Midterm Conference on Digitalisation in Higher Education and Research in International Cooperation for Sustainability

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1 Introduction

1.1 Background: the DAAD-funded SDG Graduate Schools

The DAAD SDG Graduate Schools (SDG-GS) Alliance seek to contribute to the United Nations Sustainable Development Goals (SDG), especially SDG4: "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". Funded by the BMZ, the programme assists universities in the global south to fulfil their role as driving forces for sustainable development locally and globally, in partnership with German universities. There are four SDG-GS in Africa, two in Latin America, host of the Midterm Conference), and one in Asia, each focused on interdisciplinary research topics related to sustainability[1]. Increasing teaching capacities by incorporating information and communication technologies and internationalisation are among the goals of the SDG-GS Alliance. Against this background, the seven SDG-GS proposed the Midterm Conference on **"Digitalisation in Higher Education and Research in International Cooperation for Sustainability".** The DAAD together with the ZEF-based Doctoral Studies Support Program (DSSP) lead the organisation of the conference, which was only successful thanks to the active participation of all SDG-GS.

[1] More at https://www.daad.de/en/information-services-for-higher-education-institutions/further-information-on-daad-programmes/sdg/

The conference aimed, in general, to promote cross-regional reflection on the role of higher education and research cooperation, and, in particular, to reflect on the role of digitalisation in higher education and research in achieving the SDGs, and strengthening international cooperation for sustainability. The audience of the event encompassed mainly SDG-GS coordinators (from the German and the international partner universities, which are in Cameroon, Colombia, Ethiopia, Ghana, Nigeria, Peru, South Africa, and Vietnam) and a few external experts in matters concerning digitalisation of higher education and research data management. Each SDG-GS contributed to sharing its experiences, lessons learned, and challenges, as well as raising questions inspired by these experiences. Invited experts provided additional inputs for reflection and dialogue with members of the SDG-GS.

1.2 Initial remarks

Anette Braun (Senior Policy Officer, Education Division, Ministry for Economic Cooperation and Development (BMZ)), Dr. Kai Sicks (Secretary General, German Academic Exchange Service (DAAD)), Lars Gerold (Head of Section, Institution Building in Higher Education, German Academic Exchange Service, DAAD), PD Dr. Eva Youkhana (German Coordinator of DSSP), Dr. Tomás León Sicard (Colombian Coordinator of DSSP), and Prof. Dr. Matin Qaim (Executive Director, Center of Development Research, University of Bonn) shared their perspectives on the role of digital technologies in science (research, data management and teaching), highlighting that the use of digital tools has become widespread and necessary, but that it also entails many risks that need to be addressed with smart policies.

Some of them cited the use of remote sensing to prevent deforestation and assess crop production as examples of the potential and, more importantly, the need for these tools in development research. Besides, all recalled that COVID-19 had made digital conferencing and teaching part of our daily lives. They noted that digitalisation can be a way to build bridges between people, institutions and countries to promote sustainability and the SDGs.

Among the main risks associated with digitalisation processes, they mentioned inequality of access to digital technologies, as well as the management of big data and the understanding of the growing amount of data collected by all kinds of platforms with different languages. In everyday life, the almost ubiquitous presence of digital technologies (i.e. internet, social media, etc.) can bring together people with common interests together, but it can also polarize and isolate; it can bring communities closer and at the same time deepen existing divides. It can enable creative thinking, design, and presentation but also create dependencies that limit people's imagination, not to mention the problems associated with misinformation and fake news. In short, they emphasised that harnessing the benefits of digital tools is as important as managing the risks associated with them. Therefore, digitalisation cannot be seen but needs to be critically examined, which was a central objective of this conference.

In this context, universities have a key role to play in creating, sharing, and advancing knowledge that serves to solve the multiple crises that humanity is currently facing (climate change, biodiversity loss, food security, inequality, etc.), and in guiding knowledge-based policies that offer practical solutions to these challenges in global, regional and local contexts, with digitalisation being an important part of the solutions (and sometimes also of the problems). The SDG-GS have created an important alliance of partnerships addressing many of these challenges, and supporting digital transformation in many ways that were explored during these days.

1.3 Structure of this document

Besides the introduction, this document is divided into four main sections: one on data management, one on online teaching in higher education, a short section on the use of digital tools in research and a final discussion with some remarks summarising some of the main reflections during the conference. This last section is divided into challenges, practices, lessons learned and questions for the future, all related to data management and online teaching. This is not the order in which the conference was presented, but we felt that a thematic organisation of this report would be more useful than a chronological one, especially for a future joint publication on this topic.

2 Data Management: challenges, potential and ethical aspects

Data management was covered in the Midterm Conference in a panel of experts, in individual presentations by data management experts, and in presentations that shared the experiences of the SDG-GS on the topic.

2.1 Panel Discussion

The panel was meant to critically and ethically reflect on data management and to approach its challenges and opportunities in higher education and in international/transregional settings. It was moderated by P.D Dr. Eva Youkhana with the participation of Susana Barrera from the National University of Colombia, Antonio Rogmann, from the German Institute of Development and Sustainability (IDOS) and Dr. John Jolliffe, project manager at the German initiative NFDI4Chem.

There is an upsurge in digital data management or the digitalisation of data collection, storage and distribution, which has implications not only in the technical realm but also in how knowledge is produced. Beyond the technical implications, the panel explored questions related to academic ways of producing knowledge with communities and research networks that work across national and disciplinary boundaries, linking countries that have colonial legacies as colonised and as colonisers as part of their unique historical experiences. This is an important aspect to consider

in cultural studies as part of a decolonial turn that needs to be discussed in international cooperation, in education and also in data management.

The panel also discussed aspects related to barriers to data-sharing in certain disciplines, such as chemistry, and more generally in academic cultures. The first issue within chemistry relates to a culture of competition for the profitable development of patentable drugs. In this context, John Jolliffe highlighted that the costs of data management and data sharing are negligible when compared to the costs of carrying out chemical experiments (the cost of doing science itself) and that data management according to the FAIR principles (findable, accessible, interoperable and reusable) could benefit everyone by saving substantial amounts of resources and also by allowing scientists in the global south (who often do not have the expensive equipment needed to carry out certain experiments) to benefit from existing information and to participate in discussions within the discipline. These experiences might be generalizable to other applied sciences with technological development and commercial application potential.

A second obstacle to data sharing discussed by the panel is the tendency of researchers to withhold their data. There are several reasons for this, including academic culture and deeper structural aspects of the academic world. On the one hand, there is an unhealthy culture about how to deal with mistakes in the academic context, even though mistakes are part of learning, innovation and doing science. Publishing data showing errors could be very damaging to the career progression of scientists. This culture is not only an obstacle to innovation, it could also be a disincentive for researchers to share their data and expose their practices to greater scrutiny - a practice that would be necessary for the improvement of science itself. This avoidance of scrutiny and criticism is in turn linked to other structural aspects of the academic world, in particular the constant pressure on scientists to publish more and faster, as funding to continue doing science depends on publication. This pressure would force researchers to take shortcuts that are not advisable from the perspective of good research practice but are seen as a necessity to save time and meet the demand for constant publication in peer-reviewed journals. Thus, this pressure could act as an obstacle for researchers to follow best practices during the research process (data collection, generation and analysis) and to make their data publicly available later in the process (data management and data sharing). Technical requirements, such as the need to digitalise the whole data cycle - i.e. to train researchers to use digital tools (such as digital lab notebooks) while generating their data, rather than collecting data in analogue form to digitalise it later (which would be more time consuming)- were also discussed but were less controversial than the aspects mentioned above.

Ethical and political aspects involved in the decision to collect data, what data to collect, from whom, how to share it and who has access to it were also discussed, especially (but not only) in relation to social sciences and conflict research. Important takeaways were the need to communicate transparently with local communities throughout the research process and to involve

them in all decisions about the data they contribute to generate. Again, similar obstacles arising from the academic culture and publication pressures that lead researchers to prioritise publication in indexed journals to the detriment of data sharing and communities involvement in the research process were problematised.

Finally, participants and the public discussed the existing technological gap between universities in the global North and the global South. They pointed to existing inequalities in infrastructure and resources, which already leave countries in the global south with insufficient resources to conduct research themselves. Participants considered that data management policies and requirements, related to data management and protection frameworks that are created and imposed mainly by high-impact indexed journals with a Eurocentric perspective, do not sufficiently take into account the burden that these requirements place on scholars in the global South or the increasing costs that they impose on research practice. They concluded that there is a risk to widening the North-South divide in research collaboration, and emphasised that global South scholars often publish in less highly ranked journals, not because their scientific practice is not sound, but because they do not have the resources to meet the new stringent data requirements.

Eva Youkhana thanked all participants in the panel and the audience and summarised as a take-home message that although there are many technical aspects to data management, many important issues are related to human choices and human (social) constructions, from the decision to collect data and which data to collect, to how it is processed, stored and shared. Even if technology is not neutral or objective, there is a lot of social construction involved and it is important to take this into account in our research work and in our international cooperation in order to address the bottlenecks discussed.

2.2 Environmental information and geopolitical of knowledge (SIAMI IDEA)

Susana Barrera, Nicolás Pérez, Juan Manuel Rengifo, Universidad Nacional de Colombia
Doctoral Studies Support Program (DSSP) on Environmental Peace and Development in Colombia

The presentation was structured in two parts. An introduction about principles and the geopolitics of knowledge that underlie SIAMI, as well as mentioning RDM systems that influenced SIAMI's conception, and, in a second part, the presenters showed SIAMI and some of its tools. The IDEA's *Environmental Information System* (SIAMI) was developed in the three last years and builds on its (now integrated) predecessor –the Environmental Conflicts Observatory (OCA). OCA included 15 cases of environmental conflicts in Colombia, and was inspired in the environmental justice atlas (Barcelona) and the OCMAL (platform of mining conflicts in Latin America).

The SIAMI results of a cooperation between many different people (students, technicians, engineers) and institutions (ZEF, UNAL, IDEA, DSSP program). The principal benefits it offers are saving research efforts (avoid repeated research), contribute to an open data culture, and provide a space for discussion on values, interests and policy around environmental information. The SIAMI is a digital, free, and open source Geonetwork system that manages environmental information (spatial data and other data) built based on international standards (such as ISO 19135). The core idea consists of making the information generated by the many researchers, professors and local communities available to decision-makers. Therefore, its main goals are to tackle environmental issues that decision-makers often do not consider, to empower local knowledge and learn from cultural-ecosystem relations of indigenous people, peasants and local settings, while sharing information between them and reducing data bias on environmental conflicts.

To understand the system better, the IDEA team showed some of its core functions, such as the geographic viewer and its metadata. This information must be understood in the context of the underlying historical, cultural, environmental and social configurations of Colombia's geography. SIAMI highlights the need for sharing information and aims at creating an information sharing culture that favours research beyond material gain and recognition.

SIAMI's conception acknowledges that there is a geopolitics of knowledge behind information and communication technologies and systems. People who use these systems must bear in mind that information and communication technologies affect power relations within and between countries; and who has access to and control over them are crucial factors for global decision-making in international relations, economy and politics.

The discussion with the public encompassed questions about how students and people in the field have access to the SIAMI data; how conflicts, which are by definition dynamic, can be apprehended and have their development over time represented in the system; how to deal with the often sensitive information involved in environmental conflict; how SIAMI can contribute to empower local communities; and if there is a tension between sharing data in SIAMI and publishing in peer-reviewed journals.

The SIAMI is public and open access, IDEA students are trained on how to use the tools and put the data of their own research in the platform. Students' work is also important to update and allow for understanding and representing dynamic environmental conflicts over time. Two tools help on this endeavour: a time line and the milestone tool. Besides students, there are research groups who regularly meet, discuss, and use the milestone tool within the system to add information to the cases and instantly update their timelines. Environmental conflict information is indeed sensitive. Therefore, it is extensively discussed during ethical clearance procedures of

the university and with research participants. Anonymisation is part of the work in order to protect people.

Due to SIAMI's complexity, local people do not use the system yet, but SIAMI's team is working on a small project with local communities in order to develop effective tools to make all the information more accessible and understandable to local people. Current discussions involve, among other ideas, an app that can be used in any smart-phone. There is a lot of work and reflection behind this system and it is a work in progress. In this regard, presenters also highlighted that not all information that is shared in SIAMI and that could contribute to empowering local communities is negative, despite being embedded in environmental conflicts. There are very different realities and creative strategies that people develop on their territories to cope with the problems that they face and that could benefit people elsewhere facing similar challenges. Local people are developing wonderful tools that also must be shown.

Finally, one bottleneck to keep SIAMI updated is the tension of time. It takes time for you, as a scientist, to feed your data to the SIAMI and to write your papers. And academics are pressurized to prioritize publications for individual advancement in their careers to the detriment of sharing their data, even though the later could have potential greater benefits to local communities, to science and to social change.

2.3 Research Data Management in Chemistry - Expectations, Challenges, Tools & Reality

Prof. Dr. Udo Kragl, University of Rostock, Germany - RoHan

The presentation began with the introduction of the platform NFDI4Cat and highlighted that the tools of this platform have been used by the SDG Graduate School RoHan and other research groups. The content of the presentation followed two main points: (1) A brief introduction about the German National Research Data Initiative (NFDI) and the NFDI4Cat (for catalysis), (2) A brief introduction of challenges which not necessarily are only related to chemistry.

NFDI has been founded in 2020 and there are about 26 consortia which are funded by Deutsches Forschung Gemeinschaft (DFG). Within this initiative there is an initiative of different institutions related with social sciences, NFDI4Culture. NFDI aims to make data systematically accessible and sustainably available and to coordinate the development of a networked information infrastructure according to the FAIR principles: findable, accessible, interoperable, and reusable. The basic idea behind this principle is to have the data available and reusable for doing research, to take care of the data and make it available or not depending on the use.

For chemistry there are four related consortia are: NFDI4Chem, NFDI4 Cat (one of the first with NFDI4Chem), FAIRmar and NFDI-Mat-Werk. It is important to take into account the different vocabularies each consortia uses because they are used in different contexts. NFDI4Cat (for Catalysis) is special because the beginning was driven for the cooperation between academia and industry. This initiative involved a lot of chemical companies and engineering groups that also prepare the data as universities and research institutions do and share these data to a certain extent. The advantage is to make available for the scientific community this data that normally is not available. The process of catalysis means that there are different types of data. Therefore, there are engineers, chemists and other scientists involved. In the case of this kind of processes of production and improvement of a catalyst, a lot of "waste data" is produced that could be used or might have some value in a different context. This is how this consortium use the approach of open science and digitisation in catalysis and chemical engineering, developing also uniform data standards and deploying a platform of services.

NFDI4Cat is an enabler for sustainable production of chemicals and energy carriers and is composed for 16 partners in Germany, universities, research institutions, university libraries among others. The consortium's mission is to safeguard the digital future of catalysis and transform the fields of catalysis and catalysis-related sciences into Digital Catalysis. Among the services provided by the consortia are: enabling software & Tools, Joint Workshops, Trainings, The Research Data and Management School of Catalysis and the vision is to create a community-driven and user-centred initiative, improve data quality, integrate data view, and reach a new level of predictivity. Normally, in all those consortia there are some task areas (TA) in three core topics: (1) Data and Metadata Standards, (2) Data Science and Information Infrastructure Design, and (3) Community and User related aspects such as dissemination, outreach, training and networking.

Catalysis means to have some basic data but also data on surrounding conditions and at the end there are chemical industrial processes. It means that multiple scales are needed, from small molecules to a large chemical plant, all this is related and the data have to be collected in the different scales. The consortium also has written some papers for catalysis-oriented people describing how to send up the experiments and how to collect the data. Three questions are raised here: what is this so called useless data? are there really useless data in these disciplines? or can you make use of these data in other larger contexts?

The research data in catalysis is highly heterogeneous, there are different types: images, spectra, catalysts, lab notebooks, performance data, tables, synthesis specifications and so on. There are very different kinds of data and this is one of the challenges to move from fragmented storage and collection of data to an integrated data management. Dr. Kragl presented an example of a recent evaluation of a research group of four partners (two universities and two research institutions) that have introduced three different types of Electronic Lab Notebooks. There are ways to transform data from one to the other, but this is a challenge to define the exchange of these

data and to unify them. It is necessary to compare main features, and formats to export, among others.

In the case of chemistry, chemical experiments can be quite expensive due to the costs of reagents, materials and so on. Therefore, if there is a database in which experiments and results can be searched and found (with quality of data and metadata), scientists could use the resources they have to pursue different experiments instead of repeating expensive procedures for which there is already data. With such a system available, knowledge in chemistry could advance faster, with growing data quality and quantity available to all researchers.

Regarding some examples about the specific TAs, Dr. Kragl mentioned some pilot projects on TA2 (Data Standards, Collection and Interfaces) that are working with a lot of data of different groups and literature trying to collect and make them exchangeable between groups. The other example is about the TA5. Dissemination and outreach/training specially regarding undergraduate students. There is material available about lessons learned, teaching, educational videos on YouTube, etc. There are also people travelling to different summer schools and present, live demonstrations of how to deal with the tools and materials.

One of the last important discussions pointed out by Prof. Kragl at the end of his presentation is the Intellectual Property (IP) and confidentiality of the data and corresponds with the TA 7. This service unit intends for the communication between industry, research institutes, universities, publishing companies and libraries and also analyses the European regulations in the context of data sharing. As a results of this analysis, the team has recently published a paper in *How research data management plans can help in harmonizing open science and approaches in digital economy*.

The presentation concluded with some Take Home Messages related to the necessity to deal with Research Data Management (RDM) and to implement on different levels: institution, group, individual. Including open science and open access publications. It is also important to understand that RDM is more than just an excel file or an electronic lab notebook (ELN) and that the metadata are necessary to describe and understand data. RDM will help you to make data accessible or improve the quality of data. Finally, at a given point it is necessary just to start and to introduce the appropriate tools (open source) to work on this.

During the discussion, two main points were raised regarding the motivation of other researchers to participate in this huge collaborative effort and the funding needed to keep it going in the future. Dr Kragl pointed out that the consortium is really big and heterogeneous, but they have also tried to invite different researchers to contribute, they promote the tools in seminars and conferences, and there are also some initiatives as incentives (prizes) given by publishers to researchers who publish with good documentation and data sets. In terms of funding and sustainability of this initiative, they have funding for a couple of years and they have tried to split

the budget that comes from the DFG and the budget that comes from the university, for example for the person in charge of data management, who is usually paid by the universities and it is important for the project in the future.

2.4 Best Practices in Sustainable Chemistry. Experiences with NFDI4Chem

Prof. Dr. Sonja Herres-Pawlis, RWTH Aachen University, Germany

The objective of this presentation is to show one example of the use of the Research Data Management (RDM) tools in chemistry in Germany (NFDI4Chem) and to share some best practices on the research that she and her research group are doing in bio-inorganic chemistry and bioplastics, examples that are related with sustainability issues and that showed how this group are using the RDM Tools. At the end she also showed some examples in the teaching domain.

Prof. Herres-Pawlis introduced the big garbage problem in the world and specially of plastics/micro-plastics production and waste. The problem will increase because the global plastic production increases as well as the global plastic waste which lead to environmental concerns because the plastics that are produced can remain in the environment for many hundreds of years. All this plastic is also coming back to the human beings via the nutrition chain.

Bio-plastics have been developed in chemistry as one solution for the environmental problem, there is a large family of different materials that can be categorized into two types: biodegradable (bio-based and fossil based) and non-biodegradable (bio-based). The distinction is based on their ability to break down naturally over time. Dr. Herres-Pawlis highlighted the importance of developing bio-plastics that are both bio-based (derived from renewable resources) and biodegradable and she also mentioned the role of circular economy in the sense of closing the loop and using wastes as inputs to the new processes. It is important not to see bio-plastics as single-use items but as materials that can be recycled and reused, and after a lot of uses you can actually dispose them or use their energy content.

She also summarized the chemical processes involved in the production of bio-based and biodegradable bio-plastics, processes that usually need catalysts (substances that increase the rate of a chemical reaction without being consumed in the process). In the conventional process that has been done by decades, the catalyst normally used (Tin (II) octoate) is cheap, and highly active but has been classified as toxic. When dealing with high quantities like in the industrial sector, it represents problems at the end in the valorisation, the industrial composting and the recycling.

Prof. Herres-Pawlis and her team have been working on developing alternative catalysts for the polymerization of bioplastics. Their catalysts are faster and less toxic compared to the

conventional Tin(II)-based catalysts commonly used in the industry. One example is the "bisguanidine zinc complex" and as chemists, it's needed to prove that the substance produced is the one that you were intending to produce. They do not just make the synthesis work, they also test the catalyst with a reactor and they can observe information as the spectra, kinetic plots and in general the process of polymerization. They have tested the catalyst is fast, robust and active for a lot of reactions.

Chemical recycling processes are being explored for bioplastics, including depolymerisation and conversion into green solvents. These processes aim to break down bioplastics into their molecular components, allowing for their reuse, recycle or conversion into other useful materials. If you have mixed plastics it is possible to do a fractionated recycling.

After the general explanation about the work that Dr. Herres-Pawlis and her team are doing, she explained how are they publishing the generated data in a fair way. She began explaining the way in which chemists document their work through time (in 1927 paper lab book – between 1985-2017 some digital advantages - 2023 more than 70% still working with paper and pen to document the chemical lab work). In the lab they work with paper/pen (manual Lab books), but also with expensive machines that are producing data all the time. In the end the data is used for doing graphs, plots, spectra, etc. They put the figures in a paper (PDF) that is non machine readable figures, and no computer can really read this. And this is not FAIR (findable, accessible, interoperable, reusable). For having FAIR data, you have to secure that you have also the FAIR data formats.

In the case of NFDI4Chem the vision is to support researchers to bring to life the whole FAIR data life cycle by providing tools to process, to analyse, to preserve, to publish them and producing again. They put the data in an electronic repository (Chemotion), the original data behind a link, it is possible to find full information for a substance and also download them for free. This has been used also in teaching for 3 years in inorganic chemistry in RWTH Aachen and there is also other electronic repository called RADAR4Chem.

During her presentation Dr. Herres-Pawlis emphasized the importance of data management and open access in the dissemination of research findings. Openly sharing research data allows for transparency, reproducibility, and collaboration among scientists, ultimately accelerating scientific progress. In teaching, it is important to teach this to the new generations, that's why Prof Dr Pawlis has integrated exercises in her advanced inorganic lab course for undergraduate students about the implementation of Chemotion Electronic Lab Notebooks (synthesis and full documentation of the process in a digital way) and also a learning unit on RDM (exercises and final test). The key message of Dr. Herres-Pawlis was that "teaching RDM and sustainability to the next generation is key to the cultural change" to foster this in the long term.

At the end of the presentation, an important clarification was made about the funding and benefits that private companies might receive. Dr Herres-Pawlis clarified that the private companies are not the main funders of their initiatives and experiments, in some cases they only provide some materials. For example, one of the main funders is the UPLIFT project, which is funded by the European Union's Horizon 2020 research and innovation programme. In this case, they are making all the research open access and putting the data in an open repository because science should be accessible to taxpayers. In the case of the DFG, as another funder, it is also important to have open data for the results of these projects. Finally, she clarified that industry also benefits and that in the long term the research that her group is doing could help other researchers to make research sustainable. Therefore, publishing and having open access to data is a good way to disseminate knowledge quickly.

2.5 The Importance of the Digitization of Traditional Knowledge - Spectroscopic and Biological Data for Plants Valorisation at YaBiNaPA.

Prof. Dr. Bruno Lenta Ndjakou University of Yaoundé I, Cameroon. YaBiNaPA.

Dr. Lenta is the local coordinator of the graduate school YaBiNaPa in Cameroon, he divided the presentation in two parts: at first, he gave an overview about traditional knowledge to clarify why they are making research on traditional knowledge and the link between this and spectroscopic and biological analysis. In the second part he presented the work that they have done in this SDG-Graduate School in terms of digitalisation.

Traditional Knowledge is the knowledge acquired by indigenous people and local population over hundreds of years through direct contact with the environment. For example, traditions, languages, their system of medicines, the management of society, and their plants for sustainability. Traditional knowledge is an ancient heritage that ancestors have passed on from one generation to another. It is knowledge generated within communities to address critical issues of life, it is dynamic and based on practices, experience and the adaptation of the environment. It is part of the cultural and spiritual identity of a community and it is not systematically documented but it is transmitted through storytelling, cultural rituals, festivals, proverbs, and so on.

Herbal medicines (HM) are an integral part of traditional knowledge and the oldest form for healthcare. HM are widely used as alternative remedies worldwide and they play a central role in the indigenous communities of Cameroon such as Pygmies, Bororo and Kirdi. They used plants in all the activities (festivals, rituals) and for them plants are important as food and medicine. HM contribute to the society's economy and environment. The use of plants in Cameroon varies from one region to another but is generalised throughout the country. In any society, well-managed plants have an essential role in human culture and they can also be a source of income. Cameroon

is rich in herbal medicine resources, with more than $64 billion produced annually and possessing 25% of Sub-Saharan reserves. The country's forest area is the second largest in Africa and fifth in terms of biodiversity. HMs hold great cultural significance, some have a sacred status and are used in rituals, festivals, cultural dishes, stories, myths, and histories. Besides, HMs contribute to the construction of symbolic dimensions of ethnicity, identity, and community.

The compilation of knowledge in plants is essential for communities, but in Cameroon, it is not documented in a specific library or database. This can help to improve the knowledge on the history of the plants. The journal *Flore du Cameroun* has a lot of volumes with botanical and ethnobotanical information but some of them are not available in a digital form and the physical volume is not well conserved. Some knowledge remains on the property of families, and descendants must be able to acquire it and preserve it and it is difficult to access to this knowledge.

Over the years, cultural aspects have evolved, leading to the over-exploitation of some species and the disappearance of others, which means that some infections or diseases can be more difficult to treat (i.e. in pygmy communities). The lack of proper training for descendants (identifications of species, collection time, parts used, extraction solved, dosage, side effects) and the influence of other cultures, deforestation, and climate change have contributed to the challenges faced by traditional healers in treating certain infections and preserving knowledge about herbal medicines. Uncertainties have developed in terms of the availability, accessibility and efficient use of some resources.

Information about plants and their uses is collected according to a protocol, but it lacks videos or fresh samples. The National Herbarium in Cameroon preserves dried samples (about 70.000), making identification challenging in many cases. Despite more than 10,000 scientific publications produced in Cameroon, including various fields such as botany, pharmacology, and spectroscopy, not all analytical data, such as spectra, have been digitized, making access to previous research difficult. In addition, thesis, manuscripts published and digital copies are not always available.

Several challenges need to be addressed, including the lack of a digital preservation policy and plans for long-term digital framework, lack of required standards and policies for managing digital materials, of expertise in digitalisation and digital data management, of a plan for the sustainability of knowledge on herbal medicines, lack of funding and awareness of the benefits of digitalisation. These issues have led to the misappropriation and significant loss of traditional cultural and customary knowledge.

YaBiNaPa focuses on the digitalisation of knowledge on herbal medicines, spectroscopic and biological data to preserve and transfer it to future generations. The project trains Ph.D. students and researchers for the sustainable valuing of medicinal plants and indigenous knowledge. It involves collecting plant information, including uses, cultural significance, part uses, methods,

therapeutic targets, and results, through an ethnopharmacological survey. The digitalisation of knowledge on plants is important not only for communities but also for researchers who can help conserve, learn, transfer and pass on all the knowledge to the next generations.

YaBiNaPa has developed a suitable module for digitalising herbal medicine uses using a multi-qualitative approach. This involves reviewing literature (books, manuals, data bases), designing questionnaires, pre-testing and adjusting them, conducting fieldwork with relevant knowledge keepers and elders using multimedia and local language, analysing data, and constructing modules for conserving the knowledge of HM. Digitalisation transform explicit wisdom in tactile knowledge, allows for the management and updating of a large volume of data in multiple languages, enabling easy and safe access, remote access, and searchability.

The project also focuses on spectroscopic and biological data to systematize information on many plants through a pharmacological survey. Each plant has a dedicated database with botanical information (local names, GPS coordinate, sample collection) and a survey on ancestral knowledge (cultural significance, traditional uses and the limitations of their uses). Efforts are made to keep samples at the National Herbarium. The project has also compiled spectroscopic and biological data on more than 1,000 compounds, including pure compounds, extract fractions, SCMS, and LMR, along with spectra and biological properties. This data aids in applications and the development of new methodologies. Samples are stored in a chemical library, enabling comparison and protection of species without the need for constant collection. This is one of the most important advantages of the digitalisation in this field.

YaBiNaPa, in the digitalisation process, aims to benefit traditional healers, local populations, and researchers by codifying traditional knowledge, facilitating access to knowledge and cultural exchange. The database enables collaboration and research development, streamlining processes, reducing analysis time, facilitating online training for students and lecturers, among other benefits. Some of the challenges are shared with other graduate schools, such as copyright protection (property of family and cultural identity), the protection of indigenous knowledge, student scale, internet access, hardware quality, storage capacity, and data organisation and management need to be addressed to fully harness the benefits of digitalisation. In conclusion, effective digitalisation requires a well-developed plan. YaBiNaPa must prioritize building a database to preserve and value the wisdom of the communities in Cameroon.

The transfer of Knowledge between Traditional Healers and Scientists in Phytomedicine
(Dr. Daniel Elon, Bielefeld University / YaBiNaPa)

Knowledge is an important field of research in the medical humanities and the digital humanities as well, especially in the philosophy of medicine. In this branch of philosophy, many different methods like epistemology or even narratology must be connected. In this sense, research

in the fields of the philosophy of medicine, in this case linked to the YaBiNaPa GS, aims to contribute to the UN Agenda 2030, especially regarding the Goals 3, 15 and 17. YaBiNaPa, the subject of Phyto-knowledge interconnects various important aspects which are of big interest to the humanities, like language, practices, views on nature, view on healing, amongst others and the greater goal in this context is nothing less than the preservation of knowledge.

The interconnection between different fields of the humanities concerning digitalisation is a critical issue. Like in this case, digital humanities, on the one hand, and medical humanities on the other hand, especially philosophy of medicine with its different methodological approaches. In in this case, since this this conception is linked to the YaBiNaPa project is affiliated with it. Regarding the concerning about Sustainable Development Goals is of course an important aspect. So this is maybe the connecting point between my presentation and the one of Bruno. The question for Phyto-knowledge and the possibility of preserving it.

During the discussion, two questions were raised about the use of the knowledge generated by the project. Prof. Lenta explained that they approach the collection of traditional knowledge as a means of supporting and helping to preserve the practices of local communities. They sign mutual agreements with the communities, emphasizing that the knowledge remains their property and not that of the researchers. They do not transform or exploit the knowledge for their own benefit. Instead, they collect it to support the communities, especially when knowledge transfer to younger generations becomes a challenge. For them, the preservation of knowledge is crucial. Not all the information they collect is suitable for commercialisation or patenting. Their aim is to bridge the gap between traditional knowledge and scientific research, while respecting the cultural significance of traditional practices. The role of science in this case is to support and respect the rights of communities and ensure that knowledge remains within their authority.

Another important point of discussion was the relationship between traditional healers and foreign or urban-based scientists. Dr Lenta emphasised that building relationships with healers can be challenging, particularly for foreign or urban-based scientists. However, they approach the process with great respect for the knowledge and cultural traditions of the healers. Building trust is essential and requires open communication, active listening and mutual understanding. The research group invests time in getting to know the healers, their communities and their conceptions of health and medicine, using a transdisciplinary or interdisciplinary approach that combines perspectives from ethnology, sociology of knowledge and philosophy of medicine. This helps them to bridge the gap between Western scientific methods and indigenous healing practices.

2.6 Performing Research Data Management: Comments, criticism, and collaborative efforts from a Trilateral Graduate School

Jehoshaphat Philip Sarbah, University of Cape Coast, Ghana, Dr. Adiwu Talatu Onkala, University of Maiduguri, Nigeria, Samuel Mund, University of Hildesheim, Germany
Performing Sustainability – Cultures, and Development in West-Africa

The SDG Graduate School "Performing Sustainability" is a joint project of three Universities (Cape Coast in Ghana, Maiduguri in Nigeria and Hildesheim in Germany). It comprises 18 PhD and MA students who are developing their research projects on music, performance, arts and culture in regard to the 17 SDGs.

The Data Management focuses on preserving the (meta-)data–that is, all materials from research and publication–for future research. At the forefront of this idea is the open accessibility of data within the three institutions themselves.

Research data and open data are different things. While research data can be open data, it should be a decision in which informants also have a saying rather than an obligation. Research Data Management Plans are becoming mandatory for applications for research grants in Germany (including to the DAAD). Nevertheless, it is to bear in mind that the terminology 'data' does not necessarily apply to all sorts of research fields. In cultural anthropology, for example, most scholars do not speak of data, but rather of raw materials, which include a wide range of heterogeneous materials generated in the research process, like raw audio and raw video, photos, field notes, etc. The research data life cycle includes generating and processing material, enriching the material through taking notes and adding meta-data tags, storing this data in a repository or in someone's hardware home, and finally publishing what researchers build based on the raw material.

What does apply to all DM in (hard) science-based projects are the FAIR principles, meaning that data shall be Findable, Accessible, Interoperable and Re-usable. One could say that the FAIR principles are a rather top-down approach on which the scientific community should reflect further.

Within the humanities, in social sciences and interdisciplinary research –where information and data are generated in relationships between people (scholars and informants)– the CARE principles, by the Global Indigenous Data Alliance, seem rather operational: Collective benefit (informants benefit), Authority to control (informants' interests), Responsibility (documents and publish usages) and Ethics (according to informant communities).

Performing Sustainability's project goals encompassed devising a data management plan. This bases on a Research Data Management Organiser (RDMO) –a questionnaire that gives the project team more information about the kind of data students are collecting, and guides the project team in building a shared vocabulary to the meta-data. All database is published in a word-press repository. Another project goal was to digitalise older data sets (for example, a music documentation project) that was only available in analogue form, aiming at preserving the raw materials in a limited open access (only among the three institutions), so that students could still use materials produced in previous research.

With those goals in mind, one of the key challenges consists in managing the diversity of disciplines and topics (dance studies, graphic design, theatre studies, ethnomusicology, climate change and land use conflicts, for example) and the vagueness of earlier data (often without meta-data). Both aspects impact the overall organisation of data. Thinking about and developing a common vocabulary to provide a uniform system of meta-data tagging was crucial. Furthermore, idiosyncrasy can hinder data management processes, once the importance of RDM is not always understood. Additional challenges are the severe lack of technical funding and the resulting lack of shared infrastructure for long-term storage.

Some of those challenges are being met by local solutions, such as off-line long-term storage at the three institutions and the implementation of RDM as an integral part of all research projects. Performing Sustainability's RDM strategy bases mainly in working with librarians who help to organise the materials and in making the vocabulary for meta-data uniform, which is then published in a joint repository. They project made RDM mandatory for the following cohorts and urges new scholars and informants about the importance of RD in the humanities. The project team is also formulating RDM guidelines and ethical standards for international research projects.

People from the public wondered if the 'Authority to control' would not be a limitation to research itself. In first regard, the compliance towards the people who offer their data to the researchers is a limiting factor. Nevertheless, it should be also understood as a means to rethink the way research is treating this kind of data and its original owners.

3 Insights on Digitalisation aspects - Online teaching and critical reflections

3.1 Trends in Digitalisation for Sustainability and the experience of UNSCC

Samant Veer Kakkar, United Nations Systems Staff College (UNSSC)

The central aim of this presentation is to reflect on some of the key trends in digitalisation that can be harmless for education. The United Nations Systems Staff College (UNSSC) was

established in 2002 as an inter-agency learning institution within the United Nations (UN), the mandate was to build the leadership capacities of management within the UN system. Today, it is a strategic partner to a wide planet-spanning network of stakeholders. It is not an institution of higher education, however is committed to education regarding the United Nations' 2030 agenda for sustainable development. One of the challenges is being effective in terms of communicating the knowledge related to sustainable development.

In 2016, the UNSSC set up the Knowledge Centre for Sustainable Development, a facility to engage on learning, knowledge management and training around the 2030 agenda for SD and the SDGs. UNSSC mandate expanded and since 2016 its premise has been that a conversation around sustainability and climate change must necessarily connect all actors in society: academia, civil society, private sector, others. The key message for involving different actors has been that sustainability is not the one-person business.

UNSSC was known for its face to face courses with cohorts from different UN agencies. Since the pandemic started, the UNSSC reinvented the ways in which they were teaching, they have increased its capacity, taking care of the quality of sharing knowledge, as well as the impact their courses have. From January 2021 to December 2022, the programme has developed 73 courses, 71 learning events, 160+ webinars, virtual classes, and podcast, more than 15,000 individuals trained, 27,500 registrations and 194 countries represented by participants. It has been important to find the balance but the results of this efforts showed that with this increasing capacity they have been far more effective than before, they also have been able to maintain the quality of work and the impact they wanted to have opening the audience to beyond the UN itself. As an example, Veer Kakkar presented figures that showed that a single course on digital transformation for sustainable development exceeded the number of participants that attended in 2023 (more than 10000 persons) in comparison to the 2022. In a more gender focused analysis, the number of female participants was higher. In this point he also referred to the digital gap and the impact that this gap has on women.

Based on lessons learned, UNSSC have expanded the use of new learning formats. They have well established formats before but the challenge after pandemics was how to make this courses when people are in different time-zone? So, they created the course "Integration of Artificial Intelligence" to assess the level of the learner and focused on participants who work on humanitarian aid, who usually don't have time. Then, they tried the "Interactive 360-degree videos and VR (virtual reality)" for virtual excursions to a city, to situate an experience of being in a sustainable place. They also implement a "Gamification Platform", in order to guide participants to a sustainable lifestyle with "My sustainable living challenge" oriented to a change on behaviour and learning-by-doing. Lastly, they implemented a podcast (unlearn) in order to provide learning to young professionals.

The 2030 Agenda for Sustainable Development and the implementation of the SDGs is one of the most important tasks for the UNSSC, this agenda gave them the most ambitious blueprint to set the world on a more sustainable path, nevertheless the world is not advancing fast enough to achieve those goals. The centre realized that the pandemic led them to somehow achieve some of the goals of the 2030 Agenda but it is necessary to reach more audience, to amplify the message and to find the people that carry these messages to other audiences.

Leveraging technology is one of the critical issues as technology cannot be a magic bullet that will solve all the problems. In fact, technology can bring challenges that did not exist earlier, as the digital divide that already have been mentioned. The three questions that drive the work of the UNSSC regarding this technology issue and that they try to answer through their work are: How do we use technology to strengthen collaboration between dispersed national and global ecosystems in pursuit of digital sustainability? How do we ensure that digital transformation advances with a "do no harm" principle (negative effects of digitalisation)? How do we put people and planet and the centre of digital transformation?

Some of the challenges posed by digital transformation and that is necessary to mitigate are: unsustainable consumption patterns, energy consumption, water and material consumption, digital divide, misinformation, rights violations. With respect to the digital divide, not all parts of the world have equal access, two-thirds of the world population uses the Internet, but 2,7 billion people remain off-line. This is something that it is necessary to take into account when designing programs, and trying to reach more people leveraging technology.

In the work they are doing, they are also thinking in some solutions oriented to harness the power of digital transformation for the benefit of everyone. Some ideas are related to connect communities that are not connected and at the same time connect processes of transformation, to develop digital competencies, harnessing science and systems thinking, advancing digital multilateralism, building pioneering coalitions, creating knowledge commons. Veer Kakkar finally reflected also on the need to build coalitions (financials, laws, or public policy) and to distribute information more fairly through digitalisation and technology.

At the end of the presentation some challenges were discussed, one is misinformation and how the UNSSC is tackling this issue by launching some campaigns to make people aware that not everything you read or see on your phone is a source of truth. The most important thing is to start the conversation and there are some initiatives around the world such as some website checks. He also pointed out that it is also important to have a broader conversation about universal access to education, at the policy level, and also to disaggregate the figures on the digital divide (including the gender divide) to know more details about what is happening in which groups. In terms of different kinds of knowledge, the presenter was clear that everyone involved in these areas needs to be humble and willing to listen.

3.2 Crisis-induced change: challenges and lessons learned from a transnational study program

Enrico Behne, University of Leipzig, Graduate School on Global, and Area Studies

Enrico shared the experience of the Master Program on Peace and Security in Africa, a partnership between the University of Leipzig, Germany, and the Institute for Peace and Security Studies (IPSS), based on Addis Ababa. After a short overview about the program, the Ethiopian context, and how the master programme was before the COVID-19 pandemic, he shared the challenges that the programme faces and the strategies adopted to cope with them. Established in 2012, the programme was conceived as face-to-face and, from the beginning it strongly based on students, staff and researchers exchange and mobility.

Ethiopia has experienced multiple crises since 2015, like the 2018 political transition of 2018 and escalating political violence in 2022. These multiple crises often resulted in closure of roads and other network cuts in Addis Ababa and in the region. The COVID-19 pandemic came on top of ongoing crisis, inducing the closure of universities in Ethiopia on March 25th, 2020, followed by the closure of national borders on March 23rd, 2020. Once transnational mobility was no longer feasible, partner institutes recurred to digitalisation.

The transition experience demanded much concerted work from all partners for the adaptation of curricula to digital learning modes. The work evolved in consultation with students and continued thanks to two-years funding by the DAAD, for which the institutions jointly applied. The objectives of the digitalisation initiative included enhancing technical infrastructure and competence; advancing didactic and content to fit the digital environment; developing a conference system; installing cameras and microphones for recordings, and buying software (Zoom, WebEx, Adobe Cloud, etc.). In pursue of these objectives the institute implemented various formats for e-learning, such as blended learning, flipped classrooms, hybrid teaching, virtual mobility, online lectures, seminars, tutorials, colloquia, and summer schools. A range of off-line asynchronous materials was also developed in recording series (of lectures and podcasts, among other materials).

Challenges with which the team and students had to cope included the disparity of socio-economic and socio-demographic circumstances among the students, namely unequal access to technology devices, information and internet connectivity; different degrees of digital literacy among the students, which affected community building and communication among them; and the extra hurdle imposed on lecturers that had to learn digital skills fast in order to develop their academic courses.

The main lesson learned was to put the students and their needs at the centre of conceptualizing and implementing a digitalisation strategy. Since students had different starting points, it was important to assess where each one of them was before the trainings and to keep

trainings flexible and adaptable to their needs. Equally important was the experiential learning that the most sophisticated technologies were not necessarily the best or the most appropriate to the students, teaching staff and to the conditions in urban and rural Ethiopia.

In response to emerging challenges, lecturers produced low bandwidth content (podcasts, audio formats, low-resolution videos), and recurred to online applications with low bandwidth (e.g. Slack, Moodle Forum, etc.). The programme provided VPN Connections and prioritized flipped and asynchronous formats, so as to reduce live-streaming due to unstable internet connection in Ethiopia. In case of synchronous events, the strategy was to carry them out in small groups. Moreover, the programme recurred to project-based collaborative exams and assignments. Finally, deadlines and time frames for submitting assignments also had to be handled more flexibly, and accepted communication channels for assignments submission were multiplied (e.g. Slack, WhatsApp, Facebook, whatever the students had more easy access to).

PD Dr. Eva Youkhana, acting director at ZEF, asked: how do you managed to build communities in online teaching given the fact that you flip into asynchronous learning formats (which does not allow developing an immediate communication)? Behne answered that communication within the community was higher with those strategies, since people from different programmes got involved in the courses, and students had the possibility to talk to others within the Moodle through the open forums that were available. But there was no deliberate strategy to build online communities.

3.3 Digital engagement with real-life urban problems - using online engagement platforms on informal settlement upgrading in postgraduate teaching

Taki Sithagu, Prof. Dr. Marie Huchzermeyer, University of the Witwatersrand, South Africa
Wits-TUB-UNILAG Urban Lab Interdisciplinary Bilateral Postgraduate Studies Programme for Sub-Saharan Africa

The SDG Wits-TUB-UNILAG Urban Lab is integrated into the Wits School of Architecture and Planning and also into the University of Lagos (in Phase 2), the Department of Urban and Regional Planning and the Centre for Housing and Sustainable Development. The programme is enriched by long term transdisciplinary engagements and by other international collaborations and operates within existing institutional arrangements which are both beneficial but also can be constraining. Nevertheless, this SDG-GS, with a very dedicated small team has been able to be flexible enough to get things done quickly and led transformations that have gone beyond the SDG programme.

After the presentation of the graduate school, the presenters introduced some of the real-life trends that have been intensified by the COVID-19 pandemic. Besides of a breakdown in municipal capacity to deliver services, the issues that students must be able to deal with have intensified through the pandemic, and it does mean that programme pedagogy must respond and that the programme must find ways to get students ready to confront an increasingly challenging reality. Another issues that have been intensified with the pandemic is the increase in inequality, informal settlements, unemployment, greater food insecurity and intensified urbanisation patterns.

There are also issues that directly have affected the students themselves such as economic distress in many households what makes it more difficult for people to study or more congestion around the University (in Lagos), evictions, more traffic and difficult to find accommodation. The programme is finding the student numbers dwindling at the postgraduate level, which is a challenge that the university must face, but it also affects the programme in terms of finding the students to which to give the scholarships. Another issue that directly affects the cooperation is the increase in visa refusals and delays, particularly in South Africa.

One of the main ideas of this presentation and of the work this graduate school is doing after pandemic is related to the question: How to "build back differently"? The world is going back to business as usual, but there are new digital platforms, many of them haven't been explored yet. Many of them are emerging. It is necessary to get our head around what AI is going to mean in terms of new ways of doing things as well.

There must be an overhaul of administrative processes to support the kind of change that is needed, and they have been working to find more effective ways of teaching and working. They as a collective have realised there has to be a different way of doing things. In this sense, the one thing they realised around which they want to leverage change was a timetabling initiative and this was to rethink entirely how they deliver the degrees, how they timetable them or release them. Because the student numbers are dwindling, they must rethink entirely how do they meet the part time student market? What is it that students need? What is the time they have? What are the techniques they are able to use in terms of teaching? How do the GS devise a new way of releasing their degrees that still optimise field trips and engagement with this increasingly challenging real-life reality that they have to teach about?

As lessons learned, they started off with an international webinar on timetabling on how the sister programmes all around the world, from Ecuador to India to the Global North, several leading institutions, in the global north, and some in the South. They ask themselves: Where in the African continent were people navigating this issue of timetabling? How are they doing it? What issues are they dealing with? It was a wonderful workshop where they realised, that all are in the same boat. Nobody has the capacity to do it in a entirely different way but everyone realised that it must to be done. As a result from this workshop they are exploring now three alternative

timetable models to collectively move forward. It is also important to include administration in those processes.

Three examples of real-life engagements were presented: The first example was the engagement with the informal settlement sector. For many more than a decade, they have been running an annual student stakeholder engagement on informal settlement upgrading and this meant people in national government, provincial government, NGOs and two communities that they have accompanied over many years. Their leadership comes into the classroom, and they debate, update one another, and it it's an engagement platform that officials enjoy because it's so informal, and it's also at times managed to leverage change in in the communities. During COVID-19 National Department of Human Settlements got on the similar sort of bandwagon and started an engagement platform online, biweekly for the whole of 2020 with the promise of institutionalising this where every single decision the National Department was doing, it would put out for debate. But it petered out in 2021 and they do not have any of it anymore. Then they also have an international community of practise network that engages and tries to unblock informal and upgrading and all of these they are leveraging together into an online student sector engagement platform. It has only met annually but has the potential really to perform some of what was promised by the department and to serve as a sort of engagement where the sector can talk and unblock.

The second example is the Summer School. The first phase mainly consisted of Technical University of Berlin and Wits and they alternated each year as host and guest. The summer schools were a typical traditional summer school, which consists of physical mobilities of North and South. Then they went on to our second phase. In 2020, there was no summer school because of pandemic, but the second phase in 2021 they partnered with a third University, University of Lagos, where they did virtual summer school between the three universities for the first time. They experienced issues of power cuts in South Africa, of networks being slow and therefore the summer school was a challenge and it needed a lot of contribution from all participants to actually pull that through, but then they moved back to the traditional model of summer school, so it's this whole thing of trying to just be normal again. They had another summer school at the University of Lagos physical, which was very successful, but what they try to do differently now is a mix of everything, hybrid, physical and so on. So, in the last summer school unfortunately, the University of Lagos students did not attend because of visa issues. The students were supposed to collaborate online, and then when they come to the summer school, they meet and do the assignment together. But now what happened is the master students had to pull the virtual students together with them and they used platforms. In spite of all the challenges the summer school was a success.

The third example is the international teaching collaboration. This project is linked to other international collaborations that are not part of the main GS. One of the collaborations is with the University of College London that has a different model of teaching. At first, students do online

teaching individually and self-paced. Then they move to hybrid and then they move to physical and finally they do a field work.

As overall message of this presentation is that real life challenges are becoming more and more intense, but instead of moving back to where they used to be, they are building back differently, even though the world is moving backward. They are using this time tabling initiative to initiate and leverage an overhaul of our administration, of their thinking and of their IT so that they can continue with the transdisciplinary and international collaborations that this project has allowed them to have.

After the presentation, Taki clarified the idea of 'rebuilding differently', which was a central point of her presentation. The whole concept of the presentation is that the COVID-19 pandemic has made them aware of the need to change their teaching modules from the what they used to have. Instead of going back to the normal way of teaching, they are building back differently. So they are using what they already know traditionally and also using the improvement of technology to actually enhance their teaching models. So they are trying to build back differently.

3.4 Experiences and lessons learned from CLIFOOD digitalisation initiatives to overcome resource constraints

Dr. Sintayehu Yigrem Mersha, Hawassa University, Ethiopia
German-Ethiopian SDG Graduate School: Climate Change Effects on Food Security *(CLIFOOD)*

The CLIFOOD graduate school responds to significant contemporary challenges in East Africa: the accelerated population growth and the consequent rising demand for food in an area historically raged by food insecurity meets dwindling agricultural production, increasingly threatened by climate change. With two cohorts, with 12 PhD students and two post-doctoral candidates in the first phase, and 13 PhD students and two post-doctoral candidates in its second phased, the programme is highly interdisciplinary in its studies about agricultural production, climate change and food security nexus. Research topics encompass human nutrition, livestock production, grain quality, seasonal weather forecast, soil health, farming household, weed control, food and feed crops. CLIFOOD fosters interdisciplinary research on climate-resilient agriculture through adaptation, mitigation, and sustainable development.

Information and communication technologies and digitalisation have much potential in higher education: increasing access to knowledge, improving communication and collaboration, tailoring flexible learning opportunities and personalized learning experiences, enhancing teaching methods and research, fostering skill development, innovation and administrative efficiency.

CLIFOOD gives young African scientists and university staff the opportunity to acquire professional, didactic, communicative, and intercultural skills. It enhances their employability, facilitates effective collaboration, improves research and presentation skills, develops leadership and project management abilities, boosts academic success and personal growth and prepare for diverse career paths.

The main challenges faced with digitalisation were related to the time zone differences, which made common schedules difficult to set, technical issues (power cotes, low bandwidth, internet shut-downs, and how to ensure students' active participation and engagement in the online space.

The solutions and best practices were increasing dialogue to find convergent times that allowed for common scheduling, providing technical support resources, encouraging a culture of open dialogue and understanding divergences, and implementing interactive activities to boost engagement. The programme provided devices (like smart display, video camera, audio devices, tablets, etc.) to enable experts to participate in its activities and contribute to students' growth remotely.

The presenter highlighted that a milestone of the project was establishing a scientific data centre at Hawassa University (HU). This data management centre allows for inter- and transdisciplinary data management, it joins all CLIFOOD research data, providing, among others, high resolution weather information to the centre and beyond. The data centre is unique in the country and region in its capacity to store and process huge amounts of weather data. It works as a hub for all CLIFODD data and online courses, literature etc., and it offers apps and/or cloud solutions for stakeholders. It was not easy to find suitable rooms where the data centre could be built, due to unstable electricity –necessary to run and to cool the servers/equipment– and other infrastructure challenges. The facility built for the data centre is secured against power failures through a generator. Yet, the responsibility for the maintenance of the data centre after the project ends and the challenges related to limited bandwidth to manage large data volumes remain.

3.5 Online-Teaching Experiences from the WAC-SRT

Dr. Michael Ayamga, University for Development Studies, Ghana
Dr. Wolfram Laube, Center for Development Research, University of Bonn, Germany

The West African Center for Sustainable Rural Transformation is funded by the German Federal Foreign Office. The centre results from a collaboration between the University of Bonn, Abdou Moumouni University, in Niger, the University of Development Studies (UDS), and

University of Business and Integrated Development Studies, respectively in Tamale and Wa, in Ghana.

They focus on infrastructure enhancement, master's programs in development management, agricultural economics, and sustainable rural transformation, offering scholarships to students and annual summer schools. The Centre aims to develop common research projects to sustain the centres in the long term and increase research funding for students. The Centre also seeks to promote science diplomacy and create networks and social capital between different countries and cultures.

Online teaching became necessary during the COVID-19 crisis to continue educational activities while ensuring the safety of students and educators. It enables educators to exchange knowledge and skill with geographically dispersed audiences, and multitasking. Despite its benefits, online teaching falls short from the richness of face-to-face interaction, which includes non-verbal cues, immediate feedback, and nuanced communication that can enhance the learning experience.

Online teaching was a survival technique during the pandemic and kept universities working in a moment of crisis, but it is no replacement to all kinds of leanings. Online teaching may hinder opportunities for international exposure, cultural exchange, and the development of cultural competence among students. Additionally, challenges related to internet access and technological resources may create or deepen inequalities. It is important to consider these limitations and address them to ensure a more inclusive and equitable learning environment.

Digitalisation and online teaching may, furthermore, unintentionally reduce informal interactions that are necessary for social capital formation, and for building trust relations demanded by effective collaboration and international networks.

During the questions and comments sessions, participants and presenters explained that the digital gap refers to the disparity in access to and proficiency in digital technologies. It is the difference between those who have adequate access to the internet, devices, and digital skills, and those who do not. They highlighted that, as more activities and resources move online, such as education, communication, and information sharing, those without reliable internet access or necessary devices are left at a disadvantage, a gap which can lead to unequal opportunities for education, information, and participation in the digital age, perpetuating existing inequalities.

Another challenge that participants remembered was that excessive focus on cutting budgets and organizing hybrid conferences can contribute to this gap. Organisations may prioritize online alternatives and hybrid conferences over in-person events and activities to save costs. While this may seem more cost-effective and convenient, it can unintentionally exclude individuals and

communities with limited access to digital resources. Cutting budgets without considering the impact on the digital divide can widen the gap further, as it reduces resources available for bridging the divide and providing equal access to digital tools and platforms. Unintended exclusionary effects in the digital realm can affect various aspects of life, including education, employment opportunities, communication, access to information and services, and social interactions. The digital divide can exacerbate existing social and economic inequalities.

Online teaching, by itself, is unlikely to lead to significant job loss in Africa. Traditional teaching methods, which heavily rely on in-person lectures and physical presence, are still prevalent in many African educational systems. While there may be changes in job roles and requirements due to the integration of digital technologies in education, the fear of widespread job loss specifically due to online teaching is not a major concern.

3.6 Digitalisation in trAndeS: Opportunities and Challenges

Bettina Schorr, Freie Universität Berlin, Germany
Postgraduate Programmeon Sustainable Development and Social Inequalities in the Andean Region (trAndeS)

The presentation began with general information on digitalisation on trAndes, virtual portal, hard piece of the digital strategy and critical comments on digitalisation. Digitalisation has always been part of the trAndeS programme – as is required by the funding line – using virtualisation principally as means for organisation, e.g. Skype, WhatsApp, Zoom, WebeX, mailing lists, the project's homepage, social media platforms such as Instagram and Facebook, etc.

Since the beginning of the program, trAndeS has developed a virtual library with access to the digital libraries and virtual repositories of the Free University of Berlin and the Ibero-American Institute for all students and associated researchers of the trAndeS network. The COVID-19 pandemic brought a massification of virtual class instruments and research activities, which have had positive impact on flexibility and CO2 emissions, as well as cost efficiency, due to reduced flights and oversee stays. Nevertheless, there are some dark sides of digitalisation.

The Virtual Portal of trAndeS has always been the heart-piece of the digital strategy and innovations of the programme's 2nd phase. It offers a variety of virtual materials, tools and information on social inequalities and sustainable development with an open-access policy. Those are structured within three main categories: multidimensional interdependent social inequalities; economic elites in Latin America; and a collection of materials on Gender and Diversity in online and teaching. Those models can be used as self-study formats. Furthermore, most documents produced by the project (Working Paper Series, Course Manuals, Policy briefs) are made available on open access, which implies serious additional costs.

The presentation concluded with some critical comments on the matter of digitalisation. The first point is the far we are from 100% digitalisation, there are still a lot of inequalities and it is not just about having hard- and software. While most of the students from the programme have the hardware to access, the most critical issue is connectivity and not just in Latin-American countries but also in Germany. Moreover, the social and political instability in countries we work with might prevent students from making use of the possibilities they have at hand. Even when there is a good connectivity, hardware and software, the social and political problems must be taken into consideration when fostering and dealing with digitalisation.

The second point is that the teaching needs personal contact and not once in a while, but in a continuous basis. Despite all the improvements, the personal contact is necessary within teaching and research. A third point is the opportunities and the uses of digitalisation differs from discipline to discipline and associated methods. Especially the social sciences rely on face to face conversational settings in order to do their investigation. A last point to have in mind is the need to understand what is going on with the countries which we work with and this is not possible to do just from the desk.

This presentation has been a reflection from the work of trAndes, digitalisation in research and teaching in international cooperation could be a good thing it brings many opportunities but we also learned that it is important to keep in mind that it is not a panacea or a magic bullet. Donors must take all these issues into account by when considering future projects and their funding lines.

4 Digital Tools in research

4.1 The Digital Side of the Main Agroecological Structure, an Environmental Tool for Valuing Agrobiodiversity

Dr. Tomás León Sicard, Instituto de Estudios Ambientales, UNAL. DSSP

The presentation began with the conceptualisation of environmental dimension as “the complex, continuous and deep interrelationships of different intensities and directions that occur between ecosystems and cultures” and culture as “the totality of human thinking and action carried out through: symbolic structure (myths, science, ideologies, law, philosophy, art), human organisation (power, interests, hierarchies), technological platform (instruments, machines, teams, services)”.

Humans are nature but not ecosystem, however humans interact continuously with the ecosystem, transform the ecosystem through the culture, through the ways of living and thinking

and one crucial transformation is made by agriculture. Agriculture is the main environmental modification of ecosystems. From an environmental perspective it is not only the ecosystem order (crops, associated biodiversity, energy flows, matter cycles, soils, organisms, ecological relationship), it is also the cultural order (technology, policies, socio-economic organisation, science, knowledge, tradition, values). When ecosystem order and cultural order became one, we have socio-ecological or environmental systems named agroecosystems. The agroecosystems are the base of models of agriculture.

Not all the agricultural models are the same. In one side is the "green revolution model" (conventional agriculture, transgenic agriculture, industrial agriculture). In the other side is the "alternative agriculture" (organic agriculture, agroecology, natural agriculture). In the middle is the sustainable agriculture (smart agriculture, intensification of agriculture). In the agricultural sector the green revolution model has left strong dissatisfaction due to the effects on human and non-human health, water pollution, soils pollution, losses of biodiversity, polarization of societies, exclusion, inequality, dependence, partial assessment of the environmental effects, little or no appreciation of ancestral knowledge.

Within this dissatisfaction agroecology emerges as a new scientific model that has different meanings: as a social and political movement, as an agriculture system, as a science of agroecosystems, but also as a symbolic system. Agroecology also addresses all cultural aspects of agroecosystems and therefore conducts studies of symbolic, socio-economic and technological relations, with historical, gender, equity, sustainability, and social justice perspectives.

Agroecology allows to understand and manage agrobiodiversity at different scales, at the farm level but also at the crop level. The proposal that Dr. León made is that the major agroecosystem is the farm, and the minor agroecosystems are related to the cultivation sites, meadows, and agroforestry. On other bigger scales it is possible to find the landscape (as a matrix of agroecosystems), the region and the country. In the encounter with the ecology of the landscape, the variables of study are the composition, the structure, the functionality, the changes and the connectivity. Tomás also presented the proposal made for Thomas van der Hammen in Colombia about the Main Ecological Structure as the ecological structure of the nation's support.

Based on this idea, the Main Agroecological Structure (MAS) of the Major Agroecosystems was proposed as the internal and external spatial configuration or arrangement of agrobiodiversity in the major agroecosystem and the spatial connectivity between its various sectors, patches and corridors of vegetation or production systems (minor agroecosystems) with each other and with the surrounding landscape, historically constructed and regulated by cultural variables.

After presenting the concept of MAS, the MAS index was presented as a way to measure and interpret agrobiodiversity in the ecosystem and cultural dimensions. This index is composed by ten criteria (five ecosystemic and five cultural) and there are indicators as the quantitative or semi-quantitative tools used to evaluate the criteria. There are some difficulties to measure sometime because no major agroecosystems are seen in the landscapes. So the group has used Google Earth images and cadastral information to assess with digital tools some indicators for the ecosystem dimension (connection with the ecological structure of the landscape, extension of external connectors, extension of internal connectors) and for the cultural dimension as well (land use in the farm). They used relative distance to calculate the area of influence for each farm, proportional to the size of each farm.

Prof. León presented an example of this application in a PhD thesis that did research about the relations between MAS and agrobiodiversity, management practices and cultural farmer aspects, with diversity and ecological functions of dung beetles in the agroecosystems of intensive livestock of the Colombian Andes. This thesis used drones to measure the indicators mentioned before. Some other postgraduate studies are in progress: MAS and climate change, MAS and food sovereignty, MAS and biocultural memory of the indigenous people NASA, MAS and agroecosystem matrices. MAS is a new concept, with multiple scientific (agroecology) technological (farm management), socio-economic and political (territory planning) applications, which requires more research and dissemination.

During the discussion, one of the participants recommended looking for artificial intelligence tools to overcome the challenges that some remote sensing tools and satellites usually present and that could improve the results for the MAS and related indicators. Dr León also clarified that this type of research could also be used to design or improve some regulatory instruments, but this is a long process in the Colombian context.

4.2 Survey data for cross-country studies using digital tools

Dr. Sundus Saleemi, Center for Development Research, University of Bonn, Germany

Dr. Sundus Saleemi presented her on-going research on the use of time by women. It is well-known that time use is gendered, that women have a greater share of reproductive work in households (reproductive work understood as labour that does not directly generate income but is, nonetheless, essential to the subsistence of a household). Once women assume a greater share of the (unpaid) reproductive work within a household, they have less time to dedicate to remunerated activities and/or to invest in their education, for example, with detrimental effects to their welfare and productivity outcomes.

Assessing people's time use can be difficult, since perceptions can significantly deviate from reality. In order to obtain more precise measurements and a better understanding of women's, men's and children's allocation of time patterns, as well as the impact of technologies, services and innovations in their use of time, Dr. Saleemi is conducting a research with Women in Uganda, Ghana and Ethiopia in which digital tools play a key role. The sample includes rural farming and non-farming households in the three countries. In a second moment, the data will be compared with secondary data and analysed with research partners.

The data collection instrument is an application developed for the research. This application allows research participants to register their use of time in a user-friendly interface. With a mobile phone, they can enter what they are doing (and for how long, in intervals of 30 minutes) in different times of the day. The list of activities includes daily life actions (take the kids to school, domestic activities, fetch water, cook, clean, farm, etc.). It allows to get data of primary and secondary activities and to get a complete photograph of all the work women do.

Only a digital tool could allow access to so much data, of so many women, with high precision, since a single researcher could not simultaneously carry out so many surveys, nor be observing a large group of women to register their activities for several days in a row. Another advantage of a digital survey via mobile phone application is that it is less time consuming, it has a lower margin of error, it allows for remote supervision and in-built checks during data collection, and it demands less data cleaning, since there is no need to fill in paper surveys and later on enter the data manually in a computer.

One of the main challenges was to design the data collection instrument in a cross-country setting. This demanded close coordination with the country partners and many test rounds to ensure that the order, structure, and labelling of the activities would be consistent. The same final version of the survey should be used in the three countries to ensure comparability. Another drawback of the application is the cost, both of the equipment needed (tablets and phones, that can be lost or stolen) and of the training of research assistants and supervision, not to mention the time and energy cost to respondents. It relies on respondents' self-motivation and self-report. Nonetheless, the participation rate was high so far, which contributed to generating data of good quality, and there were no significant losses.

Participants of the conference questioned the feasibility of using this method to study other social groups (especially elites), considering that the application can be quite invasive, a critique that applies to development studies in general (it only studies the poor, not the rich).

5 Discussion and final remarks

Dr. Dennis Avilés-Irahola, Center for Development Research, University of Bonn, Germany. DSSP

During the conference, participants highlighted not only the potential of digitalisation (data management and online teaching), but also the many challenges it poses. It has the potential to transform research and ways of thinking and is a central tool for all disciplines, especially after the COVID-19 pandemic. In the case of the SDG-GS Alliance, in which we find different fields of knowledge, we could see evidence of the potential of digitalisation, for example in chemistry to avoid losing knowledge and repeating experiments, and also in social sciences to help preserving traditional indigenous knowledge. It has been also a useful tool for knowledge dissemination, where solutions developed for a specific local context could be useful in another country or continent with similar problems and geographical conditions.

Digitalisation is also increasingly required by funders in the context of international cooperation for sustainability, as the SDG-GS' funding line illustrates. Nevertheless, this increases the cost of projects and poses different kind of challenges for the partners involved in the collaboration process, given the different contexts (socio-political, cultural, economic, institutional) in each region. These specific 'digital' challenges add to the existing challenges of bureaucracy (visa procedures), which were also mentioned repeatedly during the conference.

5.1 Challenges

A major challenge of digitalisation (data management and online teaching) is related to multiple digital divides (north-south, rural/urban, gender). In data management, for example, data policies are imposed from the global North to the global South, with the risk of reproducing colonial patterns and ignoring or exacerbating existing gaps. In online teaching, there is a risk that digitalisation is seen as a panacea or a "magic bullet" for quality and sustainable education, whereas many important skills can only be learned face-to-face, especially in the social sciences, and face-to-face interaction (with immediate feedback) needs to be part of courses, even when digital tools are used to support the pedagogical process.

Another important challenge, especially in data management is the complexity of data. Quantitative and qualitative data is a dichotomy that hides the fact that data are more diverse and multiple, and that scientists from different backgrounds need to discuss together to understand and work with these complex differences. This challenge becomes even more important in inter and transdisciplinary projects and in the context of international cooperation when working in and with complex scenarios as well, where ethical issues also need to be addressed.

Some specific challenges in online teaching are the need for teachers and facilitators to learn new skills and use them in innovative ways, different levels of technical literacy, internet connectivity and access to devices. Students need to discuss what they have heard in class, they need to build trust and this is not an easy task in the digital atmosphere.

On the technical side, connectivity is a major issue, also within countries and regions. This regards both digitalising education and access to digital data management systems. Further challenges are the lack of infrastructure for long-term storage and the different languages of data sharing under different hardware and software. In addition, there is still a general lack of understanding of the importance of research data management, which is reflected in scarce resources.

A sustainable digitalisation strategy must also reflect on the pitfalls involved in the process such as the risk of deepening inequalities, the misinformation, rights violations, data protection, privacy and unsolved ethical questions. A major issue in terms of sustainability are the high environmental costs associated to the material basis necessary for digitalisation: unsustainable consumption patterns and high energy, water and material consumption derived from hardware production, servers maintaining, etc.

5.2 Practices

The different experiences presented in data management share common practices, such as the implementation or improvement of technical equipment (hardware and software), data digitalisation, and the use of different kind of repositories and communication tools (e.g. websites, social networks). The material shared goes through a rigorous process and many of the GS are pioneers of digital transformation in their respective universities.

In online teaching, the cases had in common the use of blended learning, flexible times, the possibility of rescheduling, the use of many channels (FB, WhatsApp, slack, videos) and working off-line (alone or in groups). There was a common understanding that online teaching is a resource for times of crisis, but it is also here to stay. Some of us are going back to the 'old normal', others are settling into the 'new normal' or “building back differently”.

5.3 Lessons learned

Among the lessons learned from the experiences presented in DM, it was highlighted that not all data is usable or of good quality, and that many actors need to be involved in the digital transformation process (researchers, university administrators, local voices). One of the take-home messages was that we need to start sharing data now. However, reflecting about what data to share, in what contexts, how, for what purposes and for whose benefit is paramount.

For online teaching, we learned that crises need to be taken into account (e.g. Ethiopia & Peru), that it is necessary to assess where we are starting from (different levels of digital literacy, access to equipment, software) and to choose the appropriate technology and methods. The newest technologies are not always the most appropriate to local contexts (lower band-width, videos with "worse" resolution but easier to stream), sound files (podcasts), etc. Online teaching works better when supported by other strategies/tools and is not a panacea on its own. Some disadvantages were pointed out, for lecturers (lack of interaction and non-verbal cues as feedback from students), for students (lack of career opportunities due to less effective networking and soft skills development in the digital world vis-à-vis in person interactions) and funders (lack of opportunities to build shared values important in science diplomacy). As in DM, it is important to involve other actors rather than teachers and students, such as university administrators, and funders.

5.4 Questions ahead

Some of the questions that were raised in DM are: How do we ensure that digital transformation is driven by fairness and care? What would be the impact on local communities, especially in countries with a colonial past (What is development?), How to deal with local knowledge in terms of rights and data protection? Who produces data, who collects it and for what? How to get people to work on the management and protection of data collection? What kind of incentives should be used? How to share data and what kind of data to share? In online teaching the questions were: How to include students disadvantaged by "digital illiteracy" or with limited connection? How to "solve" extra costs (time and money) in training? How to harvest the benefits of digital teaching tools and integrate them into face-to-face education without enhancing existing inequalities?

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