

## CALL FOR PAPERS

# Engineering & Anthropocene? New Challenges, New Paths in the Humanities and Social Sciences

International Colloquium

Thursday, December 12, 2024, from 9 AM to 6 PM CNAM, Paris

Réseau Ingenium, in collaboration with EPSI and OFC

How do 21st-century engineers address the challenges and questions brought about by the entry into the Anthropocene, and how do the humanities and social sciences contribute to this positioning, especially in education? This is the subject that the Ingenium Network has decided to tackle head-on, following the international conference it organized on the integration of sustainable development challenges into education (2021)<sup>1</sup> and the seminar it held on taboos in engineering education (2022)<sup>2</sup>.

<sup>1</sup> “Le développement durable dans la formation et les activités d’ingénieur” - 28 juin 2021, Colloque en ligne sur Jitsi. Actes du colloque sur le lien suivant: <http://reseau-ingenium.fr/wp-content/uploads/2024/03/2021-06-28-actes-de-colloque.pdf>

<sup>2</sup> “« Tabous » d’ingénieur-e”, 15 décembre 2022, CNAM, Paris. Programme de ce séminaire sur le lien suivant: <http://reseau-ingenium.fr/wp-content/uploads/2024/03/2022-12-15-programme.pdf>

Indeed, the 2021 conference showed that the humanities and social sciences play a specific role, particularly in thinking about the techniques and limits of the biosphere. Physicist José Halloy introduced the concept of “zombie technology” to describe technical systems doomed to disappear due to physical constraints, or because of the need to survive with climate change. To move towards less harmful technologies, the entire products lifecycle must be rethought, from design to repair-maintenance to recyclability, as explored in the colloquium workshops. It emerged that engineers have a key role to play in these vast fields of activity where critical thinking and reflexivity, the ability for systemic or complexity analysis, and the contribution of ethics, seem essential. Additionally, the tension between the executing engineer and the ingenious engineer was highlighted, because what is achievable may not be desirable, for reasons that have nothing to do with economic logic or the state of technology itself. Finally, the complexity of technology today, even more than in the past, requires engineers to understand (and perhaps collaborate with) people whose training and experience differ significantly from their own (with the idea of “distributed responsibility,” integration into actor networks and hardware devices, etc.). Ultimately, this colloquium showed that new skills appear more necessary than ever for engineers to develop a more reflexive understanding of their activity as a situated and dependent practice.

The seminar on taboos at the end of 2022 highlighted the difficulty for engineers to change their *behaviors* and their representations of the issues (sexual and gender-based violence, gender issues, default orientations of future engineers, etc.). The seminar noted the absence of language exchanges between engineering students on these subjects, and the lack of spontaneous speech. Thus, the question of ethics found its place during the seminar: how to question these taboos and then overcome them? However, these *questions of behaviors* are also at stake in the Anthropocene era, hence the unexpected link between the 2021 colloquium and the 2022 seminar, on which we wish to extend the reflection.

Today, the ongoing ecological and social crises still call for profound and systemic changes in our societies. In this perspective, how can we not envisage that engineering courses train enlightened citizens, prepare them for the various transitions to be implemented, with teachers who would break down knowledge between historically distinct disciplinary communities, create new resources (disciplinary and transdisciplinary), share knowledge and pedagogical practices?

To reflect on this, we have decided to speak of “engineering<sup>3</sup>” in the plural because the positions of computer scientists or civil engineers, biochemists, or agronomists cannot be confounded. Even if common principles are observed, such as the need for tangible data or reflexivity, the analyses of the Anthropocene and responses provided differ. The question of “technosolutionism”, for example, is addressed differently depending on the specialties and sometimes within the specialties themselves.

The Anthropocene - a geological notion, still under discussion, which, in a broader sense, intertwines scientific and activist dimensions - questions the impact of human activities on the biosphere scale. This trace often signifies unintended consequences: biodiversity loss, climate change, ocean acidification, the disappearance of uninhabited areas, etc., linked to a specific economic model. How does the engineering world react to this? To what extent do engineers feel involved? How do they perceive this? How do they frame the problem, if see it as a problem according to their analyses? What responses and arguments do they offer? What philosophies, paradigms, and preferences? What means, and particularly, what is the margin of flexibility? And to what extent will their action be individual or collective?

Faced with these questions, which have been vigorously taken up by engineering students during their graduation ceremonies in recent years, several actors propose competency frameworks that are now available at the national or European level:

- Jouzel, J., & Abbadie, L. (2020). Teaching the ecological transition in higher education, Recommendations made by the working group for the operational implementation of the mission "Teaching the ecological transition in higher education"
- Higher Education SD&RS Framework: <https://www.enseignementsup-recherche.gouv.fr/fr/le-mesr-et-le-developpement-durable-49295>
- Climate-biodiversity and ecological transition plan for higher education and research (June 2023) <https://www.enseignementsup-recherche.gouv.fr/fr/plan-climate-biodiversity-and-ecological-transition-of-higher-education-and-research-91292>
- Court of Auditors (2023). Higher education and the challenge of transition Eco-friendly <https://www.ccomptes.fr/fr/documents/67841>
- MESR Framework and recommendations of the Ministry of Higher Education and Research <https://www.enseignementsup-recherche.gouv.fr/sites/default/files/2023-10/note-de-cadrage-formation-des-tudiants-de-1er-cycle-pdf-29688.pdf>

<sup>3</sup> According to the CTI, engineering can be used to refer to all the processes and methods of solution invention and technical coordination that characterize the activity of engineers.

- CTI, R&O 2023: CTI "References and Guidelines". Since March 2022, environmental issues have been integrated in more detail than before and are reflected in the various activities of the schools: operations, campus, research, student life, international, etc. [https://www.cti-commission.fr/wp-content/uploads/2023/03/RO\\_Referentiel\\_2023\\_VF2023-03-16.pdf](https://www.cti-commission.fr/wp-content/uploads/2023/03/RO_Referentiel_2023_VF2023-03-16.pdf)
- GreenComp. The European Competence Framework for Sustainable Development: <https://www.agenda-2030.fr/a-la-une/actualites-a-la-une/article/greencomp-the-european-competence-framework-for-Development?>

While these frameworks contribute to facilitating the integration of socio-ecological or Anthropocene issues into training, at least by making them visible, they are far from exhausting the subject, and sometimes even raise many questions.

Ultimately, the international conference "Engineering & Anthropocene?" will welcome contributions that may take various forms: research (results, in progress, projects, etc.), an experience, a corporate or association testimony, an original pedagogical practice, a personal reflection. Proposals may critically define what the authors mean by "Anthropocene", or by "education on the challenges of the Anthropocene", or "ecology". They may explicitly testify to pedagogical experiences or research on a project to train engineers on Anthropocene challenges.

Expected proposals will aim to feed into the debates that will be organized around different themes, for example, and in a non-exhaustive way :

- 1. How to teach in the Anthropocene era?**
- 2. What competences/skills are we talking about?**
- 3. Ethics and the Anthropocene: Unbreakable Links?**
- 4. Anthropocene: what links or oppositions between research and engagement?**

These themes are further developed below.

## THEMATIC AXES

The articulation between engineering and the Anthropocene echoes several themes, articulated around different major questions, including those listed below:

### 1 – How to teach in the Anthropocene era?

- What content should be offered in engineering courses, activities faced with contradictory injunctions between growth/continuous improvement and sobriety, high-tech and low-tech, etc.?
- What effects can these contradictory injunctions have on the careers and health of students and teachers (bifurcation, ruptures, eco-anxiety, etc.)? How important are decoding skills in developing the capacity for action?
- How can students' views be taken into account in the design of training (RESES and CNE - National Student Consultation)?
- What is the place for the co-construction and collectivization of issues against an individual ethic dependent on economic structures?
- As a teacher, how can we deal with the discomfort that confronting the environmental crisis can induce in students?
- Which pedagogical teams should be deployed to support this new content?
- What is the role of interdisciplinarity, particularly with engineering sciences?
- Can we talk about eco-pedagogical activities? eco-engineering?
- What about the scientific and technical training of teachers in the humanities and social sciences?
- How can we take advantage of the historical figures of engineers who have contributed to the actions or history of ecological ideas?
- How should the Anthropocene be integrated into existing pedagogical practices/activities? (problem-based teaching, project-based teaching)

### 2 – What competences/skills are we talking about?

- What skills do future engineers need to acquire to deal with the Anthropocene?
- What skills can be mobilised or used by teachers during pedagogical activities related to the Anthropocene?
- How can formal and informal skills acquired during (and outside of) educational activities related to the Anthropocene be valued and recognized?
- How can we integrate the issue of evaluation in the face of skills sometimes informal, evolving and/or in the face of referential frameworks from committed actors?
- What are the learning objectives?
- What didactic and pedagogical approaches are used?
- What recognition does the professional world give to these skills integrating the "Anthropocene"?
- How can individual skills be coordinated with organizational actors and socio-ecological issues?

### 3 – Ethics and the Anthropocene: unbreakable links?

- How can engineering culture accelerate or hinder the consideration of ecological and social issues?
- How can the individual ethics of engineers be reconciled to collective socio-environmental issues?
- What is the role of politicization of innovation in a democracy?
- What transformations, or ruptures, generate the notion of the Anthropocene in engineering professions?
- What new links need to be built between the design of technical systems, desirable futures, and social and environmental issues?
- How do ethical standards designed by and for engineers take shape?  
What are the challenges of the Anthropocene today?
- What resources would allow these standards to include these issues more: ecofeminist thinking, the ethics of "care" for example?
- To what extent do the ethical competencies expected of engineers include Concern for ecology?

### 4 – Anthropocene: what links or oppositions between research and engagement?

- How is knowledge (research, activism) mobilized by engineers in the face of the Anthropocene?
- What are the effects of the Anthropocene on the organization of scientific knowledge, research fields, activists, and partners?
- What are the uses of "expertise" in the hiring of engineers?
- What type(s) of commitment should engineers make in the face of the Anthropocene?
- What mechanisms are put in place by engineering training institutions to question the links between research and activist commitment, possibly with student life?

### ***Terms and deadlines of the call for papers***

Your paper proposal should include an **abstract of no more than 200 words** to be sent in Word and PDF format (Times New Roman font, size 12, line spacing 1.5), **excluding the title, author(s), institution(s), five keywords maximum, and possibly three to five bibliographic references maximum, no** later than **June 20, 2024** (strict deadline) to [secretariat@reseau-ingenium.fr](mailto:secretariat@reseau-ingenium.fr)

Proposals can come from teacher-researchers, education professionals, engineering professionals, students, or anyone interested in this theme.

Several formats and supports of oral communication are possible: posters (5 mins), feedback (10 mins), research papers (with slideshow - 15 mins). Please let us know if you would like to see the format. The Scientific Committee reserves the right to decide on the format chosen.

*Abstracts will be subject to a double-blind assessment.*

*Notification of acceptance/rejection by the Ingenium Expert Committee **on September 16, 2024.***

*The papers selected and discussed at the conference will be published as online proceedings. Selected articles will be published in a special issue of the journal.*

#### Composition of the Scientific Committee:

- Antoine Bouzin, EPSI
- Nathan Coutable, OFC
- Lucie Cuvelier, Réseau Ingenium, CESI, Lecturer and Researcher in Psychology and Ergonomics
- Christelle Didier, EPSI, sociologist MCF in educational sciences, University of Lille (CIREL)
- Fatma Fourati-Jamoussi, Secretary of the Ingenium Network
- Sarah Ghaffari, EPSI, Sociologist at IMT Atlantique (Dpt Interdisciplinaire de Sciences Sociales) / CENS (UMR CNRS 6025)
- Béatrice Jalenques-Vigouroux, President of the Ingenium Network, MCF in Information and Communication Sciences, INSA Toulouse, LERASS (UPS), LASCO (UCL)
- Mélanie Le Forestier, OFC
- Denis Maricourt, Ingenium Network
- Stéphanie Merle, EPSI
- David Oget, Ingenium Network, INSA Strasbourg, Lecturer and Researcher in Occupational Sciences education and training

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