AISSANI (Researcher at IRSTEA)

- Paula PEREZ-LOPEZ (Assistant Professor at MINES ParisTech)

- Anne VENTURA (Professor at University of Nantes / Institut Français Transports Aménagements Réseaux IFSTTAR)

CONTENT

1. Introduction to uncertainties/Variability related to LCA

2. Sensitivity analysis: Definition and statistical tools

3. Assessing spatial variability in LCA: why?

4. Assessing spatial variability in LCA: how?

5. Uncertainty Analysis in LCA

6. Global Sensitivity Analysis (GSA) in LCA

7. Understanding sources of uncertainties in impact characterization methods

8. Meta-analysis/Meta-models

9. Parameterized models & reduced parameterized models based on GSA

10. 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 .zip folder containing the files required to develop the personal project;
- A bibliographic list of major scientific publications in relation to each module

Language: ENGLISH

LOCATION

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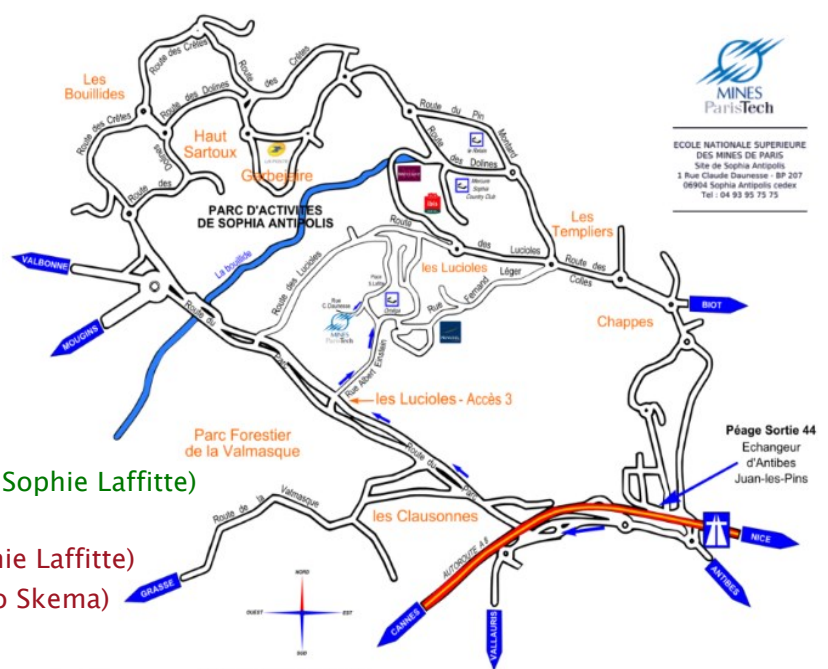Access is detailed here:

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

To get here by bus:
From Nice
   - Line 230 Nice < Sophia (to Bus stop Sophie Laffitte)
From Antibes
   - Line 1 (Bus stop Dugommier to Sophie Laffitte)
   - Line 100 (Bus stop Place de Gaulle to Skema)

REGISTRATION & CONTACT

Pr. Isabelle BLANC

E-mail: isabelle.blanc@mines-paristech.fr

Phone: +33 (0) 4 93 95 75 13

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 ParisTech: http://www.mines-paristech.fr/

Université de Nantes: http://www.univ-nantes.fr/

Centre O.I.E.: http://www.oie.mines-paristech.fr/

Chaire Génie Civil et Eco-construction: http://www.chairegc-ecoconstruction.univ-nantes.fr/

Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture (IRSTEA): http://www.irstea.fr/

Institut Français Transports Aménagements Réseaux : http://www.ifsttar.fr

EcoSD: http://ecosd.fr/

2017 PARTICIPANTS

Chaire Génie Civil Éco-construction Nantes, Centre Scientifique et Technique du Bâtiment (CSTB) Grenoble, École Nationale Supérieure d'Arts et Métiers (ENSAM) Bordeaux, MINES ParisTech, Politecnico di Milano, RENAULT, Université Aalborg.

PROGRAM

CDE 1	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8h30 - 10h00	Introduction to uncertainties / Variability related to LCA Isabelle BLANC – MINES ParisTech	Uncertainty Analysis in LCA Isabelle BLANC – MINES ParisTech	Meta-Analysis / Meta-Models Isabelle BLANC –MINES ParisTech	Case study (EP)	Case study finalization (EP)
10h30 - 12h00	Sensitivity analysis : Definition and statistical tools Paula PEREZ LOPEZ – MINES ParisTech	Global Sensitivity Analysis (GSA) in LCA Paula PEREZ LOPEZ – MINES ParisTech	Parameterized models & Reduced parameterized models based on GSA Isabelle BLANC –MINES ParisTech	Prospective uncertainties for energy pathways LCA Isabelle BLANC–MINES ParisTech	Case study finalization (EP)
13h30 - 15h00	Assessing spatial variability in LCA: why Lynda AISSANI – IRSTEA	Understanding sources of uncertainties in impact characterization methods (1) Anne VENTURA – Chaire Ecoconstruction / Université de Nantes	Case study (EP)	Case study (EP)	Presentation of the case study (EP) by groups & Discussion
15h30 - 17h00	Assessing spatial variability in LCA: how Lynda AISSANI – IRSTEA	Understanding sources of uncertainties in impact characterization methods (2) Anne VENTURA – Chaire Ecoconstruction / Université de Nantes	Case study (EP)	Case study (EP)	--
Personal work	Presentation of the Case study on Energy Pathway (EP) Paula PEREZ LOPEZ MINES ParisTech	Case study (EP)	Case study (EP)	Case study (EP)	--