Reducing the Carbon Footprint of Higher Education Institutions at the European scale: A mission statement from the SEA-EU Alliance

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017454

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Deliverable identification

Deliverable No. and Title	D2.5 Greening research and innovation practices
Leader	University of Bretagne Occidentale
Dissemination level	Public
Due submission date	30/06/2022
Submission (first version)	30/06/2022
Project number	101017454
Project starting date	01/01/2021
Duration	36 months

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017454

Versions and contribution history

Version	Date	Modified by	Reason
0	09/06/2022		Presentation of the deliverable to the RDIS
1	27/06/2022		Version sent for review to the RDIS
2	30/06/2022		Approved version produced

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1. Introduction

The aim of this position paper is to provide a Mission Statement, engaging the partners of the SEA-EU alliance[1] into a strong reduction of their environmental footprint, with a special emphasis on the carbon dimension of this footprint.

For decades now, the scientific community has alerted: we have already exceeded several planetary limits in terms of the capacity to handle Anthropogenic climate change, the collapse of biodiversity and the alteration of major biogeochemical cycles such as nitrogen (Rockstrom et al., 2009)[2]. The work of the UN Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) demonstrate, through the synthesis of thousands of studies, that these upheavals are threatening the most vulnerable populations on all continents, and even the very existence of our species on the surface of our precious planet.

We, as a species, are now facing these enormous challenges. They are tightly interconnected, together with the rise of inequalities in all regions of the world: they are

[1] SEA-EU, the European University of the SEAS. Integrated by the Universities of Cádiz (Spain), Bretagne Occidentale in Brest (France), Kiel (Germany), Gdańsk (Poland), Split (Croatia) and Malta (Malta).

[2] Rockström et collaborateurs, 2009. A safe operating space for humanity. Nature, 461 : 472-475.

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so-called « wicked problems » (Termeer et al., 2019)[3]. We have entered what some call « post-normal ages » full of uncertainty and complexity (Sardar, 2010)[4], requiring a « post-normal science (Funtowitz and Ravets, 1993)[5] that becomes more integrated, interdisciplinary and strongly linked to society and decision making. Indeed, by the time the UN launched the Sustainable Development Goals (SDGs) in New-York, in late 2015, they were calling for a "seat for science" on the High-Level Political Forum that deals with the UN's sustainable development agenda, to ensure that "science is not just an observer but an advisor to policymakers." (Elsevier, 2015)[6]. «Science, technology and innovation have long been recognized as the basis for socioeconomic development, so they are also core contributors to sustainable development and to meeting the SDGs», says the same report that describes the rise of sustainability science that emerged in the early 2000's, as the science needed to accompany sustainable development (Kates et al., 2001)[7].

By the early 2000's, scientists for sustainability were urgently needed (Clarke, 2002)[8], with important implications for the way we conduct research and we train young scholars. Sustainability courses started to flourish on many campuses, accompanying the emergence of sustainability centers, such as at Arizona State University in the US or the Stockholm Resilience Center in Europe. However, as noticed in the introduction of their important paper on «Unsustainable science», Paasche and Osterblöm (2019) fear that relying upon the scientific community to provide critical insights and solutions towards reaching the SDGs will not happen **until science itself becomes sustainable**[9].

More and more, concrete actions to embody sustainability also flourished through the idea of greening campuses: soft mobility, solar panels, positive energy buildings, local and/or organic food… Many universities now have staff in charge of the sustainability of the campus, be it in terms of contributing to lowering the environmental footprint of its activities or enhancing its resilience towards increasing shocks to come.

But Paasche and Osterblöm (2019) were talking about much more than greening campuses, behind the idea of fighting against unsustainable science. They were talking about science as a mini-model of our society as a whole, having entered a world of acceleration[10], productivism, that hinders our ability to provide original and creative solutions to the wicked problems we face[8]. This is precisely where measuring and

[3] Termeer, C. J.A. M., Dewulf, A. and Bisbroek, R., 2019. A critical assessment of the wicked problem concept : relevance and usefulness for policy science and practice. Policy and Society, 38:2, 167-179, DOI: 10.1080/14494035.2019.1617971

[4] Sardar, Z. 2010. Welcome to postnormal times". Futures, 42 (5): 435–444.

[5] Funtowicz, S.O. et J.R. Ravets, 1993. Science for the post-normal age. Futures 25 (7) : 739-755.

[6] Elsevier, 2015. Sustainability science in a global landscape. Report, 92pp. See also the UN policy brief at https://en.unesco.org/un-sab/sites/un-sab/files/Final_SAB_PB_MOI.pdf, and more information at http://www.asianscientist.com/2015/07/features/unesco-3-5-gdp-sti-spending/

[7] Kates R.W. et al., 2001. Environment and Development, Sustainability Science. Policy Forum, Science 292: 641-642.

[8] Clarke, T. 2002. Sustainable development. Wanted : scientists for sustainability. Nature, vol. 418.

[9] Paasche, O. et Osterblöm, H. 2019. Unsustainable science. One Earth, 1 : 39-43.

[10] McNeill, J.R., Engelke P., 2014. *The great acceleration. An environmental history of the Anthropocene since 1945*. Cambridge, London, The Belknap Press of Harvard University Press.

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reducing the Carbon footprint of research activities may play a key role in this game, because in reality, it is much more than just carbon. Carbon is everywhere. We are addicted to carbon. Reducing carbon emissions implies rethinking all our activities, from production to consumption. Because we have a carbon budget, at a global scale, if we want to avoid temperature increasing beyond 1.5 or 2 degrees Celcius, we need to discuss collectively where priorities should be placed. In academia, this means rethinking the way science is being produced and evaluated. Thinking about what is essential in our activities and what could or even should be reduced, what should or could possibly not.

In this position paper, the idea is to discuss first why we believe that our community of HEI's should reduce its carbon footprint. Not only to contribute to the global effort towards carbon neutrality, but also because it will necessarily lead us to rethink our research and teaching activities. This should have strong impacts on « making our science great again », meaning becoming more attractive, creative and innovative in terms of solutions to be found together with civil society towards sustainability as a whole. This first part will take the form of arguments on why HEI's should reduce their carbon footprint, counter-arguments on why they should not and a synthesize in the form of a strong position statement from the SEA-EU alliance.

We will then show the state of play for each partner of the alliance[1], where they stand in terms of carbon action. A focus will be placed on the French partner (Université de Bretagne Occidentale, UBO), leading this Task 2.5 (Greening research and innovative practices) and belonging to Labos 1point5[11], a national research structure (GDR) that has developed a tool to measure the carbon footprint of research labs in France and an approach experimenting with different ways to stimulate the reduction of carbon emissions, under different contexts (geographic, disciplinary, …).

The idea of extending this approach at the Sea-EU scale will be discussed in the last section which will take the form of several commitments toward developing a concerted methodology to reduce the Carbon footprint of the alliance, between comparison and composition. The originality and added value of conducting this approach at the EU scale will be described.

2. The argument, counter-argument and Sea-EU positioning

Argument: *Why HEI's must work on reducing the carbon footprint of R&I activities*

There are many reasons why HEI's should reduce their carbon footprint. Firstly, carbon emissions are made of an infinity of small contributions; they all count, whatever their contribution to the global emissions, and scientific research should contribute to the global effort. Secondly, the climate emergency requires changes in our lifestyles that are not limited to the private sphere, but should also affect our professional lives. This includes scientific activities and for scientists, this is very important to reduce a cognitive

[11] See Labos 1point5 web site : https://labos1point5.org/

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dissonance that would arise from making efforts in their private life while continuing emitting for their research activities without changing anything. Thirdly, many think that scientists have a duty to set an example in terms of environmental practices, especially those working on environmental issues; this is to avoid the "Do as I say, not as I do attitude". This is strongly linked to a fourth argument, i.e. the alignment of practices with discourses: scientists have alerted for decades about climate change and people outside academia would not understand that scientists continue "business as usual" despite the fact that they call for urgent action. "If the problem was to be so important, those scientists would react first, wouldn't they?" This argument is a key element of trust between science and society. This is very important in these times of fake news, disinformation, production of ignorance… A fifth argument is the fact that the commitment of research and teaching professionals can have a strong demonstration effect on society as a whole. Perhaps, as we shall see below, science is not the first field that comes to mind when thinking about reduction priorities, either because it is such an important human activity or because it is a small economic sector that contributes little to global carbon emissions; so, if this fields decides to move forward towards reducing its carbon footprint, it must have good reasons and all other activities should follow the same path.

Beyond these arguments, a crucial reason that will lead to the SEA-EU positioning described below is the notion of responsibility[12]. One cannot, on the one hand, stipulate that science, technology and innovation constitute the basis for socio-economic development, and on the other hand, imagine a deep transformation of this development model without rethinking the way science is being done. Unless one believes that technology alone will save us. But the depletion or scarcity of many raw materials essential to the functioning of the current productivist economy, including those required by digital and ecological transitions, hinders this belief. Clearly, infinite growth in a world of finite resources is impossible. The work of many colleagues, whether economists, historians or from other disciplines, shows us in particular that it is unreasonable to rely only on a decoupling of economic growth (as measured by GDP) and environmental damage (as measured by ecological footprints). For the last two centuries, the only periods in which global CO_2 emissions have decreased are the major world wars or the major economic crises; we will soon, alas, be able to add health crises such as the one linked to the Coronavirus.

Many additional arguments (time scale of technological deployments, associated rebound effects, widening of inequalities linked to their accessibility...) warn against the temptation of a transition mainly based on the techno-scientific overcoming of the planetary limits against which our societies are now stumbling. The belief that human societies are necessarily capable of solving the problems they face, whether or not they result from their own actions, through techno-science alone, is a delusion. This belief, historically maintained by the scientific community itself, contributes to delaying the commitment to the required transformations. Technological developments will certainly be necessary, but they will not be sufficient and they should be integrated into a broader vision of innovation. The latter should include social, pedagogical and

[12] Ragueneau, O. et al. 2021. Sur la responsabilité de l'ESR en ces temps incertains. See : https://labos1point5.org/reflexion/ResponsabiliteESR.

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institutional dimensions and take into account the need for frugality in terms of production, consumption and technological development, as low tech can avoid new dead ends.

Thus, from a transformative perspective, the responsibility of the research sector is fundamental, given the role it has always played in development, as well as in material and intellectual emancipation. Not only should science work on the transformation to sustainability, it should also embody this transformation by becoming more sustainable itself. This is where we meet again the arguments of Paasche and Osterblöm (2019)[9], calling for a deep transformation of the current unsustainable science, subject to acceleration and subsequent consequences that prevent science and scientists from tackling the wicked problems with the necessary time and integrated approaches needed; we will come back on this crucial aspect when describing the SEA-EU positioning. This is also where we come back to the necessary reduction of the Carbon footprint of research activities and the first list of arguments provided.

Indeed, more and more, the Carbon footprint of scientific research is being measured. For example, there are papers on the measurement of the carbon footprint of conference papers (Spinellis and Lourida, 2013)[13], or the location of a conference is being chosen to minimize greenhouse gas emissions from all participants (Stroud and Feeley, 2014)[14]. Important collective efforts are also being undertaken, at the scale of a scientific community, for example, astronomy (Knödlseder et al., 2022)[15] or at the scale of a national research system using the tool GES 1point5 (Mariette et al., 2022)[16], which constitutes a key element of the approach proposed below. This carbon footprint even becomes a research object whereby its social determinants are being studied. A good example is provided by Ciers and his collaborators, working on inequalities in carbon emissions in relation to professional status at EPFL (Switzerland)[17]. Similar studies exist in relation to gender and other issues (Ginsberger and Petev, 2018)[18].

Important to conclude this argument section: some researchers even call for stronger action, well beyond just reducing the environmental impact of research. For example, Glavovic and his collaborators call for a moratorium on climate science research, arguing

[13] Spinellis, D. and Louridas, P., 2013. The carbon footprint of conference papers. Plos One, doi : https://doi.org/10.1371/journal.pone.0066508

[14] Stroud, J.T. and Kenneth, J.F. 2015. Responsible academia : optimizing conference locations to minimize greenhouse gas emissions. Ecography, 38 : 402-404.

[15] Knödlserder, J., Brau-Nogué, S., Coriat, M., Garnier, P., Hughes, A., Martin, P. and Tibaldo, L., 2022. Estimate of the carbon footprint of astronomical research infrastructures. Nature Astronomy, 6 : 503-513.

[16] Mariette, J., Blanchard, O., Berné, O., Ben Ari, T. 2021. An open-source tool to assess the carbon footprint of research. BioRxiv, doi : https://doi.org/10.1101/2021.01.14.426384

[17] Ciers, J., Mandic, A., Toth, L.D. et Veld, G.O. 2019. *Carbon footprint of academic air travel : a case study in Switzerland*. *Sustainability, 11*(1) : 80. https://doi.org/10.3390/su11010080

[18] Ginsberger, M. et Petev, I.D. 2018. *Des attitudes aux pratiques environnementales : les fondements sociaux d'une association modeste*. In : Commissariat général au développement durable : Modes de vie et pratiques environnementales des Français, pp. 23–34. http://www.epsilon.insee.fr/jspui/bitstream/1/75535/1/SDES_thema_3_2018.pdf

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that we now know enough to (re)act[19] and calling for a focus on restoring the broken science-society contract to stimulate real action at all levels. Without going so far, many think that priorities should be set, with research activities that may cause harm to our climate and our environment being prevented, whereas other activities – either neutral towards climate or that would favor improvement in our human-nature relationship - would be strongly favored. This, of course, is a matter of deep debate, as we shall now see.

Counter argument: *why HEI's should NOT necessarily reduce their carbon footprint*

For many scientists, no one should tell a scientist what his or her research topic should be. This forms the basis of the so-called « academic freedom ». Priorities are set at the level of science policy, and funding agencies and it is up to a given scientist to work on the topic of his/her choice. Beyond recruitment, his or her science is evaluated only by the peers, when submitting a research project to a funding organization, or a scientific paper to a scientific journal. Only ethical considerations, when working with human beings, on medical issues or more and more, using animal experimentation, can limit his or her activity. We will come back to this ethical dimension in the following synthesis section because it doesn't seem that the ethical dimension of climate change, albeit so crucial, has yet been taken into consideration in these discussions.

Beyond academic freedom, many scientists and people in general think that science is such a crucial activity that it should not be limited, and *a fortiori*, abandoned as suggested by Glavovic and his collaborators. Indeed, science is a fundamental human activity, for several reasons. First, for the sake of science itself, the deep human desire to understand where we come from, how the world in which we live functions and so on. Where we go pertains more to philosophy, although with our models and in particular climate models, science now also has a say… Let us recall the humanist vision of University, from von Humbold as cited by N. Chomsky[20], regarding the function of the university in times of crisis:

"It is nothing else than the spiritual life of those human beings who, because of the leisure provided by external circumstances or by virtue of an inner yearning, are inclined to study and research … The society in which he lives may or may not provide him with 'circumstances and leisure' and the institutional framework within which to satisfy this human need to discover and create, to explore and evaluate, and to come to appreciate, refine, and exercise his talents. Society may or may not allow for the satisfaction of this human need to contemplate, make a personal contribution to one's culture, analyze it, criticize it and transform it - as well as the social structures in which it is embedded... The level of satisfaction of these human needs that is achieved by the existing institutional structures is a measure of the degree of civilization achieved by a given society. One of the elements in the never-ending struggle to achieve a more just and humane social order is the effort to remove the obstacles - whether economic,

[19] Glavovic, B., Smith, T.F. and White, I. 2022. The tragedy of climate change science. Climate and Development, https://doi.org/10.1080/17565529.2021.2008855

[20] Chomsky, N. 2010. Réflexions sur l'université. Editions Raisons d'Agir. 169 p.

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ideological or political - that impede individual fulfilment or collective action, and that the university should make possible ».

Obviously, this ideal vision of science and of the university is strongly endangered in today's world, with the marchandizing of knowledge[17,18], research being subject to both excessive rationalization and governance by numbers[21] and by this acceleration described by Paasche and Osterblöm (2019) with its social engine, i.e. competition, described by H. Rosa (2014)[22]. Nevertheless, the scientific method and the idea of objectivity still hold strong promises that we can collectively agree on facts and debate on solutions when these facts become problems. Even wicked. This is fundamental in this period of disinformation, fake news… Transmitting knowledge and involving people in citizen science programmes or Knowledge-Action projects, all participate in human development, to empower people, in particular the weakest. For these reasons also, scientific activity should not be limited.

Other arguments on why science should not be constrained by GHG emission reduction targets pertain to the category of science as being part of the solution. First, as mentioned in the introduction, science should provide key information for policy-makers, sustainability science in particular, regarding sustainable development (Elsevier, 2015). Second, science and most importantly technoscience, technological innovation, should provide key solutions to sustainable development, in particular through its contribution to green or blue growth… We will also come back on these arguments as we have seen that there are many reasons to warn against such a purely technological vision of our future; but it is clear that this is the mainstream tendency in our globalized world, to move towards and combine the ecological and numerical transitions with deep learning, artificial intelligence and so on, being deployed on so-called « intelligent territories ». Note that the development of low-cost technologies may represent a great alternative to these high-tech developments and their multiple consequences in terms of resource exhaustion (rare earth elements) and inequalities.

Finally, many scientists feel schizophrenic at the idea of limiting their GHG emissions. Anxiety is deeply present for scientists when they think about reducing the number of projects they are involved in, the number of conferences they attend etc… Will my research be affected? Will my career be affected as well? This is mostly due to the way scientific research is being evaluated. As long as it will remain «governed by numbers» (H-index, Shanghai…), with more projects, more papers, more conferences and more patents expected, scientists will have to live with contradictory injunctions, having to limit their emissions while still producing more and more, to remain in the competition.

For all these reasons, many scientists feel that science clearly should not be stopped, nor even be limited, for instance by reducing its GHG emissions. We have a carbon budget and priorities should be set, in terms of activities that should be reduced or not.

[21] Supiot, A. 2019. Le travail n'est pas une marchandise. Contenu et sens du travail au XXI^{ème} siècle. Leçon de clôture, Editions du Collège de France, 66 p. see also : Supiot, A. 2015. La gouvernance par les nombres. Cours au collège de France (2012-2014). Fayard, collection « Poids et mesures du monde », 515 p.

[22] Rosa, H. 2012/2014. Aliénation et accélération. Vers une théorie critique de la modernité tardive. Editions La découverte / Poche N°406, 149 p.

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According to some, clearly, science is not one of them and we should rather start with less useful activities such as car racing, just to illustrate the point.

Synthesis: *SEA-EU positioning*

The position of the SEA-EU alliance is clearly on limiting HEI's carbon footprint at the scale of each partner university and perhaps most importantly, as an alliance at the EU level. The alliance strongly supports all the arguments provided in the first part of this section. With regard to the counter arguments just described, the alliance proposes to reverse them as follows:

Academic freedom and ethics. The alliance acknowledges that this is essential and should be limited only by ethical considerations, especially when working with human beings, future human beings and more and more, non-human beings, especially during animal experimentation. The alliance proposes to link this ethical dimension of science to the ethical dimension of climate change or more precisely, that the latter be included in the ethical dimension of science. Indeed, climate change holds a strong ethical dimension with respect to its impacts on non-human beings, future generations, gender issues or other inequalities (social, territorial, …), especially between the Northern and the Southern hemispheres[23]. In view of the devastating effects of climate change that will reinforce these inequalities in all regions of the world (IPCC, 2022), it is essential that this ethical dimension be taken into account. Therefore, the Alliance considers it crucial that all attempts to reduce GHG emissions should be favored, including those from the scientific community. This brings us back to the first list of arguments, especially those linked to the idea of setting an example and having a strong demonstration effect beyond academia, which is crucial to restoring the broken science-society link.

This means that in all research environments, discussions should take place on the impact of science on GHG emissions: this includes discussions on their direct reduction through various kinds of incentives (see below, section IV) but also, on the research topics or problematics that should be favored or discouraged, because they directly or indirectly harm the climate.

Responsibility. Many may think, and this could have been listed in the list of counter arguments, that science is not responsible for misuses of its discoveries. We all know: science for the best as well as for the worst. Let us recall Rabelais and his famous words: «Science without conscience is only the ruin of the soul» and this is why, indeed, science is being limited by ethical considerations. We have just shown that we advocate for the ethical dimension of climate change, especially regarding development, to be taken into consideration when thinking about the ethical dimension of science. Well… Science and technoscience have deep responsibility in economic development and so-called progress. A quick look at Fig. 1 shows similar patterns in the geographic distribution of scientific output and regional CO_2 emissions.

[23] Ragueneau, O. 2020. Changement clim-éthique. Agir global, penser local et autres retournements jubilatoires. Librinova, 850 p.

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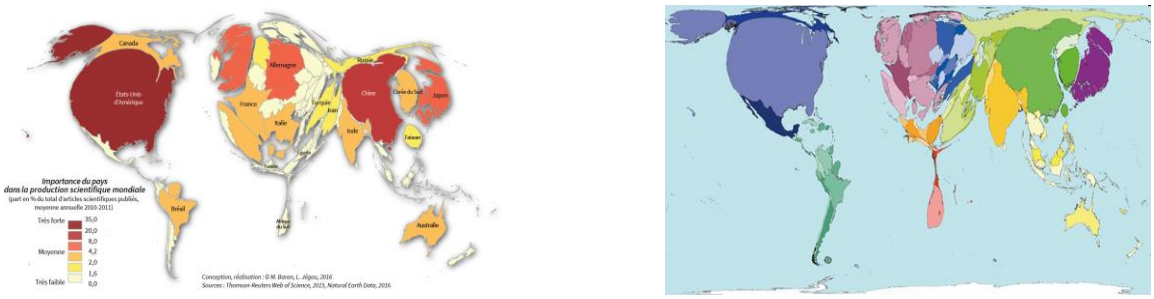

Figure 1. Anamorphosis. The size and shape of world countries are made proportional to scientific production (left) and to CO_2 emissions (right). Credit: Worldmapper.

This obviously doesn't mean that scientific activity is directly responsible for the regional disparity of CO_2 emissions but that development is intermediate, and the latter is directly related to scientific activity, recognized by the UN - as we have seen in the introduction - as the driver of development.

So one can not rethink our development model, and think about reducing the North-South divide, without rethinking the way we conduct science, especially in the North. This is clearly OUR responsibility and the SEA-EU alliance intends to honour it. Note that important words will be added regarding responsibility and ethics as within the alliance itself, important disparities exist in terms of historical responsibility.

Importance of science. Rethinking the way we conduct science doesn't mean reducing its importance or even imagining that science should stop, because we would know enough. The SEA-EU alliance recognizes the importance of scientific activities, for the sake of curiosity as well as for improving human well-being and human-nature interactions (see von Humbold's view). Sustainability, and sustainability science as well as resilience science[24] are even at the heart of the alliance. This has implications for the development of many SEA-EU activities in terms of inter- and transdisciplinary research, training of young scholars etc. Responsibility of science is high, for instance in accompanying territories in their transformation towards sustainability and this is crucial. We have already mentioned the importance of citizen science, of collaborative research between scholars and various stakeholders, in terms of decision-making

[24] Holling, C.S. 2001. Understanding the complexity of economic, ecological, and social systems. Ecosystems, 4: 390-405.

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process but also, in terms of capacity building, power to act. Learning indeed is at the heart of sustainability science and especially co-adaptive management[25].

The SEA-EU Alliance strongly believes that the importance of science, its key role on «learning territories», will be reinforced if science is able to demonstrate that it embodies the sustainability objective in its own practices. Not only accompanying local and regional institutions on their path towards sustainability and reducing the impact of human activities on the environment, but also lowering its own impact on the environment.

Science being part of the solution. So yes, science is and will be part of the solutions, especially by providing key insight to policy-makers, if and only if it is not reduced to specialized work and technoscience. We won't come back (see just above) on the importance of interdisciplinary work between natural sciences and social and human sciences[26], nor on the importance of co-constructing knowledge between academic scholars and stakeholders, civil society, for example, to move towards adaptive co-management of social-ecological systems[27]. We would just like to insist on the many caveats and dangers behind the idea of technological innovation as being THE only way to solve the major problems we face. Innovation is crucial but it can not be only technological. It is clear that technological developments will be needed, for mitigation and adaptation and the most recent IPCC report clearly shows the importance of these developments for adaptation in lowering the expected impacts of climate change, especially in the South[28]. No doubt. But it is also clear that these developments MUST be accompanied by sobriety or they will not suffice. And it is as clear, to avoid new dead ends, that low-tech, low-cost technologies are urgently needed. Therefore, innovation has to be also social, institutional and pedagogical and the alliance will work in these directions, especially in its pedagogical dimension.

The SEA-EU alliance therefore recognizes – and will contribute to the fact - that science will be part of the solutions, but not through technological innovation only. This will be through its renewed role in territories towards sustainability as well as through deep thinking about innovation in its various components (i.e. technological but also social, institutional, pedagogical…). Regarding technology, climate-friendly technologies should clearly be favored, for instance such as those developed in Fab-Labs or open factories.

Anxiety and contradictory injunctions. Truely, many scientists feel anxious at the idea of reducing their GHG emissions, as this may reduce their scientific activity and affect their career. Even without thinking in terms of career, many scientists would agree to reduce their emissions if only the way their research is being evaluated was to be changed.

[25] Armitage, D., Marschke, M. and Plummer, R. 2008. Adaptive co-management and the paradox of learning. Global Environmental Change, 18(1) : 86-98.

[26] Ragueneau, O. 2022. Interdisciplinarity in question. In : Bonnin et al. (Eds.), « Planification spatiale marine en Atlantique tropical, de la tour de Babel à l'organisation d'une intelligence collective ». RISE Paddle project, in press.

[27] Kofinas, G.P., 2009. Adaptive co-management in social-ecological governance, In: Chapin, F.S. III, Kofinas, G.P., Folke, C., (Eds), Principles of ecosystem Stewardship, Resilience-based natural resource management in a changing world, 2009. Springer. Chapter 4: 77-101.

[28] IPCC 2022. VI Report of IPCC Group II. Impacts, adaptation and vulnerability.

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Indeed, they face several contradictions or contradictory injunctions. There is this cognitive dissonance mentioned earlier, that would favor a tendency towards reducing their environmental impact not only in their private life but also at work. And at the same time, this idea of reducing their impact at work becomes more and more pregnant, whereas the way research is being evaluated, favoring competition, continues to push in the exact opposite direction. Will scientists become schizophrenic?

One way to come out from these contradictory injunctions could be as follows: under this climate constraint, can the best research project that is not climate-friendly, be considered excellent? In fact, what is «excellence» and who defines it? We have seen with Paasche and Osterblöm (2019) how science has become unsustainable, subject to acceleration and becoming less and less creative and able to find solutions. Thus, couldn't we use the present climate situation as a so-called «window of opportunity», so important for policy scientists[29], to *make our science great again*? Meaning, decelerating, respecting the various rhythms of different disciplines, and possibly moving towards slow science[30] ? This would mean rethinking the idea of competition as the main driver of excellence, rethinking the way science is being evaluated, i.e. essentially by numbers, quantitatively rather than qualitatively. Just as GDP is being questioned as THE only indicator of development measured through growth, for example by T. Jackson suggesting that there exists prosperity without growth[31], we could collectively debate about excellence in science and the way it is being evaluated.

Thus, instead of considering this need to reduce Carbon footprint as a dramatic constraint, we consider this historic moment as an opportunity for a positive and profound transformation of our daily practices, of our collaborations and data-sharing, and of the methods used to evaluate our work.

In addition to this positioning regarding the arguments and counter-arguments exposed above, the SEA-EU alliance partners consider a unique opportunity to work on this matter across the European continent for several reasons that represent as a whole a real added value:

Changing scale. If it is important that Carbon footprint is being measured and reduced at the scale of a project, a conference, a research lab or even a national research system such as in France (Mariette et al., 2021), climate change requires a rapid and vast transformation of all human activities, across scales. In this respect, any attempt to do so at a larger scale, whatever the methodology explored, is to be tested.

It is the objective of the SEA-EU alliance to undertake such a step forward at a continental scale, first using pilot laboratories that would use a similar tool to measure its footprint and possibly engage in a European scale experiment (see section IV).

Comparative approaches. Sea-EU partners represent an interesting diversity of scientific, political, cultural, economic, and technological contexts that should provide

[29] Kingdon, J. 1984. Agendas, Alternatives and Public Policies. Little Brown and Company, Boston.

[30] Stengers, I. 2013. Manifeste pour un ralentissement des *sciences*, Paris, La Découverte, series: « Les Empêcheurs de penser en rond », 216 p., ISBN : 9782359250664.

[31] Jackson, T. 2009. Prosperity without growth. Economics for a finite planet. Earthscan, New York, London, 264 p.

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important insight into the drivers of GHG emissions as well as approaches towards reducing these emissions. For example, the relative importance of heating, travelling, buying consumables etc… in the global emissions of a research lab will not be the same, not only across disciplines within one country, but also across countries where the energy mix is so different. Similarly, some countries may favor top-down approaches in setting objectives and rules whereas others will favor a bottom-up approach.

The SEA-EU alliance intends to use this diversity to undertake a comparative approach to explore regional differences in research carbon emissions across the European continent, and better understand its drivers under different contexts.

Ethical dimension. This is a crucial aspect of climate change and indeed, a major barrier in international negotiations. The SEA-EU alliance encompasses countries from Northern and Southern Europe, from the former east and west, with different present and historical responsibilities in terms of carbon emissions. According to the « common but differentiated responsibility » principle, each of these countries is not subject to the same « duty » in terms of reducing its carbon emissions. Working together on this dimension should provide important insights on how these matters can be discussed collectively and differentiated objectives be collectively set.

The SEA-EU alliance proposes to push collectively the ethical dimension of climate change. Not only as mentioned earlier, as a major reason why scientific activity could or should be limited if one accounts for the ethical dimension of climate change in science ethics, but also by accounting for this common but differentiated responsibility among its partners, regarding historical GHG emissions.

3. State of play

What are we already doing to reduce the carbon footprint of research activities?
Where do we want to go?

Nota: Here, the state of play is described separating the contribution of UBO on one side and the contributions of the five other partners on the other side. Indeed, the state of play at UBO is described as for other partners but in addition, its contribution to the French *Labos 1point5* inititive is also described. This is because the aim of Task 2.5 led by UBO is precisely (i) to share with SEA-EU partners the use of the tool GES 1point5 and the launch of a national experiment (Expé-1point5) co-driven by UBO and Paris-Cité and (ii) to see how far we want to commit together using these approaches, or other approaches, given that this is NOT mandatory.

III.1. UBO (responsible for Task 2.5)

III.1.1. UBO sustainability

Université de Bretagne Occidentale (UBO). Because it trains the citizens of tomorrow, the university has a special role to play in sustainable development and social responsibility. For many years, the UBO has been committed to a voluntary and cross-

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disciplinary approach whose aim is to build a responsible and supportive society. Indeed, the university acts on a daily basis, with the help of all stakeholders, to adopt a sustainable and reasoned mode of operation, to promote new uses that are more respectful of the environment, and thus reduce its ecological footprint.

Regarding soft mobility, the university encourages its staff and students to use alternative modes of transportation to the individual car by : (i) making staff and students aware of the importance of carpooling and cycling: "Bike to work" challenge, bicycle repair shop, creation of parking spaces reserved for carpooling in the Brest IUT parking lot, etc ; (ii) developing bicycle parking facilities at its many sites ; (iii) creating 3 eco-responsible parking areas, combining bicycle shelters, carpooling and electric vehicle charging stations ; (iv) paying half of the cost of public transportation for its employees ; (v) allocating, upon request, a sustainable mobility package to employees who choose an alternative and sustainable mode of transportation (bicycle, carpooling) ; (vi) providing a fleet of vehicles for business trips by its employees, including bicycles, 3 hybrid vehicles and 3 electric vehicles.

Regarding biodiversity, since 2012, UBO no longer uses phytosanitary products for the maintenance of its green spaces. This requirement also applies to service providers who work under public contracts. The green space teams use alternative and natural methods: weeding with white vinegar, etc. A virtuous approach that aims to preserve biodiversity, but also to protect the health of all: gardeners, users, residents...

Concerning building energy, the UBO manages a 280,000 m² building stock, with 84 buildings. From the environmental footprint to the economic aspect, including user comfort, the issues surrounding this building stock are numerous. For several years now, UBO has adopted a centralized technical management system that makes it possible to supervise the technical installations of the various sites: heating, electricity and water. To make this approach even better, meters will gradually be installed on each campus site. The goal is to monitor energy consumption by building in real time, which will greatly reduce the uncertainty in the estimation of the carbon footprint for the different laboratories using these buildings (see below). The university uses district heating, which comes from the recycling of waste from the Brest area. The UBO is a signatory to the "Biomass heating network" project, led by Brest Métropole, which will supply the Brest Iroise technology park (Plouzané) by 2023. The key to this project is the use of mostly renewable energy and a reduction in CO_2 emissions. Last but not least, the energy renovation of the building stock is an essential lever for reducing its energy footprint and improving conditions for staff and students. Major renovation projects are planned or underway.

Regarding purchases, aware that public purchasing is a powerful lever for action, the UBO is tending to systematically integrate environmental and/or social clauses into its public contracts. This is the case for many supply contracts (office supplies, paper, cartridges and toners, maintenance products, network equipment, etc.), as well as for service or work contracts. Some purchases, below the thresholds for publication of public contracts, are also made from ESATs (« Établissement et Service d'Aide par le Travail »). These organizations take in people with disabilities who cannot work in an ordinary or adapted company or exercise an independent professional activity.

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Finally, concerning sustainable computing, the digital master plan, adopted in 2019, incorporates the notion of responsible digital. Throughout the year, the Digital Usage Department raises awareness among students and staff about good computing practices, including simple habits that can help us reduce our digital footprint: regular email cleanup, proper use of one's email signature...

It is important to stress that UBO is committed to the necessary process of energy and climate transition, joining its forces with Brest Métropole and other local actors in the region within the TOMORROW project. This project aims at mitigating climate change and achieving carbon neutrality by 2050, it regroups 6 European cities including Brest (France), Dublin (Ireland), Valencia (Spain), Mouscron (Belgium), Brasov (Romania) and Nis (Serbia).

III.1.2. UBO and the « Labos 1point5 » research group

UBO, in particular the LEMAR Laboratory, is deeply involved in the coordination team of Labos 1point5, a French Research Group («Groupement de Recherche», GDR) working at transforming research collectively, to lower its carbon footprint[32]. Labos 1point5 provides a unique opportunity for the SEA-EU alliance to perform joint work at two levels: (1) measurement of carbon footprints using a shared methodology and (2) experimentation on different ways to stimulate reductions in GHG emissions.

Measuring Carbon footprint with a shared methodology: GES 1point5

The LEMAR has estimated its carbon footprint (or "C footprint") for the years 2018, 2019 and 2020, using GES 1point5 and this tool is presently being used in other labs of the IUEM (the Sea faculty of Brest University). GES 1point5 is a tool developed within Labos 1point5, that aims at calculating the C footprint of a research lab and building its GHG Inventory[33]. It is a freely accessible, online, standardized tool that allows for consistent comparisons of carbon footprints between laboratories. Its methodology is completely transparent and described in the tool. Carbon emissions estimations include those from the buildings (energy (heating, electricity) and refrigerant gas consumptions), from travel (business travel and commuting), from the lab's digital devices, excluding their electricity consumption (PCs, monitors, laptops, servers, etc.), and from purchases not accounted for in the previous three categories. It is a tool that accounts for the specificities of research laboratories, and promotes the open access to digital tools, constitutes the basis, at a laboratory scale, for further action aiming at reducing its C footprint. Indeed, by identifying the relative importance of C emission sources, it points to where the main efforts should be directed. In fact, the first results with hundreds of carbon footprints estimated, demonstrate the great diversity of this relative importance: for some labs, commutes are essential while buildings, purchases or professional travel prevail for others. This points to the importance of local solutions to be found, instead of top-down approaches that would probably remain inefficient. GES 1point5 is also the first tool ever developed to explore the carbon footprint of a whole

[32] See the Labos 1point5 web site : https://labos1point5.org

[33] Mariette, J., Blanchard, O., Berné, O., Ben Ari, T. 2021. An open-source tool to assess the carbon footprint of research. BioRxiv, doi : https://doi.org/10.1101/2021.01.14.426384

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national research system and understand its features in terms of lab sizes, disciplines, geographical locations…

The version of GES 1point5 dedicated to « anonymous users » is accessible on-line for all SEA-EU partners and below is discussed the idea of using this tool to extend the approach at the SEA-EU scale. The «Authorized user» version is dedicated to French research laboratories only, as the goal is to estimate and characterize the carbon footprint of the French research sector.

GES 1point5 is replicable around the world, provided emission factors are adjusted to the country. This includes, on the one hand, the emission factors related to electricity: in mainland France, electricity is mainly generated from nuclear energy, which is low-carbon, unlike most other countries in the world which use fossil fuels for their electricity generation. Therefore, for the same consumption level, the results for emissions from electricity consumption will differ from country to country. This includes the electricity consumption of the lab, but also all the emissions due to electro-mobility (train, tramway, subway, etc.). On the other hand, it includes the emission factors of local heating networks: each urban heating network has a different energy mix and therefore its own emission factor. For a lab located in a foreign country, the emission factor of the local heating network should be obtained or estimated.

Experimenting wih different approaches/tools to stimulate carbon emissions reductions

The LEMAR lab, through O. Ragueneau leading this position paper, is co-ordinating a national experiment (Expé 1point5) together with A. Sabbagh (University Paris Cité), as part of the Labos 1point5 GDR. This experiment builds on the GES 1point5 tool and aims at filling the gap between intention and action: knowing doesn't mean acting/changing. Once the main sources of GHG emissions have been identified, how to stimulate changes in our daily research practices that would favor reductions in these emissions? Will raising awareness be sufficient? Will we need more binding commitments? Will we need to turn to financial tools such as taxes or quotas? Nobody holds THE solution and as we have seen just before, there will not be a unique solution but rather, a diversity of solutions that will be context-dependent. The main idea of this experiment is to explore this diversity by experimenting different tools and different modalities by which they could be applied: different levels of taxation, quotas being distributed equally or varying depending on criteria to be defined collectively etc…

This experiment has two main components:

- ***Accompanying component***, including (i) the Kit-1point5 for an easier appropriation of the different awareness raising, financial and regulatory tools, (ii) facilitation of debates and decision-making procedures to choose a reduction objective, build scenarios, choose one or several of the tools proposed in the Kit 1point5 and (iii) a collaborative platform to facilitate the exchange of good practices among experimenting labs.

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- ***Research component***, evaluating the effects of different options for reducing GHG emissions on these emissions as well as on the quality of research and well-being at work. Indeed, as demonstrated before, climate change AND the unsustainability of science subject to acceleration both force us to rethink our activity and develop new metrics to measure its quality and its impacts.

In 2021/2022, the experiment has entered a pilot phase with some 23 labs involved, testing this approach. The Kit-1point5 is being improved and will be made available to all by late 2022. A tool that is under construction that will help labs to build their scenarios. An interdisciplinary team is also under construction to explore the experiment from different perspectives (economics, law, science studies, environmental psychology, …). It is planned that by early 2023, more labs will enter this experiment that will last for several years.

III.2. Other partners

Kiel University (CAU) has set itself the goal of becoming climate-neutral in operations by 2030 and reducing the energy-related, operational and mobility-related CO_2 balance to zero. The focus is on the economical use of natural resources. This includes the optimization of energy requirements and mobility, as well as the promotion of biodiversity and waste avoidance. In this way, Kiel University strengthens its sustainable profile and saves operating costs, which can benefit research and teaching.

For this reason, Kiel University implemented the environmental management system in accordance with the **EC Eco-Audit Regulation (EMAS III)** in 2012. The coordination of the environmental management system is the responsibility of the university administration's department for ressources. The Chancellor of the CAU, Ms. Claudia Meyer, is the central environmental management officer. EMAS - Eco-Management and Audit Scheme - requires organizations to voluntarily do more to protect the environment than is required by law and to continuously improve themselves. In addition, they are regularly checked by a state-approved environmental expert and disclose their operational environmental protection in an environmental statement. Environmental goals are drawn up every three years and officially adopted by the Executive Committee and Senate of Kiel University.

In recent years, Kiel University has succeeded in reducing energy-related CO_2 emissions by more than 60 percent by purchasing electricity from renewable energy sources. Although the campus is growing, measures to increase energy efficiency and energetic refurbishment measures were able to prevent energy consumption from growing at an above-average rate. New buildings at Kiel University are planned, erected and certified according to the federal government's criteria for sustainable building. In the development of the new campus area "Bremerskamp", strict sustainability criteria are applied and the use of geothermal energy and other regenerative energy sources is examined.

When it comes to traffic volume, Kiel University is specifically promoting cycling and has been able to reduce car parking spaces in recent years. The planning of the new buildings is closely linked to mobility management. In many new buildings, showers for cyclists,

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separate bicycle cellars or extensive parking spaces with canopies are planned. The realization of a bicycle parking garage with up to 800 parking spaces is currently being examined. The technical operation and service at Kiel University has also been changed: technical staff now use electric bicycles and cargo bikes to go to their jobs on campus.

The promotion of biodiversity is also a declared environmental goal at Kiel University. In recent years, several thousand square meters of species-rich flowering meadows have been created and several dozen fruit-bearing trees and shrubs have been planted. In addition, Kiel University provides a higher ecological compensation for construction measures than is required by law.

In order to make environmental and climate protection at Kiel University visible to the people who deal with the topic in different ways as researchers, in science, as students or employees, there is the interview series "Unter Zwei" - based on the two-degree-target of the Paris climate agreement. The interviews are conducted by students. In addition, a so-called Green Office will be set up at Kiel University to provide students in particular with a contact point for sustainability issues in the university context.

The University of Cadiz (UCA) holds the Sustainability Promotion Plan, which integrates the three pillars of sustainability (economic, social and environmental). Its objective is to strengthen the performance of its academic programs and social projection, based on a broad and committed participation of the university community as a whole. It is composed of a set of programs framed within several thematic areas that work in an interrelated and complementary manner to drive and promote the commitment of the University of Cadiz toward sustainability. These programs work along the following lines of action: a) Environmental Education and Awareness (to promote good environmental practices on campus and its surroundings, to develop training, education and awareness actions that contribute to raising awareness to solve environmental problems); b) Participation and Promotion of Environmental Volunteering (to attract the attention and encourage the participation of the university community, and society in general, in responsible actions concerning the environment that surrounds us); and c) Environmental Training (to promote environmental commitment among the university community so that they take responsibility and actively collaborate in pursuit of a more sustainable university. It includes a sustainable mobility plan).

The UCA is involved in the regional project entitled "Declaring ourselves in Climate Emergency". This project is funded by the Andalusian Agency for International Development Cooperation (AACID) and is facilitated by Ecotono S. Coop. Andaluza —an entity of social interest. The project aims to help universities to build a specific plan for the fight against climate change, following the Declaration of Climate Emergency promoted by the UN (2030 Agenda and the Paris Agreement). The project involves other Andalusian universities such as the University of Cordoba, the University Pablo de Olavide and the University of Seville. The project addresses the creation of environmental education and sustainability programs on campuses to solve some of the university needs: a) Absence of an Action Plan specific to each University to develop the climate commitments acquired; b) Insufficient knowledge about climate from the society; c) Lack of awareness from the university community about the actions within their university in terms of Sustainability and Agenda 2030; d) A university community

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oblivious to the options available to participate in these actions; e) Necessity to network with other universities to address the Climate Emergency.

The Strategic Plan of the University of Cadiz establishes in its objective 4: consolidate a sustainable and socially responsible governance model. It includes the following actions, related to the reduction of the carbon footprint of the different campuses (4 campuses - Jerez, Puerto Real, Cadiz, and Algeciras): a) Advance in the UCA Guide to Sustainable Public Procurement (ethical, social and environmental obligations in service and product supply contracts); b) Approval and implementation of a UCA Environmental Plan (Energy, Water, Biodiversity, Waste, Recycling, Food Waste, Mobility, Alternative Energies, etc.); c) Improvement in communication and dissemination of the impact of the university activity on the environment (carbon footprint measurement), as well as the dissemination of the Environmental Management System (EMS), encouraging the participation of the university community in activities that reduce environmental impacts on the University and its surroundings (mobility, energy efficiency, water and waste, etc.); d) Increase in the use of alternative energy sources; e) Improvement in the air conditioning infrastructure of some centers.

The University holds a department in charge of the actions toward sustainability. This department is called the *Office for Sustainability*, which supervises the University's participation in the Carbon Mapping 2020 Project, of The Planet App and Bye Carbon. The objective of this project is to statistically characterize the carbon footprint of Spanish society. UCA community has participated in a brief survey that enables us to conclude the transportation habits of the participants and the environmental impact of these, as well as to make a comparison between different parameters such as people by sex, age, place of residence, occupation (student or worker), or university where they study or work.

The declaration of Climate Emergency by more than 7000 universities, institutions and higher education networks around the world in 2019 recognizes the need for a drastic social transformation to combat this civilizational threat and assumes the role they have in training younger people to respond to the environmental and climate challenges ahead. The commitments made by the Universities with the signature are carbon neutrality between 2030-50, more resources for research on climate change.

In the coming years we would like to analyze in a shared way with the rest of the universities of the consortium the carbon footprint produced by the university community. This will allow us to take decisions regarding common actions to reduce the emission of carbon dioxide. On the other hand, we believe it is important to make a particular study regarding the production of carbon dioxide from research activities in our university, applying standardized methodologies, which should be common to other universities in the consortium.

The University of Gdansk (UG) firmly believes that universities should reduce their carbon footprint. This is supported by a number of socio-economic arguments, such as (i) the university not only educates students, but also shapes their attitudes, behaviour and habits; therefore, the university must show many good examples within its own activities in order to become a reliable source of knowledge and skills, especially in terms of implementing good practices related to sustainable development; (ii) the

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implementation of research requires the use of energy-intensive apparatus and equipment, which can have a negative impact on the environment; however, alternatives that reduce the carbon footprint should always be sought; (iii) thanks to the commitment of the university authorities, researchers as well as administrative and operational staff are beginning to recognise the need to reduce their negative impact on the environment and (iv) the close cooperation of universities with local authorities, business associations, companies and NGOs in terms of education for sustainable development and the sharing of related research results, encourages and inspires environmentally friendly actions leading to a reduced carbon footprint. Accordingly, the University of Gdansk (UG) presents the following activities, limitations and plans to reduce its carbon footprint.

Work is underway to implement a research infrastructure carbon inventory system, and analyse possibilities to reduce emissions, regarding energy and electricity consumption, especially by research apparatus. Concerning mobility, staff travel, especially for research and teaching placements, is covered by policies to reduce the carbon footprint of travel (similar to ERASMUS guidelines). Ongoing also, the preparation of guidelines and implementation of a green procurement policy by the UG Procurement Policy Centre.

UG also sees important limitations, as it is not always possible to reduce the carbon footprint when conducting research. Most often, limitations in this respect are due to the following considerations: (i) for research work, specific, concrete apparatus is required that makes it impossible to reduce the carbon footprint; (ii) the implementation of some research processes requires the use of energy-intensive technological processes; and (iii) researchers from UG conduct scientific research on different continents. Therefore, air travel cannot always be avoided.

Despite these limitations, several activities are planned to reduce C emissions at an administrative, campus-wide level: (i) use of renewable energy sources to power UG research apparatus and equipment through the installation of photovoltaic panels; (ii) the possibility of powering the entire UG from renewable sources through specialised suppliers is being analysed; and (iii) improvement of self-assessment processes: the University of Gdansk participates in international rankings of higher education institutions such as THE Impact and Greenmetric; to this end, a data collection system will be built, including elements for measuring the university's carbon footprint; at a later stage, it will be used to implement measures to reduce the university's carbon footprint.

The Strategic Plan 2020-2025 of the **University of Malta** (UM) (https://www.um.edu.mt/about/strategy/downloadstrategicplan/) serves as a guidance for UM with regards to sustainability. The theme is specifically addressed in chapter 7. The chapter reflects the principles of the UN Sustainable Development Goals (UNSDGs) with the need for sustainability to be mainstreamed across other functions, including administration, teaching, and research.

Sub-themes within the strategy are focused on improving efficiency and end-of-pipe solutions in the collection and treatment of waste, water conservation, the development of training and research and the promotion of healthy living practices. The

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Strategy commits UM to extend education related sustainability beyond the academic and student community and towards the auxiliary support staff. Furthermore, sustainability practices are planned to be mainstreamed within programmes with the topic being included as one of the courses' learning outcomes. General courses on the appreciation of local wildlife and flora and sustainable practices are also planned, while multi-disciplinary projects are encouraged.

The Strategy also acknowledges the connection that food consumption and unhealthy living has with environmental impact and therefore requires that a wider range of healthy food be made available on campus. This is accompanied with initiatives to promote walking/cycling, the availability of fitness infrastructure and the promotion of organised sports events on campus. Finally, training on work-life management programmes for staff and flexible working hours all aim to enhance healthy living.

While these themes address sustainability issues they are not directly focused on carbon-emissions. However, the increased efficiency, coupled with improved infrastructure will lead to indirect savings of carbon. More direct handling of carbon-emissions is tackled under the topics of 'energy efficient measures' and 'sustainable transport measures'.

Energy efficient measures allow space for various initiatives. The installation of a solar power park coupled with the shift to energy efficient light fittings, and the installation of a centralised smart air conditioning system with ethernet control, have already resulted in the annual saving of 1,000 tons of carbon dioxide emissions with the annual grid energy consumption for the years 2015 to 2018 inclusive below the 2014 grid consumption. It should be highlighted that several buildings within the UM campus have a primary energy consumption that is below national targets for non-residential nearly-zero energy buildings. However, UM acknowledges that the carbon-emissions programme needs to be sustained and aims to emphasize the continuing investment in centralised, efficient air-conditioning systems which have capillary control capabilities to replace stand-alone conditioners. Passive measures to reduce energy consumption needs of buildings, the installation of photovoltaic on new buildings and the use of presence and light sensors for more efficient energy management.

With the adoption of the Green Travel Plan in 2011 several initiatives related to green travel at the UM Main Campus were introduced. While parking space occupies 47% of total land area around the campus, parking limitations introduced in 2006 Local Plan act as a very strong deterrent to increased car use to and from campus. The UoM campus benefits from direct transport links which is like all towns and villages in Malta. Effort to increase walking and bike usage is continuous.

The University of Split (UNIST) both through scientific work and teaching activities has made efforts to raise awareness about climate change and undertook different actions to protect the environment. Students play a critical role in the fight against climate change, for which relevant knowledge can be obtained through a variety of study programs related to: climate system and impact of climate change, meteorology, air, soil and water pollution, environment and environmental protection, preservation of life on land, remediation technologies, sustainable development etc.

UNIST is a beneficiary of the Operational Program "Competitiveness and Cohesion". All EU projects currently in implementation are in line with European Union horizontal policies, which aim to have a positive impact on the horizontal principles of sustainable development, climate challenges, resource efficiency, and the green growth principles. Projects relate for example to (i) sea level rise impacts at sub-hourly timescale[34], (ii) preventing, managing, and overcoming multi-hazard natural disasters in the affected regions of Italy and Croatia, such as river and sea floods, meteorological tsunamis, and earthquakes[35], or (iii) strengthening resilience to climate change of vulnerable sectors of water resources management, agriculture, energy and tourism in a specific area, the Imotski Region[36]. Other projects demonstrate the deep involvement of faculty staff in the adaptation of Croatia to climate change impacts, including water management in cities[37] or fire prevention, for example through the work of the Center for Open Space Fire Research, which maintains the network portal of fire protection of the Split-Dalmatia County. This is the central place from which all modules of the information system of the integrated fire protection of the Split-Dalmatia County are accessed. Regarding training, the project "Practical-Active-Together-Interdisciplinary! – provides socially useful learning programs through which students from different faculties work together on projects that contribute to environmental protection and sustainable development[38]. This enables the connection of students and teachers from different faculties, and consideration of environmental topics from different perspectives, etc.

Beyond research and teaching, other sustainable development initiatives have already been implemented at UNIST and plans for future are being developed: improvement of the electrical network in laboratories; investment in renewable energy sources by installation of solar panels at University; education of employees on rational electricity consumption; adaptation and replacement of existing lighting with more energy efficient ones; rational use of electricity through more concentrated teaching schedule, purchase of energy efficient scientific equipment, heating system replacement (air source heat pump); adequate waste disposal (batteries, toners, electronic waste, biological and chemical waste); waste recycling (organized collection of paper for recycling); electric bicycle stands; greening of campus space; introduction of a digital repository of papers, … Raising awareness continues, through lectures on the challenges posed by climate change; calculation of carbon footprint during lectures or students graduate/final theses; introducing the public to the importance of preserving the environment, climate change and water supply at College Open Days, European Researchers' Night or the Science Festival; reuse of waste; extraction of active components from waste; green technologies; composting within the student restaurant, etc.

UNIST hopes that the collaboration within the SEA-EU alliance will bring new ideas and perspectives to be more efficient in environmental protection, especially in reducing the carbon footprint and mitigating climate change.

[34] ERC project SHExtreme: https://projekti.pmfst.unist.hr/SHExtreme/project-info/
[35] PMO-GATE : https://www.italy-croatia.eu/web/pmo-gate
[36] https://vodime.eu/vodime-en/
[37] https://www.interreg-central.eu/Content.Node/CWC.html -
[38] PAZI project : https://sunce-st.org/en/news/practical-active-together-interdisciplinary-service-learning-programs-for-the-environment-and-sustainable-development/

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III.3. State of play: a first brief synthesis

From this state of play it is evident that all SEA-EU partners are deeply involved in a worldwide movement of « greening campuses », in relation to the social and environmental responsibility of institutions. This goes beyond carbon, including biodiversity and other environmental features as well as other components of sustainability, especially social (e.g. gender issues).

The focus of this position paper being carbon and climate change, it comes out that all partners are at very different stages in the process of decreasing their GHG emissions:

- There is a wide gradient, from awareness raising to the design of an experiment aiming at testing different tools to reduce GHG emissions of research activities (buildings, travel, purchases, commutes, …), going through the measurement of carbon emissions linked to these activities and actions already being taken regarding building energy consumption or mobility (especially commutes or the promotion of soft mobility).

- Similarly, just concerning this GHG measurement, different approaches are found, be they top-down (Kiel) through the construction of an environmental management system in accordance with the EC Eco-Audit Regulation (EMAS III) or more bottom-up, one partner willing to develop its own research infrastructure carbon inventory system (Gdansk), another one (Brest) using the GES 1point5 tool developed to measure and analyse the carbon footprint of a whole national research system, hundreds of labs using this same tool for comparison purposes. As UBO, UCA (Cadiz) is willing to use a standardized methodology though GES 1point5 at their university and among SEA-EU partners.

- Regarding the willingness to reduce GHG emissions, there also exist a strong gradient from those willing to reduce all components of emissions to those pointing to limitations due to the necessity to travel on all continents or to use equipment that consume a lot of energy, going through those willing to have discussions on what is essential or less essential in research activities, what activities could be mutualized, reduced or even abandoned.

This diversity in the state of play for each partner - regarding where they stand between intention and action, how they measure GHG emissions or their reflexion on which activities should be reduced or not – holds important implications in terms of SEA-EU commitment towards reducing its carbon footprint. Clearly, the idea of launching an experiment at EU-scale, such as the one undertaken by UBO (Brest) and Labos 1point5 at the scale of the French research system is premature. However, many joint activities can be performed that may lead in the near future to the development of a joint approach, that will lean on the diversity of contexts and possibly, methodologies employed.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017454

In France, the Expé-1point5 leans on the fact that all labs will measure over several years their GHG emissions using the same tool – GES 1point5 – for comparison purposes. As will now be shown, one of our goals is that the tool be used by all partners of the alliance in a near future, for such a comparison to be carried out at EU scale. This is crucial. But at the same time, discussions can be launched to start joint activities regarding very important aspects, such as the ethical dimension of climate change. Based on these discussions, a wide experiment could also be designed with very different foundations, for instance according to the diversity of approaches to measure and analyse GHG emissions in each country, on the wide diversity of cultural and political contexts, on the diversity of historical responsibility and so on. This will now be proposed in the last section dedicated to the SEA-EU commitment towards reducing its carbon footprint.

4. Moving forward: the SEA-EU commitment

Given the results of this brief overview of ongoing activities and plans regarding GHG reductions within the SEA alliance (section III) AND the strong positioning of the alliance regarding the necessity for HEI's to reduced their carbon footprint (section II), all SEA-EU partners commit to explore the following possibilities:

Regarding the objective of reducing GHG emissions

- To launch discussions within each partner, to set up an objective regarding the reduction of GHG emissions, in line with the Paris agreement (-50% before 2030) or willing to do less or more, for reasons to be described.
- To share the result of these discussions with other SEA-EU partners, possibly to set up a joint objective. By this, we mean a global reduction objective at the scale of the alliance that would account for national differences, in line with the different historical responsibility of each partner country.

This will allow the alliance to push collectively the ethical dimension of climate change. Not only as mentioned earlier, as a major reason why scientific activity could or should be limited if one accounts for the ethical dimension of climate change in science ethics, but also by accounting for this common but differentiated responsibility among its partners, regarding historical GHG emissions.

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Regarding the measurement of GHG emissions

- To measure year after year their carbon footprint, using a constant methodology for such a multi-year survey that would allow each partner to compare its real trajectory with the one in line with the objective set for 2030.
- To use GES 1point5 for the yearly measurement of GHG emissions, either as the main tool *or in parallel* with the tool used by the partner, at least in one research structure of the university, for comparison purposes amongst SEA-EU partners.

This will first allow for testing the applicability of this tool worldwide, provided emission factors are being adapted to the local context. This will also allow for comparisons among partners, the aim being to use the SEA-EU diversity of geographical, political, economical, cultural contexts to undertake a comparative approach to explore regional differences in research carbon emissions across the European continent, and better understand its drivers under different contexts.

Regarding actions towards reducing GHG emissions

- To share good practices with other partners, regarding filling the existing gap between intention (willingness to reduce GHG emissions) and action (reality of GHG reductions); this could be done either through regular meetings or through the development of an on-line collaborative platform, to be discussed and constructed.
- To launch discussions about a possible experiment to explore how best to stimulate GHG emissions reductions. It would be conducted at the scale of the alliance, in a few years from now, leaning on the already rich and diverse experience of each partner and building upon the skills that will be developed and shared within the alliance, thanks to the first five commitments.

It is important to note that such an experiment is yet to be designed and it can take at least two major directions, and probably much more:

- The first one would resemble the one coordinated by the University of Brest and Paris Cité, within Labos 1point5 (see section III) : use of a similar tool - GES 1point5 – to measure GHG emissions ; exploration of a common set of tools (awareness raising, financial, regulatory) to stimulate reductions ; comparison of results of such a similar methodology among partners, under different contexts.
- The second one would allow each partner to develop its own approach to stimulate the reduction of GHG emissions, with the idea of a more compositional approach[39] rather than a comparative approach using similar tools explored under different contexts.

[39] Corrêa D.S., Magnelli A.R.d P. 2020. L'apocalypse de Gaïa : la cosmopolitique pour l'Anthropocène de Bruno Latour. *Nat. Sci. Soc.* 28 (3-4) : 314-322.

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It is important to note that in the comparative approach, a large degree of freedom is given to experimenting labs, which are completely free to set their objective, their trajectory and the different modalities under which the different tools can be applied.

Concluding words

Obviously, many other aspects of the SEA-EU contribution to sustainability could be discussed, including (i) moving beyond carbon, (ii) demonstration effects on other sectors of human activities or (iii) thinking scholars and students' mobility within the alliance, under this climate constraint. It is important to stress that the pandemia has led, on the one hand, to a wide extension of digitalization and remote work, which favors the reduction of GHG emissions; it has also led to major social difficulties, especially for students feeling isolated in many cases. Clearly, an equilibrium must be found between limiting GHG emissions and favouring mobility as an important component of collaboration and social interactions in general. Many alternatives to planes do exist, and the SEA-EU alliance could play a strong role of advocacy to favour low-carbon mobility and to reduce existing inequalities in terms of professional travel, between students and older faculty staff (Ciers et al., 2019)[17].

At this stage, it is important to recall the strong SEA-EU positioning described in the synthesis of section II, clearly encouraging to (i) include the ethical dimension of climate change into science ethics, so that the scientific activity may be constrained somehow by planetary limits and the question of common but differentiated responsibility and other inequity problems be treated at the level they should and (ii) honor our responsibility by rethinking the scientific activity, in its objectives as well as in its practices and its evaluation, leaving competition and acceleration, making our science great again so it can both contribute to the global effort towards reducing GHG emissions and play a major role in accompanying the transformation to sustainability.

We, as an Alliance, share the same objective: beyond stimulating the reduction of GHG emissions at EU scale, we wish to stimulate collaboration instead of competition to compose a common world, thereby (i) fighting against acceleration and its multiple consequences including the unsustainability of science itself and its present inability to address the sustainability question[9] and (ii) contributing to prevent potential future conflicts when climate change impacts become catastrophic.

This is the main reason why the EU was constructed, isn't it?