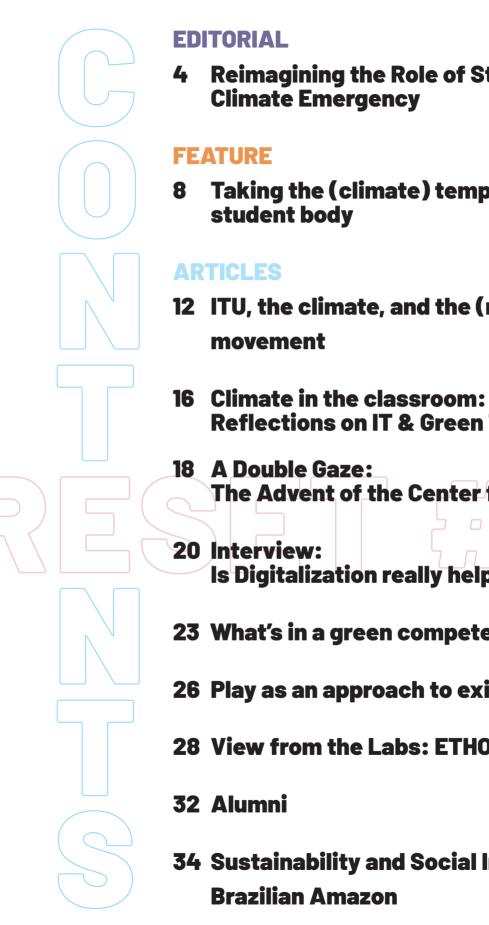# RESET

a climate magazine by the IT University of Copenhagen

*Students in
the Climate Emergency*

Jebel Kissu, in northwestern Sudan, emerges abruptly like an island in the vast Sahara Desert. The plateau is the eroded remnant of a granite dome. The bright linear features are truck tracks, common in the Sahara where there are no paved roads.

CONTENTS

REIMAGINING THE ROLE OF STUDENTS IN THE CLIMATE EMERGENCY

James Maguire
Michael Hockenhull
Tom Jenkins

It won't have escaped anyone's attention that some of the most inspirational and significant climate voices of recent times have come from students. Take but two examples. *Fridays-for Future*, a youth led movement inspiring students around the world to join together in public protest against inter-generational climate injustice. Or a group of American teenagers who have successfully sued the state of Montana on the basis of a constitutional right to a clean environment. This is unprecedented, not just in terms of specific groups trying to hold governments accountable, but also in terms of the magnificent fact that it is students leading the way, inspiring us all.

It strikes us that now is *the time of the student*, so it seems fitting to explore their role in the climate emergency. For that reason, this issue of RESET examines the relationship between the university, its students, and the enactment of more desirable climate futures. At its heart is a curiosity towards how students see this relationship, situated alongside a series of insights from various institutional perspectives: researchers, labs, centers.

The issue finds its inspiration not only in our desire to listen more attentively to what students are saying – attested to, in part, by the inclusion of students in the RESET team of writers and editors. It is also reflected in our desire to probe the university's role in helping students engage with the multi-dimensional challenges that the climate emergency is producing.

Universities as we know them carry significant importance for both students and the knowledge producing society. As key societal institutions, they are a gateway of sorts where students *transform* into the workers, leaders, and carers of tomorrow. This is crucial for us: an understanding of the university as a site of (radical) change, despite its neoliberal, managerialist leanings. In a more classic sense, it is a site of *dannelse,* or *cultivation*: not just a place where teaching and learning happens, but a site where more fully rounded citizens are shaped. Cultivation is, however, not instrumental, it is about learning for the sake of learning, aiming to develop students as people. We need students who can design, manage, optimize, act, and yes, *solve* the climate crisis. But as our last issue highlighted, the climate crisis is a wicked problem, one composed of various rebound effects and entangled with our entire socioeconomic system. Producing students-as-instruments just doesn't cut it. We need students

that are *well-rounded* if they are to be up to the task.

In a sense, then, this issue is an effort to both *take account* of student voices while holding our institutions *to account* in developing and realizing those voices. To try to capture this, we have conducted a survey of ITU's student body, which you can read about in our feature article. This survey signals quite clearly that ITU students have a strong desire for more engaged and sustained climate interventions. It is difficult to understand that the ITU is one of the only, if not the only, Danish university without a set of climate emission reduction targets. From our perspective, this clearly signals a need for resolute and strong leadership in order to live up to the standards of a contemporary university. It also means reimagining our teaching infrastructures to help students become the people they need to be in a world filled with strikingly adversarial conditions. This is a point we take up in another article, where we discuss one attempt to bridge this gap via a new interdisciplinary course, IT & Green Transitions.

However, should we reconsider our teaching infrastructures in response to the climate emergency? On this point there is considerable debate.

Fridays-for-future showing that when young people demand change, their voices are listened to.

While some academics oppose the idea of allowing any single concern to shape our institutional forms and academic freedoms, there are others, including us, who feel that the profound changes we are experiencing necessitate a re-evaluation of our pedagogical values, priorities, and sense of relevance. In this reading the climate emergency is not *an* issue amongst others to be tackled, but *the* issue that fundamentally determines the nature of our relationship to the planet. And while there is now, finally, widespread agreement within industry, politics, and the education sector itself on the need for a radical overhaul our our ways of living, the problem, it seems, is translating such agreement into forms of meaningful action.

Institutional responses have varied. The most daring are universities whose entire modus operandi hinges around the climate question. A recently established university in Wales is now offering a singular degree program focused solely on the topic of sustainable futures. Here a wide palette of disciplinary knowledge forms are being brought to bear on the question of more desirable climate futures. Other institutions have restructured their entire research agendas through the prism of the Sustainable Development Goals (SDGs). Many have designed specific climate education programs at both master and bachelor levels. While others again have developed climate schools, centers, and specializations with deep connections to teaching formats. At the more tepid end of the scale are universities with either singular climate courses and/or green competency profiles. This is where ITU locates itself. While there is nothing wrong with competency profiles as such (see the article *What's in a Green Competency* in this issue), they strike us as insufficient for addressing the pressing need to transform the students of today into the leaders of tomorrow.

Another innovative response has been what could be called *alt-teaching formats*, such as climate teach-ins. Here university staff discuss climate change issues in public spaces, specifically those places of power where climate decisions are of-

tentimes made. However, these alt formats are on the periphery, and only very occasional. From our perspective, more of this spirit would be welcome within our institutional walls. Ultimately, the real challenge we want to pinpoint, and which clearly needs more sustained attention and action, is how to produce not just more *green students*, but how to develop student subjectivities that can take on the challenges of co-creating more desirable climate futures. One of our stories dives into the history of student movements and explore what it might take for ITU students to mobilize themselves and take on this co-creating role.

It is our conviction that the accelerated and complex transformations that society is undergoing need to be addressed more directly. Rather than merely adding green profiles to an already over-

burdened competency matrix (whose effectiveness is questionable to begin with), we should *reimagine the role of students in the context of the climate emergency*. While students will look to industry and the public sector to focus their skills and broaden their experiential knowledge, industry will, reciprocally, look to students to generate new thinking, methods and approaches to the vastness and interconnectivity of the challenges posed by the climate emergency. It is the university system that sits at the crossroads of these exchanges. Having a clear-eyed understanding of that role— and the responsibility it implies—is one pathway towards more engaged and meaningful climate education. The purpose of this issue of RESET is to draw attention to the various ways that this is already happening, and, more importantly, to pave the way for how it might happen into the future.

James Maguire
Associate Professor

Michael Hockenhull
Postdoc

Tom Jenkins
Associate Professor

Taking the (climate) temperature of the student body

Max Christian Sørensen
Hanna W. Grue
Frauke Mennes

What do ITU students think about the current state of the planet? And what do they think ITU's role is in addressing the polycrisis we face? The RESET group was very keen to find out and thought it was time to complement the anecdotal evidence we've been listening to for several years by way of a (non-scientific, yet still robust) student climate survey.

Conducted on February 23rd in ITU's Analog, our student climate survey asked nineteen questions and garnered 110 answers across ITU's ten study programmes. In broad terms, we asked students for 1) their personal opinion on climate change, 2) their expectations for climate driven education at ITU, 3) their expectations of ITU as a climate leader, and 4) their thoughts on the concrete actions ITU can take to lessen its own climate impact. And here is what we found: students are overwhelmingly keen for ITU to do far more on the climate front. Both in terms of the organization's own practices and impacts as well as how we educate students on the uncertain climate futures we face.

In the following article we break down the results of the survey, highlighting the most interesting findings, nuances, and overarching stories.
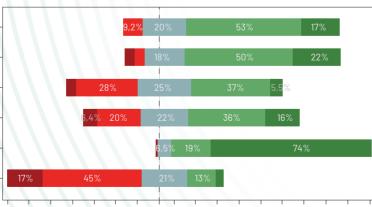
1. Views on climate change: Structures, not tech

As we can see in Figure 1, while the majority of students are already 'enacting' change on a personal level, they still see structural interventions as *essential*. What is most striking about this graph is that only a small minority of students believe the optimistic rhetoric around *green transitions* which, in essence, postulates that green technology interventions are sufficient to limit temperature increases to 1.5% by 2100 (baseline 1990). This is undoubtedly connected to recent scientific findings that the planet has already reached a 1.2% temperature increase, so it is almost impossible to see a pathway that limits us to 1.5%. The entire narrative of green transitions has been put into serious doubt by these long anticipated, and hence, unsurprising, findings. Importantly, therefore, the policies that drive green transition infrastructures (also known as Green Growth, Greentech, decoupling, or more generically, decarbonization), have been severely undermined. Embedded within such policies is a strong understanding of technology *as a saviour*, where a seemingly endless reserve of hope in technological solutionism resides. That the student body of an IT university recognize this basic idea is both striking and hopeful. But such hope cannot exist in a vacuum. It has to be directed into particular interventions across a wide range of societal phenomena. And as we suggest in our editorial, it is the university sector that holds the key to realizing this hope in material forms as it shapes the next generation of caring planetary citizens.

Let's look more deeply at student perspectives on ITU's responsibilities, both as an education provider and as an organization.

2. Student perspectives on ITU and Climate Education

In this question we asked the student body their opinion on the role of climate and sustainability in the courses that ITU offer as well as their relation to the jobs market.

Figure 1: Student opinions on the climate crisis

Figure 2: Student opinions on ITU's programmes, courses, and potential job prospects in relation to the climate crisis.

The survey results show overwhelming support for further integration of climate and sustainability in the existing curriculum. Not only do around 90% of students state that ITU needs to develop more courses on sustainability, but the same majority also finds that ITU should go a step further and develop specialisations and even entire degree programs tailored to meet the challenges society faces.

Not surprisingly considering ITU's student body, many students specifically mention wanting to learn more about the carbon impact of algorithms, coding languages, machine learning and data gathering, in order to use this knowledge to build more sustainable websites, businesses, and computational worlds.

The survey results indicate that students are aware that the labour market expects them to possess more robust climate and sustainability inflected skill sets; around 95% of students think climate and sustainability competencies will be demanded from them in the short term by the labour market. Hence, they conclude that more teaching on climate and sustainability will benefit their educational profiles and job prospects. This is, of course, a way of saying that even beyond the ethical arguments for taking care of our planet and its vulnerable populations, it is common sense for future coders, designers, managers and analysts to integrate green thinking and practices into their skillsets. It is up to the university to be as far sighted as their students clearly are.

3. ITU's responsibilities as an organization

The third question we asked revolved around student perspectives on ITU as an organization that has its own set of climate and sustainability related responsibilities. Looking at student responses, (Figure 3), the overall picture seems clear: students overwhelmingly support the university in taking more, and faster, action on its own emissions front. And that most clearly embrace the idea that teachers, staff, and students should be involved in these initiatives to create a sense of legitimacy around them. It is difficult to parse this underlying student sentiment with the idea that ITU is currently the only university without any climate reduction goals. Just because we are small, does not mean we need to be last.
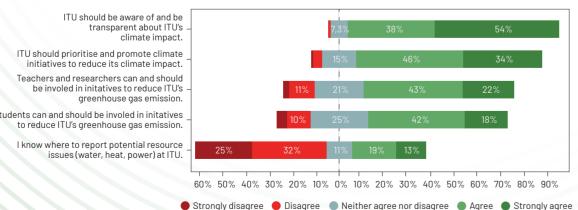
In order to make these numbers more actionable and concrete, we also asked respondents about specific ways the ITU could reduce its climate impact. We asked about energy consumption, travel policy, the canteen, and waste management, amongst others. The survey showed overwhelming support for ITU taking (more) initiative in reducing its climate impact. More than 70% supported securing green energy for university servers and more than 50% supported making the canteen green or vegetarian. With the conversion of the ITU canteen into the Wicked Rabbit this semester, the issue appears to have reached a pragmatic settlement, for now: a new canteen with an emphasis on vegetarian and vegan options, but not excluding meat.

As we mentioned above, the ITU is one of the only, if not the only, university not to have specific climate emission reduction targets. In addition, many other universities have formulated ambitious organizational goals across a range of areas. In fact, the majority are now in the implementation phase of these strategies, while we have still not developed a policy. Copenhagen University, for example, has promised to reduce its CO_2 emissions by 50% by 2030. Aarhus University has made similar commitments, whilst Aalborg University has been very ambitious in stating it would reduce emissions by 70% (baseline: 1991) by 2030 and be climate neutral in 2045. Outside of Denmark, many universities have set up climate councils to combat and prepare for climate change with staff, students and local community members. ITU should let itself be inspired by these ambitions and jump on board. As our survey indicates, the student body is already aboard this train.

Climate temperature: Red-hot and ready for action

Our survey finds that there is overwhelming support for the ITU to do more on sustainability and climate. Whether it be within education or at an organizational level, students are keen for more action and more options. While they are personally acting, they are clear sighted about the need for leadership and structural change.

Of course, students are also aware that ITU is merely a drop in the ocean in relation to the broader planetary picture. Nonetheless, our commitments, while small, matter greatly. Not just in terms of the moral leadership of a leading Danish institution, but also more pragmatically, as the students of today become the professionals and leaders of tomorrow. Change in this sense, is less about quantifiable, measurable reductions (important as this is) and more about, as we have continually mentioned throughout this edition, the subjectivities that we cultivate in the coming generations.

Our hope is that these insights into the (aggregated) opinions of ITU students – whether it be on personal attitudes towards the climate emergency, ITU education, or expectations for moral leadership by ITU management – will inspire and embolden both students and management alike. We hope students will claim their right to more inhabitable futures by pushing for far more action at their home institution. Additionally, we hope that management will take clear and robust action in tackling this wicked problem. According to our survey the majority of the student body *will* stand behind ITU management but *expect* them to take the lead!

Max Christian Sørensen
Student

Hanna W. Grue
Student

Frauke Mennes
Project manager at Center for Climate IT

ITU should be aware of and be transparent about ITU's climate impact. 7.3% | 38% | 54%

ITU should prioritise and promote climate initiatives to reduce its climate impact. 15% | 46% | 34%

Teachers and researchers can and should be involed in initatives to reduce ITU's greenhouse gas emission. 11% | 21% | 43% | 22%

Students can and should be involed in initatives to reduce ITU's greenhouse gas emission. 10% | 25% | 42% | 18%

I know where to report potential resource issues (water, heat, power) at ITU. 25% | 32% | 11% | 19% | 13%

60% 50% 40% 30% 20% 10% 0% 10% 20% 30% 40% 50% 60% 70% 80% 90%

● Strongly disagree ● Disagree ● Neither agree nor disagree ● Agree ● Strongly agree

Figure 3: Opinions on ITU's, faculty's and students' responsibilities relating to the climate crisis.

ITU, THE CLIMATE, AND THE (MISSING) STUDENT MOVEMENT

Karoline Dyrvig Egelund

Students demonstrating for climate change across the world.

Throughout history students have mobilized to voice their opinions, demand action, and catalyze change. It starts in the classroom, being critical of course material or teaching style, and then it moves out into public spaces, as it did with the historic global student movement in 1968. Students are defined partially through their critical stances on the status quo and partially through their curiosity towards different ways of doing things.

The global student movement Fridays for Future has moved climate politics worldwide and inspired action here at home. Copenhagen Business School's (CBS) climate student organization Oikos demanded and achieved the instalment of recycling bins all over CBS' campuses. Students at Roskilde University initiated the social climate movement 'Den Grønne Studenterbevægelse', challenging the Danish governments on their climate politics. Be it small interventions or large ones, when students care and mobilize, their actions can be meaningful and drive real change.

So, what do ITU students care about? As is clear from RESET's student survey, ITU students, like most Danish students, care about the climate emergency. However, we aren't mobilizing in the same way.

"We [Student Council] would definitely applaud if ITU got a student climate organization. If anyone wants to start it, then we have the supporting tools to get it up and running, we just need the students who are willing to try."

More practical than ideological?

According to the Student Council, ITU has never truly sparked political engagement in students. Compared to for example Copenhagen University and its history of student demonstrations and protests, a broader political interest seems somewhat absent at ITU, at least at a formalized level. And this has made us in the RESET editorial group wonder why. A chat with the Student Council points to one reason: our potentially more pragmatic than ideological approach to issues.

→

President of ITU's Student Council Viktor Shamal suggests that even though the climate emergency is a very practical and pragmatic problem, the motivation to organize usually comes from a strong ideology. Perhaps our pragmatic mindset leads us to think the truly important decisions are made outside of campus – and that our best contribution is to be conscientious consumers, get our degrees, and vote for those fighting climate change? Simultaneously, ITU students are, as most students, busy with course loads, student jobs, and the many other extracurricular activities. So perhaps it's simply that there is too little time and too much hassle involved in collectively organizing around this issue? Yet, as the examples from other universities above show, mobilization is a powerful collective technique that can bring the changes desired by ITU's students. A lack of mobilization is thus perhaps a missed opportunity in exercising the most accessible power of all: the power of the collective.

Viktor Shamal does however hope that because the Student Council has eased the processes of starting and managing student organizations, and applying for funding, a climate organization could be founded soon. He says, "**we [Student Council] would definitely applaud if ITU got a student climate organization. If anyone wants to start it, then we have the supporting tools to get it up and running, we just need the students who are willing to try**."

Reviving RethinkIT
According to the RESET survey, ITU students have plenty of opinions and ideas on how ITU could and should participate in solving the climate crisis. Ideas, opinions, and a critical stance on current ways of doing things might be just the spark to create a climate focused organization. Or revive one.

Luis Landa, DIM graduate and current member of faculty, co-created ITU's very own climate or-

ganization 'RethinkIT' back in 2019. Reminiscing, he says, "**it all started when I wanted to do my thesis around climate change, and I also wanted to know why we don't recycle more at ITU. I was asking questions and, well, they led nowhere.**"

Just like the current student body, the members of RethinkIT had plenty of ideas for how ITU could improve and minimize its climate impact. However, when pursuing them the team met several barriers. Safety rules and fire hazards were cited when RethinkIT tried to bring more plants into ITU and the idea of solar panels was shot down because architects have to sign off on any major buliding alteration. It's worth noting however that most universities work under similar conditions, with similar safety rules and rented buildings, and have, despite these barriers, managed to push for improvement. Other ideas from RethinkIT did lead to actual changes, like the introduction of vegetarian dishes (pre–Wicked Rabbit) at the canteen and **Too Good To Go** options to minimize food waste, a sign that management and faculty did engage the student organization and their ideas.

But in the end, RethinkIT dissolved. This was partly due to its thin organizational structure and the difficulties that the Corona pandemic imposed. Reflecting on RethinkIT, Luis is reluctant to label it a success. They essentially wanted to mobilize the students to achieve a greener agenda at ITU, but it never reached that point: "**we wanted to mobilize the collective idea that we as ITU students actually have a lot of power to transform the institution.**"

The power of mobilization
It is famously difficult to create continuity for student organizations, given the reoccurring cycles of graduation and exchange. RethinkIT represents a first move and a testament to the fact that mobilization at ITU of course is possible. As faculty continue to point out, it is students whose

voices are most keenly listened to beyond management corridors of power. When they protest, strike or demand change, the institution is more inclined to listen. We have seen this when students from the University of Copenhagen protested a curriculum change at the Department of Psychology, as well as sleeping outside the Rector's office to oppose the de facto scrapping of smaller courses.

On the education front, RESET's survey shows that ITU Students would like to be able to choose specializations related to climate and sustainability, as well as have a greater range of climate and sustainability courses to choose from. Ultimately, management must cater to student if not society's needs, so perhaps it's time to ask a bit louder for the education we want? The Student Council have done what they can to lower the barriers to organizing, leaving it up to us to actually do it.

Karoline Dyrvig
Egelund
Student

Interested in being part of an ITU Climate student organization? Get in touch with RESET at Frauke Mennes frme@itu.dk and/or the Student Council.

Climate in the classroom:
Reflections on IT & Green Transitions

Luis Alfredo Landa Mariaca
Laura Juncker-Jensen

Great sandy desert with large sand dunes in Western Australia. The fan-shaped lighter shades are scars from wildfires

Climate change is a problem that is oftentimes referred to as 'wicked': that is, it is highly difficult to solve because of its vast complexity and interconnectedness across many scales, sectors, and geographies. From reducing road traffic emissions by developing Co2-intensive machine learning solutions, to designing more nuanced and situated climate calculators that grapple with the complex realities of our systems, to pushing the boundaries of our own climate imagination, one question we continually grapple with is how we can 'teach' ITU students particular methods and perspectives to address the climate emergency. What are the boundaries of such an endeavor given the wickedness of the problem?

This was the challenge taken up when launching the new cross university, inter-disciplinary course, IT & Green Transitions (IT&GT). While the roll-out of the course was a first step in what we hope can become a more extensive climate presence on our curricula, it formalizes what faculty, staff and students have been doing for some years now – directly engaging issues at the intersection of technology and the environment.

While our first issue of RESET focused on how researchers navigate the oftentimes contradictory role of IT in so called 'green transitions', this issue focuses on how we bring such complexities into the classroom and confront our students with them. It's important to say from the outset that running a new cross-university course of this nature is its own type of experiment. One where course managers and faculty, teaching assistants, and students remain open to both the newness of its content and organizational forms as well as its obvious constraints. The course was offered in the autumn of 2022 as a 7.5 ECTS to MSc and BSc students in their final years. The teaching team was delighted when around 150 students signed up.

Over the 14-week course, twelve faculty members presented perspectives on green transitions from their own research fields, offering students an array of perspectives and tools through which to think about, and research, the complex quandaries that arise at the intersection of climate and IT. These topics included an introduction to key concepts, design strategies, perspectives from future studies, more efficient machine learning methods, governance, and organizational considerations, to name but a few. In practical terms, each lecture introduced a climate case or controversy alongside a tool or framework through which the case could be considered.

One pitfall of such an inter-disciplinary approach is that it runs the risk of overwhelming students given the array of options on offer. So, while the course did offer an interesting range of cases and perspectives, its weekly introduction of new frameworks, concepts, tools, and so forth left many students feeling slightly overwhelmed.

While part of the problem is the experimental nature of the course, its newness, organizational structure, and mixed methods approach, another part is the very choice of such a course as the primary vehicle for delivering climate related education. As we write about elsewhere in this edition, there are many options for implementing climate education in the university sector. A cross-institutional interdisciplinary elective may be a good starting place, but it is unlikely to be a good end point.

Put differently, the work of helping students develop the kind of climate "subjectivities" we are discussing in this issue of RESET is lacking in a one-off elective approach. If we view subjectivity as a kind of cultivation ("dannelse" or "bildung") of the self, less about a strictly instrumental relation to knowledge and more about the development of the person, then this course needs to be a first step in a longer sequence. Shaping climate subjectivities is really about cultivating a climate-based sensitivity towards the world as a way of problematizing issues, developing methods to study them, and implementing a range of techniques and tools to address them. And it is undoubtedly asking too much of one elective course to achieve all this. Further discussion on how we move forward in teaching climate issues at ITU is clearly needed.

Many faculty members who contribute to this course see a strong case for expanding our commitments to teaching climate at ITU. To the critical eye, adopting one climate-oriented elective as an add-on to the existing portfolio of courses is simply not enough. There is much more to do at this juncture. As we know, many ITU students go out into the world full of promise and hope, ambitious to change the world for the better. Some even end up in positions of power within both industry and the public sector. So why not empower them to act boldly and wisely? This, of course, involves learning inter-disciplinary methods. But it is more than that. It is about cultivating a disposition towards complex, multi-dimensional, planetary problems that connect to historically laden issues of power, culture, colonialism, patriarchy, and capitalism. What this current cohort of students have shown us is that they are eager to learn, eager to work across disciplines, eager to be part of experimental teaching forms.

Let us hope that ITU can envision a bold and imaginative climate educational profile that lives up to the eagerness of its student body.

> *"There are many options for implementing climate education in the university sector. A cross-institutional interdisciplinary elective may be a good starting place, but it is unlikely to be a good end point."*

Luis Alfredo Landa Mariaca
Lab Assistant and Lecturer

Laura Juncker-Jensen
Research Assistant

A Double Gaze:
The Advent of the Center for Climate IT

Astrid Grue
James Maguire

Every time you compose an email, write a piece of code, or train an algorithm, you are doing computational and environmental work. While the internet is often conceived through the beguiling metaphor of "the cloud" – a rather frictionless image of environmental and computational relations – the fact remains that computation is contingent upon a vast environmental infrastructure: the submerged data highways that run along the ocean floors, the huge amount of precious earth metals, minerals, and materials it takes to build and maintain computational processes, and all the other environmental goods that go into the production of digital artifacts – water, for instance. Not to mention the global extraction of cheap labor that assembles our phones and computers, the mountains of waste created by digital technologies, and the enormous quantities of fossil-fueled energy. Computational actions are, quite clearly, also environmental ones.

As a response to the growing awareness of the reciprocal relationship between climate and IT, winter 2022 saw the birth of the Center for Climate IT (CCIT), a new research center at the ITU whose mission is to engage, question, and challenge the many issues arising at the intersection of these domains of knowledge and action. Headed by Professor Steffen Dalsgaard and co-headed by Associate Professor James Maguire, the CCIT is the result of a profound wish across ITU researchers and their respective disciplinary traditions to address the question of IT's current and future role vis-à-vis the ongoing climate emergency.

The CCIT builds on the recognition that climate change and its concurrent emergencies cannot be addressed without imaginative, critical, reflexive, and productive ways of engaging with digital technologies and processes of digitalization. As an emerging field of research, Climate IT brings various forms of knowledge and expertise to bear on the role of digital technologies in the move towards more desirable climate futures. Data, machine learning, and AI all promise revolutionary advances in the speed and scale at which climate related problems can be addressed. The CCIT is a place that critically engages with such promises by opening up a space of collaboration and problematization with public and private organizations, government, civil society actors, as well as national and international scholars.

Such a research focus means grappling with complex climate and sustainability issues that demand more than one single entry point. The CCIT thus combines research into digital technologies with a focus on the wider impact that these technologies have for the state of the climate and our approaches to climate change, mitigation, and adaptation. The center's ethos is to research not only the technical make-up of technologies, but also their social, political, economic, and environmental entanglements, including policy and regulation among state actors, planning and execution amidst businesses, or everyday life choices of consumption. The researchers affiliated with the CCIT employ a combination of approaches from the computer sciences, the humanities – including human-computer interaction and interaction design – and business and social sciences including anthropology, science and technology studies, and political science.
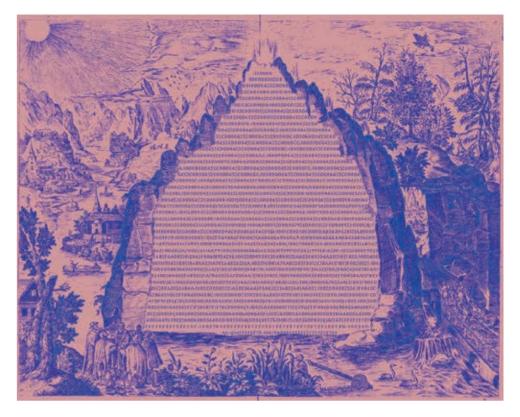
For example, CCIT computer scientists are researching urban planning, power efficient computations, and the modelling potential of machine learning. Design researchers focus on how design methods and approaches can contribute to pushing consumer behavior and choices in more sustainable and climate conscious directions, as well as speculating on how to bring more climate friendly futures into being. And social scientists focus on the conceptual, organizational, infrastructural, and managerial opportunities and challenges of digital technologies in relation to climate change mitigation. While still in its infancy, in the coming years the CCIT also aims to engage private and public partners in various climate problems and their solutions, and to engage the broader public in the important questions that emerge from within the field of Climate IT.

In short, the CCIT is framed by a double gaze that looks at how the environment is embedded within computation, and how computation is embedded within the environment. As Associate Professor Leon Derczynski showed in the 2022 issue of *RESET*, a single training session for a machine learning model can use the same amount of energy as driving 700,000 kilometers by car – a good example of how profoundly the environment is embedded in computational actions.

At the same time, the environment itself is increasingly mediated by computational and digital work. Data, machine learning, and AI are used to promise revolutionary advances in the speed and scale at which organizations – including governments, industries, corporations, the public sector, civil society, and local communities – can respond to environmental and climate challenges, shaping notions of what the environment is, how to develop environmental knowledge, and what is conceived as environmental challenges and solutions. Here, one could think of the many IoT devices that gather data in urban settings, producing interventions at various sites and scales such as, for instance, datafied solutions to areas that are vulnerable to rising sea levels (read: all of Copenhagen). Or one could think of the many ways in which forests are becoming subject to datafication and sensorization when scientists, entrepreneurs, and climate activists work together to try and find ways of sustaining the rainforest, something Assistant Professor Priscila Santos da Costas is currently researching in the Brazilian Amazon (see also her article in this issue).

It is our hope that the CCIT can live up to its mandated responsibility as a world class research center. At the same time, we also envisage the Center being a place where researchers, students, as well as public and private organizations come together to work through some of the complex climate related problems of our times. While thinking and researching at the intersection of climate and IT is but a small niche within the broader climate debate, we hope that we can bring our double gaze to bear in insightful, inspiring, and stimulating ways.

Image from "Waveforms of the earth" by David Gauthier and Jacob Remin.

Astrid Grue
Previous project manager at Center for Climate IT

James Maguire
Associate Professor

Interview:

Is Digitalization really helping the Climate?

A conversation with Olivier Corradi

Astrid Grue
Olivier Corradi – CEO of Electricity Maps

Olivier Corradi

The CCIT's launch event consisted of ITU researchers presenting their ongoing work within Climate IT and a panel of invited experts from industry and academia debating the role of IT vis-à-vis climate change. A video recording of the event is available on the CCIT's website (https://ccit.itu.dk/Engagements). One of the panelists was Olivier Corradi who is the founder and CEO of Electricity Maps, a company that provides electricity data to help businesses reduce their emissions and enable end-users to become more carbon aware. Olivier has a background in statistics, machine learning, engineering, and computer science, having studied at both the Technical University of Denmark and at CentraleSupélec in France. RESET spoke to him on a chilly morning in March via a videocall.

What is Electricity Maps and what is your vision with the company?
Electricity Maps is a data platform that can tell electricity consumers how clean their electricity is at any point in time anywhere in the world. We see the platform as a powerful tool in the move towards decarbonization. Our vision is to make sure that we live in a world with the cleanest pos-

sible electricity. In essence, our mission is to drive the transition towards a decarbonized electricity system.

Broadly speaking, what is your view on the relationship between the fields of IT, climate change, sustainability, and green transitions?
We tend to think that by removing some of the materiality behind our work, we are avoiding emissions. An example could be that, instead of traveling to meet in person, we meet online – just as we are doing right now. But figuring out our actual footprint is difficult. Do we actually have a smaller impact on the environment by digitalizing everything? To answer that question, we need to understand the impact of our IT use. This is quite tricky. When we take the car, we can smell the exhaust fumes and that way, we know when the emission is happening. But right now, by using my laptop which is connected to the internet, I am calling on a large range of different elements, including routers, fiber cables, and data centers that are all powered by electricity. It's difficult for us to grasp what is happening. Quantifying the environmental effects of IT is a complex and very important

task because it ultimately tells us whether we are doing the climate a favor by digitalizing our society or not. My vision is for us to move away from an electricity system where production is a reaction to consumption and on to a system where consumers react to the availability of natural resources like sun and wind. But it is neither conceivable nor likely that we as individuals will be able to take on the mental load of making all these decisions consciously over time. So, the only way it can happen is if we have an intelligent society where systems that are flexible consume electricity at the times when it is clean. We basically want all the dishwashers to run when the wind is blowing. If we don't move in this direction, we are going to have to use a lot of materials and build more storage systems which is far from desirable.

During the panel debate at the launch of the CCIT, you mentioned something called "the rebound effect" as a risk entailed in technological development. Could you say a few words about this effect?
I typically make use of the analogy of cars that have increased in efficiency over time. The im-

pact of more efficient car engines, however, has not been a decrease in total emissions. On the contrary, emissions have increased because more efficient engines have enabled us to make bigger cars and to drive longer to get to our workplaces. We live further and further away from where we work because commuting has become easier with more efficient vehicles. The "rebound effect" is basically saying that if something becomes better in intensity,
we tend to use more of it. Better internet connections will not make us use the internet less. We will use it a lot more. We will increase the resolution, watch more series on Netflix, and so on. So, the only way to ensure that a technological improvement doesn't end up increasing emissions is to restrict the usage of it.

Speaking of restrictions, at the panel you also underlined the need for a regulatory framework. Could you say a little bit more about that?
Consumers will, to some extent, have their freedom restricted by regulatory frameworks. At the same time, I think there is a more constructive way ⟶

WHAT'S IN A GREEN COMPETENCY?

Michael Hockenhull
James Maguire

to look at it which is by focusing on the innovation that can come when companies must work within regulatory frameworks. ChatGPT, for example, is an amazing innovation which, however, uses a lot of energy. Now, if we had a regulatory framework that said: You need to construct a ChatGPT which has a ten times lower energy usage or else your will not be able to commercialize it – just imagine the amount of innovation that would go into making this sophisticated model which would only use a little bit of energy. In my view, fixing the rebound effect can be done by setting in place regulatory frameworks, particularly around products. For example, we could say: It's nice that we now have a better car engine. But let's restrict the weight of the car, so we don't end up simply building bigger cars with better engines. Instead we'll have the same size car but with a better engine.

Would you like to see researchers becoming more engaged in political debate?
Researchers and knowledge institutions are sitting on a ton of knowledge which needs to come out to the broader public and to the politicians. I believe that, ultimately, politicians respond to voting citizens. So, there is an opportunity for researchers to engage more in a broader dissemination of their knowledge beyond their traditional audiences, such as the classroom. Some researchers and knowledge institutions are indeed starting to get on new social media because they have suddenly realized that they can have a much broader reach and greater impact with their knowledge. I really believe that if you want to act on politics, you need to create this public debate and make knowledge easily accessible. At Electricity Maps, we are trying to get

the world to transition from counting electricity emissions at the yearly level to counting them at the hourly level. In that way, people can start to see when the sun shines and when the wind blows. We are trying to make this transition happen exactly by opening up public debate on how we ought to measure the origin of electricity. That's why we've built a free app where anyone can see where the electricity comes from on an hourly basis, and this appears to be quite an effective way of creating public debate. Then, regulatory frameworks can come after that debate. The critical first step is to open up information and knowledge.

What do you hope to see from the CCIT in the future?
The wish list is long (Olivier laughs). But maybe a good place to start is the convergence of different skill sets. Traditionally people that are well-versed in the science of climate change have not engaged significantly with people who work with the future of IT systems whether it's machine learning, or AI, or building data centers. But if we can put all these people in the same room, then we can really make innovation happen. Secondly, like I said, we need to educate the public on how technology works and the challenges that we are facing so that, in the end, we can have some regulatory frameworks in place. It would be amazing if the CCIT could be a place where different mindsets meet and innovation is created by inviting some people who know about climate change, some who know about software, and some who know about hardware, and putting them all together with the goal of saying: How do we build IT systems that are low-carbon? So, it's about getting these people to meet and be creative.

As part of the university's contract with the Ministry of Higher Education and Research, ITU has been asked to embed green competencies within its current set of competency profiles. But what are competency profiles and in what sense can they be green? RESET's Michael Hockenhull and James Maguire give an insider account of how ministerial climate requirements become institutional reality.

On the 19th of May 2022 then Minister of Higher Education and Researcher, Jesper Petersen, signed the "Strategic Framework Contract 2022-2025" between the IT University of Copenhagen and the ministry. According to the somewhat dull document sitting innocuously at the bottom of the ministry's webpage, the ITU will deliver "Relevant educations with low unemployment and gender diversity" and ensure said relevance by way of "ongoing dialogue with employers' panels about the educations' 'employability' and **green competencies**" (emphasis added).

Competency
But what is a green competency? To answer that question, one first has to know something about the framework that shapes such competencies. In this instance, the ITU Employability Profile. All ITU educational programmes have such a profile, which is described as a "visual overview of graduate qualifications." As can be seen in figure N, this profile is an overview of competency types

that ITU graduates are supposed to have gained through the course of their education. They can be programme-specific skills (horizontal axis) or thematic ones such as 'Critical and innovative thinking' or indeed, 'Sustainability and ethics' (vertical axis). Additionally, the document notes the type of work or future studies students are qualified for.

BSc Global Business Informatics					
	Critical and innovative thinking	Collaboration and management	Design and programming	Digital literacy and flexibility	Sustainability and ethics
Description of skills	Identify stakeholder needs, desires, and contexts. Know how to address issues with IT-technology and create desirable, feasible, and viable solutions in a scientific way. Ability to critically reflect on their implications.	Build the right business model, products, IT strategies and governance processes to develop a viable business or accelerate an existing business. Ability to productively work with people from diverse backgrounds, disciplines, and contexts.	Design high quality digital services, experiences, platforms, hardware and software technologies fitting for the task, the users, and the context. Know what coding is and implies, and/or ability to code.	Effectively make sense of information technologies to identify, evaluate, and create content and successfully communicate information and ideas. Ability to adapt swiftly to rapidly shifting trends in a changing ecosystem.	Aware of the potential and challenges of digitalization for humans, organizations, societies, and nature. Demonstrate social and societal responsibility, creativity and originality to ensure sustainable and secure IT solutions.
Programme-specific skills	Analyze and improve business processes and information flows in organizations. Analyze challenges and opportunities related to globalization.	Analyze and facilitate IT-enabled and global collaboration. Analyze and manage organizational change processes related to IT or globalization. Choose, apply, and reflect on project management methods.	Write and analyze code in a modern programming language. Design and build databases and basic business apps to solve business problems.	Translate and facilitate between technical and business experts. Present an analysis of a business problem and suggestions for improvement with due consideration for different target groups and their professional and cultural backgrounds.	Critically assess positive and negative consequences of IT use for organizations and societies. Reflect on changing relations in work practices, gender, subjectivity, culture and technology in a global context.

Working as a business analyst, project manager, IT manager, product owner or in related professions

MSc in Digital Innovation Management, Information Systems, Science and Technology Studies, Business Administration, Software Engineering or related fields

IT UNIVERSITY OF COPENHAGEN

Figure N: The Employability Profile for the BSc programme Global Business Informatics

A competency in this framework is a propositional statement: it 'proposes' something that a student can perform upon graduation. For example, "write and analyze code in a modern programming language" or "demonstrate social and societal responsibility, creativity and originality to ensure sustainable and secure IT solutions." No small feat!

Green as contractual obligation

So, while the ITU already has a competency around 'sustainability and ethics', it has now been mandated to add 'green competencies' to the list. Leaving aside the question of the meaning of 'sustainability and ethics' as well as its institutional story of origin, why are we being mandated to add *green* to the roster?

According to the contract between the ITU and the ministry, "*IT-education must contribute to the green transition. It is central to the education's relevance that it can support Danish sustainable development*" The word 'must' here is central. What the ministry clearly articulates is that our courses won't be relevant unless they contribute to the green agenda. Strong words indeed. The contract delegates this work to those who are responsible for education programmes. Out of the contract's sixteen pages, just two paragraphs are dedicated to green competencies, leaving it very much up to the university and its educators to define what this actually means in practice.

Workshopping green

So, what to do? At ITU, the department of Business IT (BIT) is spearheading the effort to develop green competencies. A working group has been formed to take on this process, and just for full disclosure; both authors are a part of this working group.

The first step has been to engage faculty in a dialogue about the meaning of green competencies, both on paper and in practice. A primary concern for us has been to avoid an approach that simply appends the language of green to the current competency descriptions. What we are interested in is a serious engagement with the idea of how to develop green student subjectivities that are up to the task of dealing with the rapid and complex transformations that society is undergoing. Said differently, how is it we can *produce* future students who can *produce* more desirable climate futures.

To this end we have engaged faculty in a set of dialogues, both individually and collectively, to get a sense of how they see the intersection of their expertise (translated into course curriculums) with green competencies. Here we have in mind if, and how, we can translate the green competency concept into actual course content. There are many possible ways of going about this, such as introducing relevant green concepts and tools (lifecycle analyses, rebound effects, political ecology, path dependency, emissions equivalents, and much more), choosing climate related cases, choosing readings centered on green topics, but also rethinking courses entirely to focus on planetary limits or expanded stakeholder groups (such as non-human animal species, or even whole ecosystems, instead of just shareholders and consumers), for instance. What is important to us is that these translations are relevant and meaningful to the individual teacher. And that the greening of course material can help students develop the skills and subjectivities needed for the future.

Competencies in the making

But while it is heartening to see the notion of green competencies rise so high on the ministerial agenda, it is still far from clear what the term means, or how it will be mobilized. This could be viewed as an expression of trust in the university system whereby the flexibility inherent in the term is resolved at the level of university management and/or faculty. A more skeptical reading, however, could see it as an exercise in green washing: a more bureaucratic 'box ticking' exercise that results in little while ostensibly signaling much.

Some colleagues have even voiced concerns with the very premise of the project, suggesting that 'green' is yet another fad that shouldn't make its way into the heart of course curricula (akin to the inclusion of the 'global' twenty or so years ago). While we share some of these reservations, our concern is less about climate issues and problems taking up residency within university study programs, and more about the scale and ambition of how climate features within and across these programs. As we advocated for in this issue's editorial, a more expansive re-imagining of the role of the student in the climate emergency is a necessary precursor to reimagining how our teaching infrastructures can live up to the tasks that the climate emergency is producing. If anything, the concern around fads is more related to the competencies concept than it is about green issues.

Over a year has elapsed since the contract with the ministry was signed. And while we continue to work on the green competency project – whose output and adoption are still very much undecided – we hope that this is merely a first step in the slow, inertia filled life of university change. But much ultimately depends on how individual course managers are guided by our educational leaders. Both in terms of the concrete tools they are given to implement change, and the imaginative landscapes that are sketched out for them. Here we are thinking of some of the longstanding critiques of the competency concept, and particularly how it is oftentimes deployed within education as a managerial tool rather than, as we would like to see it, being emblematic of a sense of cultivation ('dannelse' or 'bildung'). The latter, less managerial, approach to green competencies is clearly about opening up the creative horizons for thinking about our courses in the context of our current planetary conditions. ITU's task, as we see it, is to help teachers with the work of translating green competencies into meaningful course content.

Despite the unpredictable nature of this process and despite it being far from clear if it will generate a meaningful outcome, its mandatory nature comes with a responsibility to try. Perhaps, and not incidentally, this captures many of the dilemmas of working towards more desirable futures; being constantly wary of green washing, trying not to let the perfect be the enemy of the good, and soldiering on despite feeling that *so* much more is needed. On that note we must end with a dissatisfying answer to our initial question: What's in a green competency? We don't actually know yet. But we're working to make it mean something in practice so that students develop both their skills (tools) and their general disposition (subjectivities) towards the climate emergency.

Michael Hockenhull
Postdoc

James Maguire
Associate Professor

Play as an approach to existential terror

▶ Tom Jenkins

The Center for Digital Play is ITU's newest research center. Formerly known as the center for Computer Games Research, the renaming reflects the belief that play in all forms is at the core of human experience. "Instead of being focused and studying one kind of object, we study all kinds of phenomena as play," Professor Miguel Sicart, the head of the center explains. "The center spans from machine learning to design, art, and museums, to games, to social media and digital life." Play is something shared by, and fundamental to, humans and may offer various avenues towards imagining and creating more sustainable worlds.

One of these avenues is the idea of play in the Anthropocene, the current geological epoch where human effects on earth have become a dominant force. "Games are cultural objects that can represent and engage with the cultural discourses of the Anthropocene, and the climate catastrophe." Because games are played, the players take on the role of interpreting and making sense of possible worlds that a game establishes. Sicart says that video game genres like survival horror where post-apocalyptic settings are the norm, offer visions of "what kinds of societies are imagined, what kinds of social constructions are imagined, and what kind of world you imagine." This is true across digital and physical games. A physical map-drawing game called *A Quiet Year*, for example, lets players collaboratively tell a story about sharing resources after an "unnamed, but climate-related catastrophe." Play in this mode offers ways of establishing new metaphors for engaging with crises. And unlike the more individualist survival mode of games like *The Last of Us*, it offers new imaginaries for how we might imagine collaboration and mutual aid as a form of post-apocalyptic resilience.

Similarly, Associate Professor Hans-Joachim Backe explores the environmental values encoded into mainstream games. For example, a game like Minecraft creates a world where everything is a resource that can become useful to the player. In this frame, nature is a kind of repository for human use, and ecologically conscious thinking is simply outside the scope. Backe believes that this matters because games have a certain kind of logic to them that players perform during play: "My big-picture theory is that games are very good at teaching systems thinking. And that for a lot of what we're seeing these days, what hampers the understanding of our role in the environment—our responsibility—is that we struggle to understand the human as part of a bigger system." Because so many digital games place resource management as a backdrop for their story and logic—in survival games the world is cast as a tool, in city building games the goal is endless growth, in 4X games like the Civilization series the goal is to ruthlessly expand and take over new terrain—it becomes hard to envision worlds where consumption and growth are not the norm.

A third mode of engaging with climate through play is by creating games that explicitly deal with climate issues. Associate Professor Hanna Wirman is running a project on "Sustainability in Games Education." Using game jams as a format, she illustrates four core approaches through which games can support thinking about sustainability.

First is the traditional idea of educational games centered on awareness-raising. This is a classic concept suggesting that games are great at conveying messages through complex simulations and exploration. Here, the game artifact itself embodies messages around sustainability and climate. Second, students can enter an interpretive mode, evaluating the values and ideologies that games, any games, bring forth. For example, does your game model unlimited natural resources and unlimited growth as a backdrop

for players' actions? Or do you foster cultural sustainability through the inclusion of different viewpoints and persons? Third is a more material approach. Games can be made more sustainable through efficient 'green' code, using as little energy as possible, as well as considering how and where they are meant to be played—for example limiting what screens the games can be played on in terms of their energy usage, incentivizing playing outside of hours of peak electricity consumption or designing games with simpler graphics. Fourth and finally, critical and speculative approaches to designing games allow people to imagine something outside mainstream norms and industry conventions. We break typical ways of making games and go against players' expectations to trigger reflection and critical thinking on topics like sustainability.

Wirman's work is expressly aimed at trying to create better outcomes for the world as well as for the games industry: "I research an industry that is contributing to the climate catastrophe. I educate IT professionals who will work in an extremely fast-growing and fast-changing industry that has the power to shape the lives of around half the people on Earth. These people have the responsibility to make games that matter and that take sustainability into account."

Play is not necessarily something that has the power to change things on its own but can offer an approach to topics of existential terror (like climate change) through an engagement with their concepts and constraints. While play may seem ironic in catastrophic times, Sicart says "Play is one of the phenomena that we see as soon as there are enough resources to survive. If we don't have play, if we cannot imagine other possibilities, we are locked down in the most terrible and oppressive relations that we can imagine." These perspectives take play as a cultural endeavor that offers a mode of testing ideas that may help to reimagine both what leads to as well as how to deal with the climate catastrophe.

Tom Jenkins
Associate Professor

VIEW FROM THE LABS: ETHOS Lab

➤ Michael Hockenhull

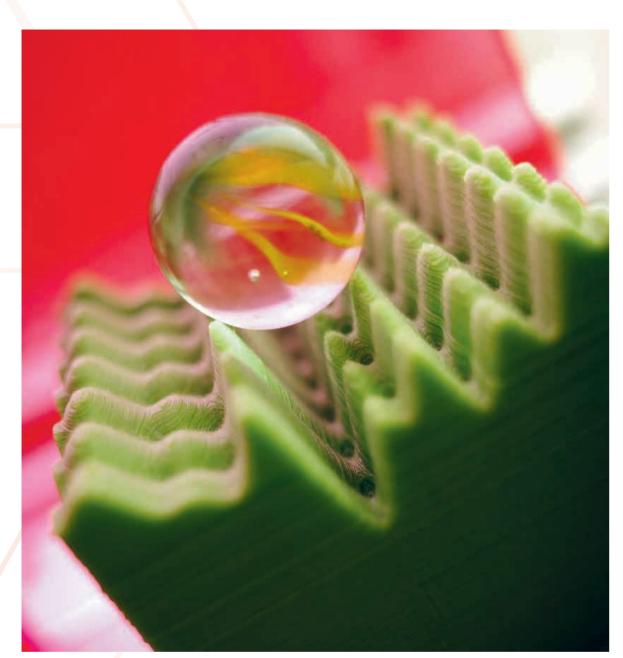Nestled in the corner of the 3rd floor of Rued Langgaards Vej 7, you can find a small but magical space: fairy lights hang under the ceiling, creating a cozy atmosphere, whilst a dense array of machines, artifacts, plants, post-it notes, posters and various hard-to-identify things give the space an unmistakable aura of being lived in. The place is ETHOS Lab, and as the description indicates, it is far from the clinical notion of a "lab" and equally far from IT as a purely abstract zone of ones and zeroes. In ETHOS information technology is material and tangible.

ETHOS Lab has existed since 2015, where it was founded by then Associate Professors Brit Ross Winthereik and Marisa Leavitt Cohn, and initially managed (full disclosure) by the author of this piece. ETHOS stands for Experimental Techno-Humanistic and Organizational Services and was initially intended as a space to develop and highlight the wide array of business- and society-oriented IT research taking place at ITU. Importantly, the lab was also intended to be a place for students to meet and interact with researchers – a tradition that proudly continues to this day.

Since its founding, ETHOS has developed into a well-known institution at ITU that is integrated in a wide network. It is well-known as a techno-feminist lab, meaning a space of critical engagement with technology based on feminist principles and perspectives. The researchers affiliated with the lab focus on things such as affect, gender, labor, maintenance, absence and more. The cozy materiality of the space embodies these principles and interests: images of history's first programmer Ada Lovelace, knotted macrame weaves, 3D-printed data visualizations, vibrant green plants, actual books – everything emanates care, craft and an idiosyncratic engagement with IT.

FeminisT futures being sown.

A creation of Ethos' 3D printer

You can read more about ETHOS Lab at ethos.itu.dk, as well as read blog posts from all previous Junior Researchers about their experience and research outcome.

Today ETHOS is still led by Associate Professor Marisa Leavitt Cohn, but she has now been joined by Assistant Professor Jessamy Perriam and Lab Manager Henriette Friis. Henriette, who has a background in Creative Sustainability from Aalto University (Finland), has been in the lab for just over a year and describes the lab as a "feminist critical playground" with focus on experimentation with method, in particular around intersectional topics such as power, bias, gender and indeed, climate. While climate isn't the primary focus of ETHOS Lab, Henriette considers it an unavoidable topic which she thinks will take up more space in the lab going forward: "Notions of green transition or sustainability are obviously

linked to feminism; you can't just look at environmental sustainability without also looking at political/social sustainability. You can't have one without the other. Feminism reminds us to ask 'who'-questions, which are essential when dealing with climate change and especially notions of a 'just transition' – a just transition for whom?"

Currently, climate change has been brought into the lab by a project run by RESET's Luis Landa, who has been experimenting both with building a version of the lab homepage run exclusively on energy from solar panels, as well as developing a low-energy or "slow" large language model. These projects exemplify how work and research are done in ETHOS – decentral, experimentally and driven by personal curiosity. The researchers who make up ETHOS Lab, of which Luis is one, conduct their lab research via workshops, writing retreats and events such as the annually celebrated Ada Lovelace day (always with cake!). Students on the other hand, can engage the lab via its Python Study Group, drop-in during opening hours or become a part of the Junior Researcher (JR) Programme.

The JR Programme is open to all ITU students and consists of carrying out a voluntary research project over the course of a year. As a junior researcher, one becomes part of a cohort that is invited to regular "Pitch & Play" sessions where senior faculty offer feedback to student projects. The programme has been running for several years now and is considered a great

success by the many students who have participated in it. According to Henriette, many of them report that the JR programme gives a rich sense of the interdisciplinarity ITU often talks about, but which can be challenging to manifest in practice. The programme is all about giving space and resources to students wanting to explore and experiment. The goal, Henriette says, is to create critical, self-reflexive and curious researchers – fully in line with ETHOS Lab values.

It's important to underline that projects don't have to be explicitly feminist, and Henriette emphasizes the importance of other topics too. Feminism is intersectional in ETHOS, meaning that gender is not understood in a vacuum, but rather as sitting in a complicated web of relations with power, race, culture, bias and indeed, sustainability. ETHOS Lab is a space that seeks to cultivate critical and curious approaches to what are serious and sometimes 'heavy' topics, including climate change. As Henriette says, when asked about what 'RESET' means to her and the lab: "Things are moving too fast for reset to mean pausing and starting over. That's not an option. We have to find ways to reinvent the train while it's still moving. There's a lot of technology-optimism in mainstream discourse and also at ITU. But we have to have some reality checks in case those technologies don't work. So, if you're a student who feels like you are missing a community to discuss these types of issues from a critical perspective, or have curiosities that aren't addressed in class – come to ETHOS Lab!"

Michael Hockenhull
Postdoc

Alumni

Here we present two profiles of ITU alumni to showcase how they have used their degrees to work in the field of sustainability.

➤ Max Christian Sørensen

Søren Svejstrup
(Digital Design and Interactive Technologies)

Søren is a product manager at Clever – a company specializing in charging stations for electric vehicles – where he works at the intersection of Product Management, Business development, and User Experience. He uses the skillsets he acquired at ITU's Digital Design department – particularly their approach to technology and behavioral design – as a way to engage with green transitions. Søren is curious about what it is that drives us as humans? And in particular, how it is that we create digital solutions that make it easier to shift away from something that is known and comfortable to something new and different?

His passion for interactive design and User Experience led him to work first in a financial innovation hub with the aim of creating a user-centric, lean approach in the company. But because he wanted to use his skills to help tackle the problems of our time, Søren decided to move on to a startup that was 100 % focused on creating positive climate impacts. With this switch, he also took on more responsibilities in product development, whilst using his digital design expertise to foreground the user experience in this process. As such, he takes his point of departure in the challenges experienced by users to create products that enable them to drive positive change.

Søren continues to use these skills at his current job with Clever where he is focused on making it easier for companies to switch to electric vehicles by building digital solutions that document the CO2 effect of fossil-to-electric replacement. He emphasizes the importance of data-driven solutions so companies know that what they are doing has an effect and to show how they can further reduce their emissions. One of the ways the company does this is by developing intelligent electric vehicle charging. Here charging is activated at those points during the day when electricity is cheapest and greenest. Søren is also working with his colleagues to implement renewable energy projects to make sure that the electricity on the power grid comes from renewable energy sources.

Looking back, Søren would have liked to have more focus on climate change and sustainability in his studies. He believes that all students in all ITU programs should be taught about our ecosystems and the climate challenges we face, thus creating awareness on their severity whilst also inspiring students to drive positive change. The question that Søren hopes all students will ask themselves is this: "How can I – with my skills and knowledge – have the greatest impact on the climate and be part of a green transition?"

Elsa Jasmine Nightingale
(Digital Innovation and Management graduate)

Before studying Digital Innovation and Management, Elsa began working with sustainability via Environmental, Social, and Governance (ESG) compliance.

While still a student, Elsa was offered a full-time position after graduating from ITU in 2019. She believes that the disciplinary breadth of some of ITU's degrees, including Digital Innovation and Management, is useful for anyone considering a job within sustainability. Given that sustainability questions crop up across organizations, a more interdisciplinary approach is really helpful.

Elsa now works as a Business-to-Business consultant at Schneider Electric where she's actively involved in helping companies design, implement and monitor their sustainability strategies. By carrying out full ESG evaluations, she helps companies assess emissions, energy efficiency, foster workplace diversity, and uphold ethical governance, amongst other tasks. Elsa also works on scope 3 programs, which focus on reducing emissions from a company's entire supply chain.

When asked about what she gained from her studies at ITU, Elsa highlights her project management skills, Scrum Master certification, and the know-how of existing technologies and their impact on the environment. All of these are useful in her current work with sustainability, though she does note that more focus on sustainability throughout her studies would have been of great benefit.

The facade of Inovação Gileade.

Priscila Santos da Costa

The Amazon is the world's largest tropical forest, with a total of 5.5 million square kilometers covering almost 40% of South America and housing 10% of the world's biodiversity. More than half it is within Brazilian borders, housing, alongside animals and plants, more than 24 million people. Of this population, 80% live in towns and cities and the geographic and sociological distances between the rural and the urban are usually smaller than one commonly suspects. What often depicted pictures of the Amazon usually miss is that Amazonian biodiversity erupts everywhere in these cities and the migration flows between rural and urban populations are as old as the foundation of the first urban centers. Recognizing this sometimes-unacknowledged intertwinement, the geographer Becker points out that issues plaguing its urban population, such as lack of basic sanitation and poor waste management, should be considered as equally important environmental problems for the Amazon region.

During my fieldwork in the State of Pará (Brazil), in 2022, my main research goal was to understand how technology figures in sustainability projects in Amazônia. This is how I came across *Inovação Gileade,* a nonprofit association that teaches robotics and programming to youth at social risk. 'We *are* in an APA (Area of Environmental Protection), there [pointing to the left] is this important park, with important lakes. There [pointing to the right] is the *Lixão* [landfill]. From here, we have no access to the Park, but we have access to the *Lixão*, we can also smell it'. It is Ricardo Gimenes, current president of *Inovação Gileade,* that explains to me how meaningful the location of this socio-digital inclusion initiative is. Equidistant from Utinga Park, where important flora, fauna and water resources lie, and the *Lixão Aurá,* a partially inactive open landfill that until 2015 has received just under 2 tons of waste a day, its existence embodies the complex Amazonian realities and problems that Becker described in the 80s.

Teaching Technology through Repair and Maintenance

Sustainability and Social Inclusion in the Brazilian Amazon

A donor's broken router now provides internet for the whole building.

'What else could crop up here?', Gimenes replied when asked about purpose. As I came to understand, to *Inovação Gileade,* sustainability is not so much a choice, but a vocation and a necessity, both deeply connected to the association's embedment in an Amazonian periphery. 'The chairs you see here, the fridge, the tables, the circuits boards, it was all electronic waste.' As I was taken on a tour around the two-store house, all Gimenes pointed at was reused, recycled, upcycled, repurposed. Technology usually arrives to the association via donation, is stored in a warehouse, assessed, repaired, and reused. The process of repair itself becomes a maintenance course, and the tech that has been fixed becomes, for instance, the computers used for python classes or the router that provides internet access for everyone. Electronic pieces that could not be fixed become decoration and when there is too much of a particular object repaired, it is sold locally and the money to pay for the utility bills or the children's morning snack.

Courses are given in the morning before the kids go to school. Volunteers are responsible for the

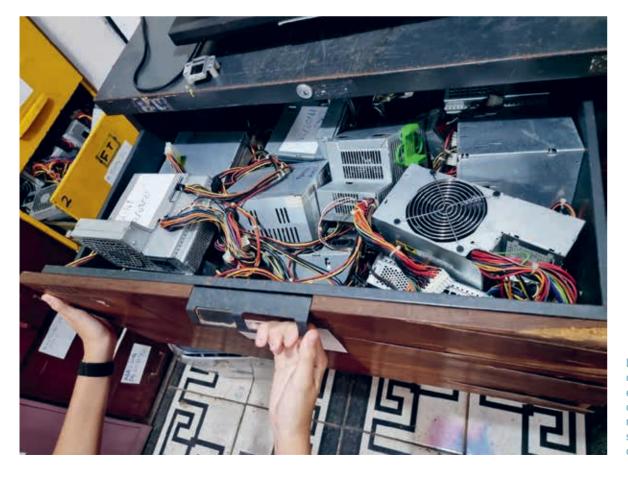courses' organization and delivery but, Gimenes reminds me, 'finding people to come during workdays in a place as peripherical as here is rare.' During my visit, I met two of them. João Roberto, a mathematician with a background in Computer Engineering, tutored students on basic electronic components. He told me how important it is that students' first contact with electronic devices is framed by concerns with repair and reuse. And Jayne Benmuyal, a bachelor's student in Electric Engineering, was currently teaching Python with a project involving image recognition and image to speech conversion: an app that would let visually impaired traders know which banknote is on their hands. For her, it was important that sustainability and technology are always connected with social inclusion. Roberto and Benmuyal were the only available volunteers at that time and, as I write, Gimenes tells me again about his struggle to find people. The abundance of electronic waste that could and was patched, filling the initiative's warehouse that I have also visited, contrasts with the lack of personnel and budget for even small things such as snacks (only redundant if one overlooks

the social class of the targeted audience). These aspects ultimately limit the number of kids to whom the association can cater.

But teaching the young has so far had a clear impact. Over the years, the association has supported the work of a competitive team of their own called *Garotas Conectadas* [Connected Girls]. The 'Girls' have for the last four years participated in the FIRST LEGO League robotics tournament, getting 3rd place under the innovation category' in 2022. The project's main themes: sustainability and social inclusion. 'We wanted to take affordable technology to them to show that they are important to us. We [from urban areas] receive their *açaí*, their shrimps and other products (…)' and so, Giovanna, a 15-year-old member of the 'Girls' told me, it would only be fair to give back. The project proposed the use of Arduino sensors in traditional riverine boats, that would recognize obstacles and convert these signals into light and sound clues. The aim is to facilitate navigation for riverine dwellers with visual and/or hearing impairments while
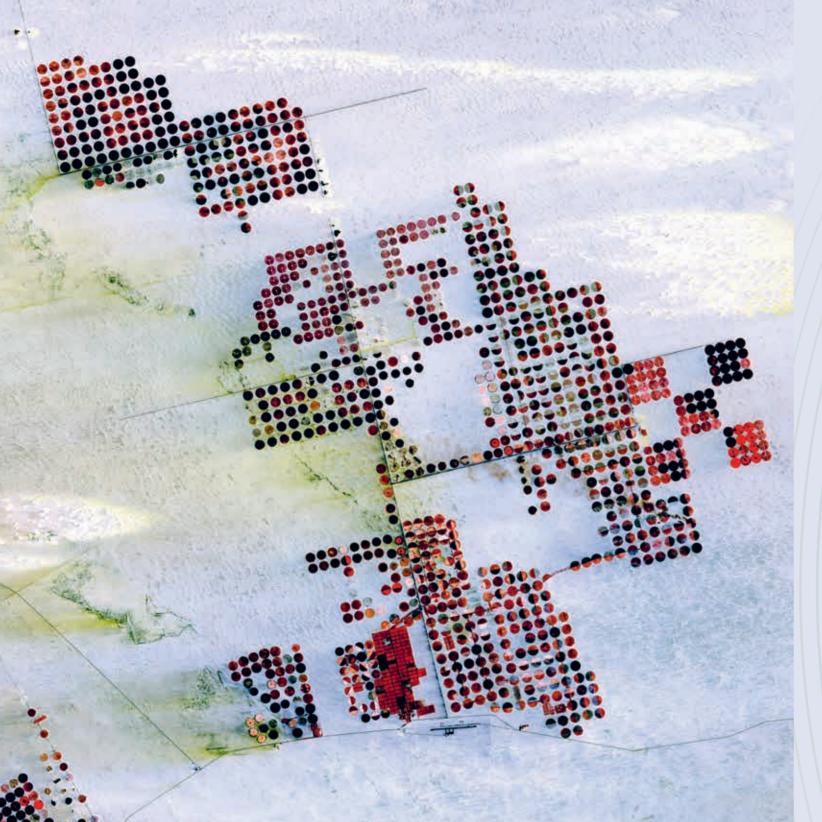
also aiding able-bodied navigators who usually transport cargo at dusk.

Using technology to promote sustainability in Amazônia can take many forms. It can look like drones used by indigenous communities against loggers and gold prospectors or like an AI system identifying deforestation trends. *Inovação Gileade* provided yet another vantage point from which to think sustainability and the Amazon, one that takes into consideration both its urban and peripheral populations as well as the value of technologies that otherwise might be considered fit for the scrapheap.

Priscila Santos da Costa
Assistant Professor

Drawers full of recovered electronic components ready to be serve a variety of purposes.

To Inovação Gileade, *sustainability is not so much a choice, but a vocation and a necessity connected to its location in the amazon.*

Geometric shapes lie across the emptiness of the Sahara Desert in southern Egypt. Each point is a center pivot irrigation field a little less than 1 kilometer (0.6 mile) across. With no surface water in this region, wells pump underground water to rotating sprinklers from the huge Nubian Sandstone aquifer, which lies underneath the desert.

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Interested in contributing to RESET's next edition?

Write to ccit@itu.dk!

Along the southeastern
coast of Greenland, an
intricate network of fjords
funnels glacial ice to the
Atlantic Ocean. During the
summer melting season,
newly calved icebergs join
slabs of sea ice and older,
weathered bergs in an
offshore slurry that the
southward-flowing East
Greenland Current some-
times swirls into stunning
shapes. Exposed rock of
mountain peaks, tinted
red in this image, hints at a
hidden landscape.