



T. Teaching Impact

Business education meets planetary boundaries: how to teach energy and climate in business schools?

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[Business education meets planetary boundaries: how to teach energy and climate in business schools?

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Abstract:

Beyond reframing each management discipline, sustainability education involves a deep disciplinary renewal within management education. Such renewal is necessary to build a deep, transversal and systemic understanding of sustainability grand-challenges, and to realize how business activities are affected by planetary boundaries. After exposing the centrality of energy and climate issues in sustainability, this article builds on a new 30h course *-Energy: Business, Climate & Geopolitics -* started in 2021 at ESCP Business School - to reflect on the major pedagogical choices and outcomes. After considering the need for large-scale and systemic changes required to address the energy and climate challenges, we reflect on five general -and disquieting- observations about business and the climate transition.

Keywords: Energy, climate, sustainability, business education

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Introduction: sustainability and disciplinary renewal within the business school

As sustainability grows in importance within business schools, it raises fundamental disciplinary challenges for management education. A first facet of this challenge is to *integrate sustainability into existing disciplines* (finance, marketing, strategy, operations, accounting, HR management, etc.). While this process of “greening” existing disciplines is in itself quite a challenge, it is marked out by several limitations. Firstly, disciplinary boundaries are based on silo-thinking which is by nature ill-adapted to systemic issues such as climate change or biodiversity mechanisms. Secondly, because of the inherent complexity and multidimensional aspect of sustainability issues, there is a risk of promoting solutions which may appear relevant within the frontiers of each domain, but which lose their relevance when considered at a more general scale. At the extreme end, if business schools simply put a “sustainable” label in front of each discipline, they risk ending-up promoting marginal adaptation instead of meaningful change, thus inhibiting radical, critical and fundamental questioning of key disciplinary hypotheses in management about corporate governance and “sustainable” value creation.

As a result, beyond integrating sustainability within each existing business discipline, a second approach is required, focused on *knowledge extension and renewal*. This approach is needed to develop a deeper understanding of the mechanisms of sustainability ‘grand challenges’ (such as climate change, biodiversity collapse, ecosystem dynamics, social inequalities, etc.) and the development of specific competencies related to the assessment of sustainability impacts (Life Cycle Analysis, scenario analysis, etc.). Such knowledge is key to understanding the true scale and scope of sustainability challenges, to apprehend the systemic and non-linear character of climate or biodiversity dynamics, and to assess the relevance of sustainable solutions. However, this approach is still largely lacking. According to a wide scale study conducted by the Shift Project (Shift 2019), the vast majority of higher education institutions (76%) do not propose any single course on climate and energy issues. In France, Jean Jouzel -former president of the scientific group of IPCC- recently submitted a report to the French Ministry of Higher Education to formulate various recommendations towards a new “common knowledge-base” for all students of higher education on the theme of ecological transition (Jouzel et Abadie, 2021). There are clear expectations from students as well, such as the Student Manifesto for Ecological Wakeup, which gathered more than 30 000 students signatures demanding a reframing of corporations and higher-education curricula to integrate the themes of ecological transition and climate issues.

In the field of business schools, one central difficulty is that such knowledge is not already available “on the shelf”, and must be imported from outside of its classic disciplinary boundaries and then translated to be made meaningful within a business context. Indeed, natural sciences (biology, physics) or engineering are vastly under-represented in management education. From our own experience, such a lack of expertise is also true, unfortunately, for the ‘usual suspects’ in business sustainability: professors developing sustainability and CSR contents. Indeed, academics trained in the fields of Corporate Social Responsibility, business ethics, sustainability or Business & Society are cognitively rooted in business and management activities, mostly reflecting on economic value creation, managerial ethics, or interactions with stakeholders. They generally lack a strong background or training in natural sciences and deeper understanding of the paradigmatic shift involved in the era of the anthropocene (Hoffmann & Jennings, 2015).

How do we address this challenge of academic renewal? How do we build and integrate new bodies of knowledge related to sustainability grand-challenges within business schools ?

Among the grand challenges of sustainability, climate change and energy obviously constitute key issues, with massive ecological, civilizational, and business impacts. For this reason, this article reflects on the creation of a 30h course on energy and climate at ESCP Business School, created in 2020 and run for the first time in 2021. This course was created and taught by a team of 4 professors and professionals in sustainability (Aurélien Acquier, Pierre Peyretou, Alexandre Joly and Charles Sirot) under the lead of the present co-authors. The paper is structured as follows: we first explain why energy and climate occupy a

central position in sustainability debates. We then elaborate on the pedagogical approach of the course. In a third section we reflect on five major observations from the class to reflect on the road ahead.

1. Why do climate change & energy stand at the core of the sustainability transition?

Among the “grand challenges” of sustainability, energy constitutes a key and foundational dimension, lying at the roots of several civilizational challenges and paradoxes.

From a social and economic perspective, energy has played a decisive role in human development, well-being, productivity and growth (Jancovici, 2008, Smill, 2017). Historically, industrial revolutions were enabled by access to -and domestication of- cheap, intensive and easily storable sources of energy such as oil, gas or coal (Auzaneau, 2018). The correlation between energy use and GDP growth is very strong at the global level (Soytas & Sari, 2003), and the global consumption of energy is marked by a steady growth over time (Our world in data, 2021). As a consequence, our society and economic systems are strongly dependent on the ability to access growing quantities of cheap and convenient sources of energy (Auzaneau, 2018).

At the same time, from an ecological perspective, our collective destiny is shaped by our ability to limit climate change in order to maintain ecosystemic services and an inhabitable earth. Energy is at the core of these debates. As the Intergovernmental Panel on Climate Change (IPCC) reminds, the world is currently 1° celsius warmer than pre-industrial levels -mainly due to the massive use of fossil fuels by human activities. Under the Paris agreement, countries officially committed to limit the rise of global average temperatures as close as possible to 1.5 degrees above pre-industrial levels, in order to avoid the worst impacts of climate change. However, the UN points to a catastrophic drift between national commitments and current policies. Under the current trend, global warming is likely to reach 1.5°C as soon as 2030; if it continues to increase at the current rate, it is likely to reach 3.5 to 5 degrees by the end of the century (IPCC Special Report, 2018). Beyond the threshold of 1.5 and 2 degrees, there is strong scientific concern that humanity may break a climate tipping point (Lenton et al., 2019) where the consequences on human life and biodiversity (fires, droughts, access to food and water) would become so dramatic that where humans would no longer be able to control climate dynamics through human emissions reductions.

Faced with such antagonisms, we thus need a true and urgent shift in the way our societies access and use energy. To keep within the limits of a carbon budget complying with the Paris climate agreement, a country such as France has to divide by a ratio of six its CO₂ emissions per capita in the coming 30 years, moving from 12 tonnes of CO₂ a year to 2 tonnes of CO₂ in 2050 (before reaching carbon neutrality by 2070). Clearly, these transformations have far-reaching implications for both individuals (consumption, education and professional jobs), public and private organizations as well as economic systems.

These facts are only being marginally and superficially covered in higher education and business schools. In France, experts such as Jean-Marc Jancovici -through his open courses at Ecole des Mines and conferences- and organizations such as the Shift Project have brought the topics of energy and climate change to a broad audience. While these contents are essential for understanding the fundamental terms of the energy and climate equation, they have huge business implications which remain largely uncovered. From the perspective of a business leader, what are the risks and vulnerabilities faced by a specific business in the light of such energy challenges? What types of investment and change are needed to adapt corporations to this coming reality? Who bears the costs and how do we manage the risks and process of change? How do we design a low-carbon trajectory at the micro level compliant with macro trajectories? How should business contribute to sectoral, national and international regulations to design a relevant regulatory framework in the light of these challenges?

Such challenges involve key organizational transformations at the social, regulatory, sectoral, business and individual levels. For this reason, organizational and business skills are highly needed in such a transition.

Moreover, student expectations are rising concerning the topic of energy and climate. This demand has risen in parallel with development transversal courses and seminars on business sustainability and ecological transition, being addressed to all students from the Master in Management Program at ESCP Business School (see Acquier, Verzat & Teglborg, this volume). Such developments also echo students' expectations to develop professional opportunities on sustainability careers.

2. Contents & design of the course “Energy : Business, Climate & Geopolitics”

To address those questions, we launched a 30-hour module on “Energy : Business, Climate & Geopolitics”. The course was designed by four professors and professionals in sustainability, each taking a lead role in the course at different moments:

- Aurélien Acquier is a professor in Sustainability at ESCP Business School and Associate Dean for Sustainability Transition,
- Alexandre Joly is a senior consultant in energy at the French consultancy company Carbone 4,
- Pierre Peyretou is an entrepreneur and independent consultant on energy and sustainability and a trainer for the Climate Collage association,
- Charles Sirot is a senior consultant in sustainability at the environmental consultancy company Quantis, a co-founder of the Climate Collage association and a co-creator of the Biodiversity Collage,

The course is designed around two axes, to help students make connections between macro, sectoral, business and individual levels of analysis.

Axis 1 - Energy: physics, climate, geopolitics and humans: exploring the systemic complexity, importance and tensions of energy.

The first four sessions focused on defining energy and understanding its multidimensional facets and paradoxical tensions. We explored its physical dimension, its geopolitical consequences as well as its key role in historical economic & social development, in order to introduce the grand challenge of climate change within this picture. The first sessions highlighted the exponential growth of primary energy consumption, its mix over time, the correlation between energy and GDP and the co-evolution of energy exploitation, machinery development and the uses of the population.

In order to introduce the wide diversity of sources of energy in an interactive manner, students were split into groups and had to prepare 10-minute keynotes as a home-assignment, to present one source of energy, its share in the world energy mix, its industrial & economic value chain, its main uses and its contribution to GHG emissions. At the end of the presentation, the group gathered the data into a Sankey Diagram in order to build an ‘Energy Big Picture’ collectively.

Climate change causes and consequences were then explored through a 3-hour collective workshop based on the IPCC reports called ‘Climate Collage’. As some members of the class had already participated in this workshop through an earlier seminar within the school, they were coached by one of the professors to take charge of the animation of the workshop for their fellow student during the session.

At the end of this first stage, students could make sense of the grand challenges of energy, understand the big picture of the energy mix and the scale of transformations required to address the issue of climate change and remain within a 1.5 to 2 degree trajectory, as defined by the Paris agreement.

Axis 2 - Business, energy & climate: highlighting the antagonisms, providing tools to analyse and build low-carbon strategies.

The next six sessions were focused on exploring the links between energy, climate and business, by exploring these questions at the sectoral and corporate levels.

Several external guests were invited during this stage. Focusing on the aviation industry, Grégoire Carpentier and Olivier Del Bucchia (Supaéro Décarbo and the Shift Project) presented the conclusion of their research study entitled « Flying in 2050: which aviation in a constrained world?». Even after

integrating the impact of covid economic downturn, the study reveals the impossibility for the aeronautic sector to combine current growth scenarios (4% a year) and meet the trajectory of Paris Agreement at the same time, even under very optimistic hypotheses concerning technological innovation and the introduction of the hydrogen plane (Supaero Decarbo & Shift Project; 2021). An expert from the International Energy Agency (IEA) presented IEA's scenarios to meet the Paris Agreement objectives, revealing the necessity to simultaneously decrease consumption, to scale up Carbon Capture and Storage techniques (CCS) at a very fast rate and to dramatically increase renewable energy production. We also received Pierre Hamelin, CEO of Air Liquide Engineering & Construction who presented Air Liquide hydrogen activities and discussed the prospects and current challenges for both green hydrogen and CCS techniques.

During this second phase, the professors introduced the notion of physical and transition risks for businesses. We introduced key methodologies (Bilan Carbone) to measure the carbon footprint of businesses with detailed examples for multiple sectors and activities, as well as important managerial tools for low-carbon strategies, such as carbon pricing integration, Task Force on Climate-related Financial Disclosure frameworks (TCFD), scenario analysis, etc.

Major antagonisms between business and climate objectives were also revealed to explain the difficulty of reducing GHG emissions for companies, conflicting short-term business priorities with long-term climate consequences and the contradictions between carbon reduction objectives and business strategies driven by growth of production volumes. A significant time was spent as well exploring the promises, conditions of feasibility and limits of some currently promoted technical solutions (such as carbon capture and storage, or hydrogen), and debunk some questionable assertions advanced by some companies (around carbon neutrality for example). Overall, the team of professors chose to “focus on the problems”, describing the phenomena and the multiple dimensions and complexity of their interconnections (energy, social, economic, political, international relations). Identified potential solutions, tools and their limits, were always presented critically in light of this complexity.

Over that second phase of the course, students were asked to conduct a strategic assessment of the current climate strategy of 7 corporations using the tools and knowledge developed in class, to formulate recommendations for their CEO and to present their results during the final session.

Helping students project themselves into their future professional career in the light of the acquired knowledge from the course.

An additional and transversal objective was to help students reflect on their professional choices, and identify a fulfilling career both professionally and personally. We pushed students to anticipate their future role in organization in the light of climate change and planetary boundaries. A dedicated workshop based on the “Ikigai” matrix structured the reflections around four axes to find a purposeful job to make a living today as well as in two or ten years; a job that makes sense, as a significant part of former business school students tend to suddenly quit traditional career pathways for “meaningful” jobs; a job that uses individuals skills and talent; and a job vector of collective progress and of reduction in risks, by heading towards a more resilient society.

3. Outcomes: five general -and disquieting- observations about business and the climate transition

Overall, feedback from students was very positive. An anonymous survey was sent to the student to identify the elements students liked and disliked. To the question “How probably would you recommend this course to another student from 1 (min) - 10 (max)”, 94% of respondents answered 8 to 10, with a Net Promoter Score (NPS) of 63. Students praised the importance of the topic and its multidisciplinary approach (covering the macro, physical and technical dimensions before digging into business implications), the diversity of the professors and professional guests, the multiple workshops and

interaction with the teaching team and the overall dynamics in the course. The most repeated negative feedback was related to online tools and remote conditions of learning, as the class was mostly held remotely due to the sanitary situation. Some students also pointed out that the course was sometimes personally destabilizing, because of the scale of the energy issue and the difficulty in identifying corporate models or adequate, scalable technical solutions in solving the energy equation.

For the four professors, the experience was also a very rich collaborative and learning experience. Beyond the technical and analytical dimensions covered in all the sessions, this course brought to light a few transversal (and disquieting) observations about business energy transition:

- There is a stark disconnection between climate macro objectives and actual business transformations.

On a planetary scale, GHG emissions have never stopped growing over the last decades, except for several months at the start of the Covid-19 pandemic (-7 to -8% of CO₂ emissions in 2020 according to the International Energy Agency¹). However, such rates of decline of CO₂ emissions would need to become the norm for the next 30 years in order to remain within the trajectory of the Paris agreement and thus limit global warming well below 2 degrees by 2100.

Similarly, on the scale of large international companies, absolute greenhouse gas reductions are the exception rather than the norm. The team has found it very difficult to identify large organizations significantly reducing their absolute levels of emissions on their direct and indirect scope of activities (scopes 1-2-3), while maintaining their competitiveness. There are a few exceptions that are sector specific or related to specific business-model innovations from start-ups. While several companies boast about becoming 'carbon neutral', most of them do so by limiting their carbon footprint to scopes 1-2 and/or massively using carbon offsetting schemes. Other companies may communicate their emission reductions through changes in their control metrics. For instance, companies cast their climate efforts by showing decreasing CO₂ emission either by euro of revenue or by unit of energy. While this relative decrease in CO₂ emissions is a step in the right direction, it often hides an absolute growth of CO₂ emissions driven by increasing revenues and energy consumption.

For the future, there is a clear need to explore corporate innovations on how to decarbonize profits, and explore the business and regulatory conditions for such a shift to be generalized at a systemic level.

- The systemic dimension is often neglected... and it is a key problem.

Designing low-carbon societies and economic systems imply some wide-scale and systemic changes. However, a lack of systemic thinking is often apparent in certain central energy debates, where actors seem to reflect in silos, hiding from the "big picture". For example, many economic actors don't count all the emissions generated by their activities, products and services (they exclude scope 3 from their calculations). At the sectoral level, scenarios about the greening of transportation often rely on unchecked -not to say unrealistic- hypotheses on the future energy mix (over which they have no control), such as an illimited availability of renewables energies. For instance, to meet its growth and keep within a carbon budget compatible with the Paris agreement, the aviation industry would have to develop hydrogen-planes and replace old craft at a very fast rate, AND use a very significant proportion of available renewable energy to produce low-carbon hydrogen (Supaero Decarbo and Shift Project, 2021). This would inevitably restrict the availability of low-carbon energies for other types of needs.

The same type of questioning on system-level implications applies for other types of practices such as climate offsetting mechanisms (where companies will compensate for their emissions through financing), which raise questions about their impact and efficiency in a situation where deforestation continues unabated at the global level.

¹ <https://www.iea.org/reports/global-energy-review-2020/global-energy-and-co2-emissions-in-2020>

Ultimately, there is a need for more system integration and collective reference points to 'add up the maths' and frame their calculations. Science-based targets (<https://sciencebasedtargets.org/>) may provide a tool in the right direction.

- There is a lack of a real-life and tangible description of a society that would be compatible with a 2 degree scenario.

Quantitatively, the Paris Agreement objective is to limit global warming to +2°C in decreasing trajectories and reaching carbon neutrality between 2060 and 2080 worldwide. The scientific community has derived precise calculations about the remaining "carbon budget" that is left to reach that objective, and the magnitude of the change required in global emissions to meet this. But these abstract figures and objectives remain quite poorly translated into concrete scenarios, behaviors, and daily life experience. We found very few initiatives raising the following question: "*What does it mean to live in a world where emissions have been divided by a ratio of 6, as compared to today's current emissions?*"; "*Which sectors may be the most severely hit, in their very ability to operate?*"

There are currently very few attempts -beyond very local experiments- to describe or enact what a "carbon neutral society" could look like and what the transition path towards it could be. This lack of description of the potential real-life implications of the Paris Agreement is a major issue, as it inhibits our ability to both envision the individual, sectoral, and business consequences of such a shift, not to mention our ability to manage the organizational and political complexities of conducting such a change.

As a result, there is a massive need to initiate such storytelling around possible and attractive futures, to construct the possibility of choices, and to enact a collective process of change.

- It remains difficult to envision radical strategic shifts in light of the global warming challenge

At the end of the course, students presented their corporate analysis to conduct a "*strategic stress test*" of the firm's climate strategy. Professors were struck that, in spite of the course and while being now fully aware of the scale and scope of the changes required to address climate change, students were still heavily influenced by existing corporate policies and practices, and were uncomfortable with the idea of stopping certain activities, even when they are obviously harmful to climate. Instead of challenging 'business as usual', students tended to interiorize the "imperatives" of economic growth and financial profitability. When confronted with trade-offs between business and climate, they tended to prioritize profits and try to "do less harm" rather than addressing the issue. Some of them also tended to conflate energy issues with broader corporate sustainability policies, and had a hard time challenging the climate strategy of companies that enjoy a "green" brand image and a good sustainability reputation.

- The course was a strong source of learning and emotional experience, both for professors and students

The course was a strong learning experience, as it made the different professors formalize and share knowledge and methodologies around the topic of energy, climate and geopolitics. Beyond knowledge, the course was also a strong emotional experience, as it eventually challenged some key paradigms and strongly held beliefs in management education. It made participants reconsider their approach on the role and mission of the corporation, on the role of regulation, on their vision of progress, growth, or on the ability of technical innovation to respond to the challenges. It also confronted some students with an entirely new topic, with problems on a radical scale and without any easy solutions. Such a situation was quite destabilizing for some students, especially in a covid situation where most of the lessons were held remotely, thus limiting informal and emotional exchanges among participants (students and professors). While students were grateful towards the professors for not imposing a single solution, they were also destabilized by the lack of easy solutions given the current economic paradigm.

Conclusion

We opened this article by pointing to the need of opening management education to new sustainability grand challenges and disciplines. Hopefully, this article shows that such initiative is not only a rich endeavour but also a fruitful experience, both for professors and students. From our perspective, developing ambitious courses on such grand-challenges is both a responsibility and an opportunity for management education.

However, the experience of this course also shows that because of the multidisciplinary and systemic complexity of energy and climate change, developing such contents require strong partnering capabilities, resources for coordination, a sense of curiosity and openness, and time. Such processes are not facilitated by the current institutional dynamics of the field of management education, be it the reinforcement of financial pressures on business schools or the current academic pressures for publication which tend to reinforce disciplinary focus and distract professors from complex and new multidimensional problems (Davis, 2015). For these reasons, business schools need to invest resources and time to encourage such multidisciplinary research and education on sustainability grand challenges. There are various ways to do so: one of them is to prioritize issues/grand challenges and make specific investments in time and resources to build relevant institutional partnerships with schools in engineering, agronomy, social science and even other business schools, to develop such multidisciplinary contents. Another is to reinforce links with alumni, students, professors, administration, building ecosystems around schools with companies in order to spread the knowledge on a wider scale, gaining insights on experiments conducted in the business world. Setting up informal and formal networks between professors, alumni, professionals and students can offer a useful resource to generate such projects - for instance, a new *ESCP Transition Network* was created in winter 2020 with this objective in mind. Lastly, inter-organizational collaborations and active sharing of solutions and good practices, even among traditionally competing institutions such as business schools, should also probably be encouraged. This would be a clear sign that “business as usual” practices and classic competitive boundaries should be radically challenged in order to find collective solutions to mitigate climate change.

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