



IFSA2026: Farming and Agri-Food Systems dynamics: facing crises and trade-offs in transition pathways

Theme 3 Capacity development to support systemic change: approaches, methods and tools

Sub-theme 3.1 Conceptualising and documenting learning processes

3 July 2026 CIHEAM Montpellier, France

Interdisciplinary approach to reverse land degradation and restore terrestrial ecosystems in drylands: documenting the co-design of an international doctoral course

Davide Rizzo^{a,*}, Oumarou Malam Issa^{b,c}, Cheik Sougueh^c, Eric Léonard^d, Abdourahman Daher^c, Jalludin Mohamed^c

^a LISAH, Univ Montpellier, AgroParisTech, INRAE, Institut Agro, IRD, Montpellier, France

^b Institut d'écologie et des Sciences de l'Environnement de Paris (iEES-Paris), Sorbonne Université, IRD, CNRS, INRAE, Université Paris-Est Créteil, Université de Paris, Centre IRD de France Nord et Ouest, Bondy, France

^c Agroecology Laboratory, Institute of Life Sciences, Centre d'Etude et de Recherche de Djibouti (CERD), Djibouti

^d SENS, IRD, Université Paul-Valéry Montpellier 3, Montpellier, France

KEYWORDS	ABSTRACT
Great Green Wall Field-based learning Capacity building Scientific diplomacy Sustainability science	Large-scale sustainable land management programmes addressing dryland degradation demand interdisciplinary approaches, yet academic training often reinforces disciplinary silos. This study documents the co-design of an international doctoral course utilising the Great Green Wall in Djibouti as a case study to foster epistemic integration among early-career researchers. Anchored in transformative learning theory, the methodology combined online theoretical framing with immersive, shared fieldwork across three contrasting sites, engaging sixteen PhD students and fourteen researchers in multicultural, multidisciplinary teams. The co-design process involved forty actors over one year, culminating in field-based landscape analysis, soil characterisation, and semi-structured interviews. Findings reveal that while shared fieldwork successfully disrupted silos and cultivated systemic interdisciplinary competencies, participants experienced tension between disciplinary habits and the need for integrated problem-framing, highlighting the necessity for stronger pre-field methodological guidelines. Crucially, the process catalysed an epistemic shift: participants moved beyond sectoral diagnostics to reframe sustainability as an integration of biophysical degradation and social marginalisation. Theoretically, this demonstrates that place-based, confrontational learning can bridge the divide between biophysical and sociotechnical perspectives, offering a relevant pedagogical model for addressing Sustainable Development Goal 15. Finally, the course emerges as an intermediary object that can inform the cross-sectoral framing of scientific diplomacy for land management research in the Sahel.

Context, research problem, practical and theoretical background

Large-scale sustainable land management programmes have catalysed interest to reverse land degradation in drylands (Diop et al., 2018; Scherr et al., 2012). These programmes integrate geopolitical, social, economic, ecological, and environmental dimensions. They raise complex scientific questions about their design and implementation (Mutio et al., 2025; Neely et al., 2024). Addressing them demands interdisciplinary approaches that bridge regional stability, rural-urban transitions, land tenure governance, migrations, power dynamics, equality, efficient water use, biodiversity preservation, soil health, and carbon sequestration. Understanding and reversing land degradation, a paradigmatic example of a *wicked problem* (Bouma et al., 2021; DeFries & Nagendra, 2017), requires integrating knowledge across disciplines. Yet academic training often reinforces disciplinary silos, privileging depth over integration. Early-career researchers are thus left to reconcile fragmented knowledge when engaging with land managers and policymakers (Tress et al., 2009). This gap highlights the need for educational models that foster epistemic integration from the outset (Enengel et al., 2012).

* Corresponding author: Davide Rizzo, davide.rizzo@ird.fr

<https://ird.hal.science/ird-05712644> DOI: 10.5281/zenodo.21826712 <https://doi.org/10.5281/zenodo.21826712>

This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>), Rizzo et al. 2026

Purposes and questions

This study documents the co-design of an international doctoral course aimed at strengthening analytical and methodological skills for interdisciplinary research on land degradation and ecosystem restoration in drylands. We ask: *How can moving beyond the juxtaposition of disciplinary perspectives foster a more integrated research approach?* Specifically, we evaluate the opportunities and challenges of a multicultural, multidisciplinary, in-field learning process to bridge biophysical issues and sociotechnical questions.

Desing, methodology, approach

The course was designed to foster epistemological and methodological integration through shared fieldwork. The process began with topic selection and stakeholder engagement, followed by co-design to translate disciplinary insights into a shared framework.

Selection of the topic and case study: Great Green Wall in Djibouti as an example

The main topic for the course was the Sustainable Development Goal 15 “protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss” (Transforming Our World, 2015). This choice is part of a commitment to capacity building in sustainability science by the organisers (Richelle et al., 2024) and fills a gap in the current themes on sustainable development goals in higher education (Chung et al., 2024). As a case study, we adopted the Great Green Wall, a high-level political initiative launched in 2007 by eleven Sahara and Sahel countries (from Senegal to Djibouti). This initiative mobilises scientists, government technical services, local associations, and international organisations to preserve an endangered environment and improve sustainable livelihoods of rural populations in African drylands (Dia & Niang, 2012; Gadzama, 2017). Djibouti was selected as the target country because of the interest of the local academic community and policymakers in exploring the regional land management dynamics under climate change. In this regard, we focused on the Grand Bara plain (Fig. 1), which is under study as a priority adaptation and innovation zone (ZAPI) within a regional initiative addressing climate adaptation.

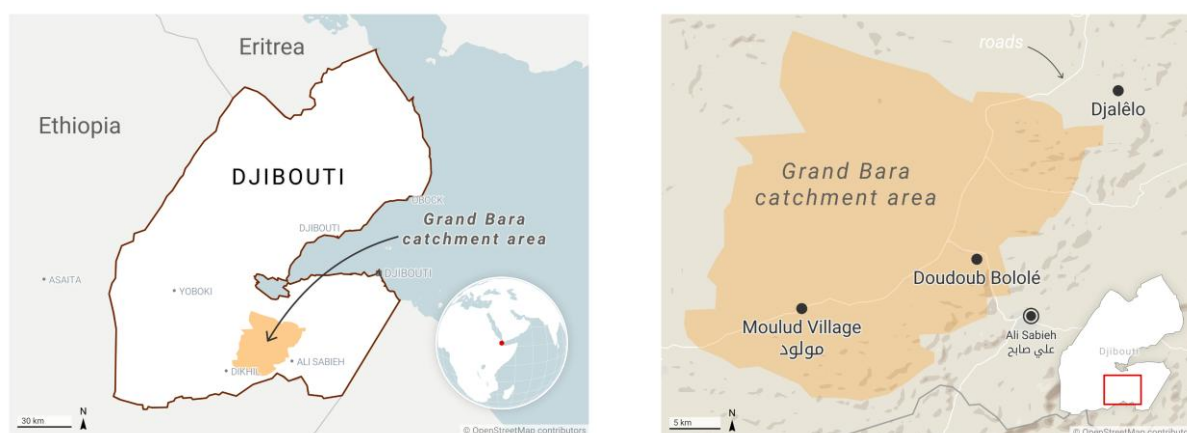


Figure 1. Location of the study area (left) and of the three study sites (right). Maps created with Datawrapper. Grand Bara boundaries retrieved from Moussa Omar et al. (2021, Figure 1).

Educational strategy and course design approach

The course design was explicitly anchored in capacity development literature, specifically targeting second-order transformative learning aiming to shift PhD students’ frame of reference through an in-field immersion framework (Howlett et al., 2016). Experiential field-based learning was the core educational strategy (Kolb, 1984), grounded in two hypotheses: (i) direct in-context and shared confrontation with biophysical issues and social dynamics allows overcoming disciplinary fragmentation; (ii) land degradation and restoration are best addressed through field-based engagement. To this end, the course structure comprises three stages (Pederson et al., 2022): (1) *foregrounding* to identify existing assumptions; (2) immersion, engaging learners and experienced researchers in place-based inquiries to apprehend the system complexity; (3) *iterative reflection* at the individual level, then in subgroups, and finally comparing subgroups to challenge disciplinary biases. A fourth stage will concern the *agency*, seeking the translation of new understandings into research actions when addressing the “wicked” problems (Mezirow, 1997), such as those raised by sustainable land management.

The course design drew on lessons from a 2024 interdisciplinary soil health course in Côte d'Ivoire, particularly regarding the role of facilitation under logistical constraints in place-based approaches (Sahle et al., 2024). The overall course design was framed as a participatory approach fostering epistemic confrontation and debates among organisers and contributors.

Findings

The active co-design phase spanned one year and involved approximately forty actors from diverse disciplines and expertise levels in the realm of sustainable land management and restoration.

Course design process

The course was the cornerstone of a year-long series of events (Fig. 2). A preparatory launch webinar was held in November 2024, convening panellists from academia, policymaking, finance and NGOs about geopolitical, socioeconomic and scientific issues related to the Great Green Wall. The panellists called for better translation of scientific evidence into policy-relevant indicators to overcome fragmentation. They also highlighted the mismatch between disciplines in defining and addressing the Great Green Wall and its assessment. A subsequent two-day workshop identified interdisciplinary challenges and co-designed the course programme, producing four draft versions. A second webinar refined these based on budget and logistical constraints, selecting three study sites to enable direct community engagement and local knowledge integration.

Course programme

The course combined online theory and in-field practice. Four weekly online sessions (September–October 2025) covered: (1) the Great Green Wall institutional framing and land degradation dimensions within the Sahel region; (2) definitions of interdisciplinarity and transdisciplinarity, with a presentation of disciplinary approaches to socioeconomic issues, carbon sequestration, pastoralism, land tenure, and environmental management; (3) mixed-methods training, such as interviews, economic efficiency, discourse analysis, participatory appraisal, and soil health; (4) the Djibouti-specific context with a focus on the Grand Bara plain, with contributions from local experts about geopedology, hydrology, land degradation, agropastoral systems, pastoral livelihoods, and socioeconomic dynamics.

The field phase (26–31 October 2025) began in Djibouti and then moved to Ali Sabieh as a hub for Grand Bara access (Fig. 1). Day one included landscape reading and soil profiling. Participants then split into three interdisciplinary teams (one Anglophone, two Francophone), each assigned to one study site. Over two days, teams conducted landscape analysis, soil characterisation, and semi-structured interviews on land use, water access, tenure, and ecological indicators. Afternoon workshops enabled iterative synthesis and peer feedback, culminating in a public poster presentation to local communities on 30 October. The final day in Djibouti focused on collective reflection and methodological insights. The in-field activities purposely blurred the teacher-student hierarchy, treating all participants as learners, to give voice to everyone regardless of their career stage, as most were new to the region and topic.

Profiles of the involved actors

The design and implementation of the course brought together three types of actors: organisers, contributors, and early career researchers (Fig. 2). The course was coordinated by the 'Land & Soil' knowledge community (CoSav *Terres et Sols*, <https://cosav.xyz/terresol/>) and its working group on the Great Green Wall. This CoSav, established in 2022, has over 400 members from worldwide academic and non-academic entities, and fosters inter- and transdisciplinary dialogue on sustainable land and soil management and to contribute to the IRD's long-standing regional partnerships in southern countries (Richelle et al., 2024).

For the organisation, the international research network on the Great Green Wall (IRN Reset_GMV), which also helped to involve the local partners, including the CERD research centre and the University of Djibouti, as well as the Doctoral Alliance for Climate Adaptation (ADAC) supported the CoSav. IRN Reset_GMV, established in 2023, aims to structure, strengthen and raise the profile of an interdisciplinary research community that is active and engaged with the various national and regional coalitions in order to coordinate the achievement of the Great Green Wall's objectives. The network comprises 17 universities, training, and research centres in the Global South and North, including 22 research teams and 15 research units from the Global South, as well as 4 joint North-South laboratories. RESET-GMV mobilises over 150 researchers with a range of complementary skills and expertise in areas such as

ecosystem services, sustainable resource management, socio-ecological system dynamics and adaptation, and territorial governance. Finally, ADAC's goal is to create a regional space for research and innovation based on educational research in East Africa. These partners played a critical role in contacting and selecting the participants and in defining the study sites and the related thematic issues.

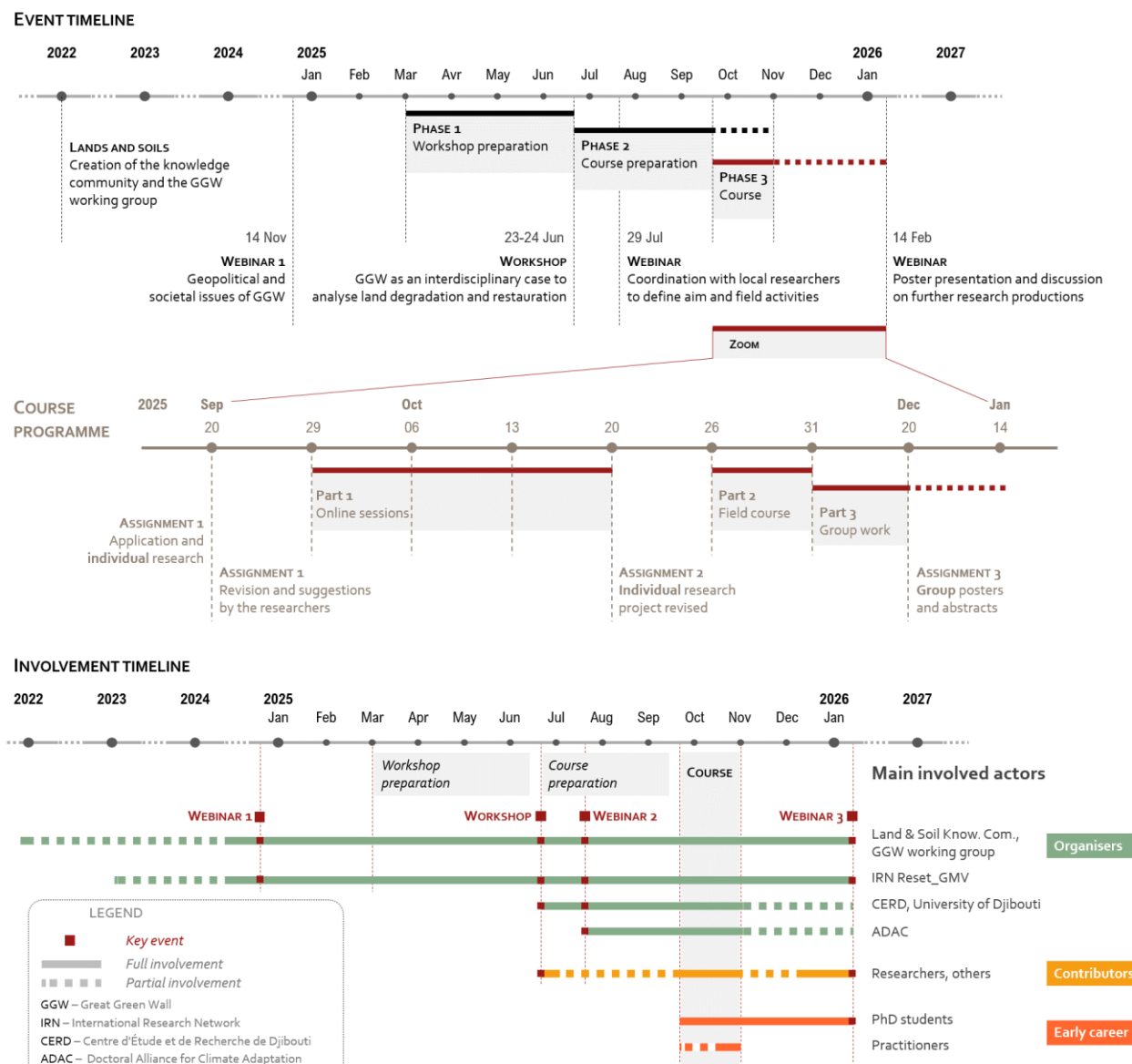


Figure 2. Timeline of course design (top) and involvement of key actors (bottom).

Over 20 researchers and other contributors took part in the workshop, which was aimed at designing the course. Others were invited to take part in the course itself online, in the field or both. In total, thirty people joined the organisers, widening the range of disciplines and expertise. Furthermore, some practitioners from local ministries (e.g., agriculture, research, and environment) and organisations joined the groups during the field activities, further widening the range of expertise represented.

Enrolment and setting up of field groups

Enrolment targeted PhD students and early-career researchers previously engaged with organisers. Applicants were asked to submit a CV and a 2-page statement linking their research to interdisciplinarity. The confirmed researchers involved in the course were asked to provide feedback on the students' documents and evaluate the contextualisation of the research question, the link with the course, the clarity of the research goal, the presentation of the discipline and of the methods, as well as the interdisciplinary interest. Students revised their statements after the online session and before starting the in-field learning week. In total, 16 PhD students and early career researchers were finally enrolled, coming from eastern Africa (Djibouti, Somalia, Ethiopia, Kenya, Tanzania), the

Sahel region (Senegal, Burkina Faso, Niger, Chad), and the Maghreb (Algeria). Additionally, 14 confirmed researchers participated in the field activities. To ease dialogue and critical reflection participants were split into groups.

Groups were balanced for career stage, discipline, regional origin, field knowledge, gender, and language (Somali, French, and English). Practitioners from local organisations and Ministries joined field activities, enriching expertise and understanding of regional dynamics. Each group (9–11 members) produced a poster summarising their negotiated research question and interdisciplinary insights. Drafts were presented locally during the meeting with delegates of the local communities on the closing day in Ali Sabieh. Revised versions were presented and discussed in a January 2026 webinar.

Assessment and learning outcomes

The learning of the early career researchers was assessed on two levels (Redman et al., 2021). First, individually, before the field to prompt self-reflection about challenges to implement interdisciplinarity. Participants were requested to write a short application document comprising a summary of the key issues, methodological approaches and interdisciplinary links of their ongoing research activities, along with their CV. This document was evaluated for contextualisation, link with training topic, clarity of the research goal, presentation of the disciplinary approach and methodology, and opening to interdisciplinarity. Second, at the group level (all members regardless the career stage), assessment included peer-evaluation through a concluding debate. The debate was informed on the summary posters produced by each group that have been drafted for the public presentation at the meeting at the end of the field week, and then refined for the concluding online presentation, fostering the interdisciplinary debate based on shared evidence and reflections. The present paper is part of the self-assessment strategy for the smaller group of participants having shown interest in the follow-up exercise.

A more formal longitudinal tracking is still being finalised. The organisers are considering two working hypotheses for follow-up, based on participants' feedback. First, the establishment of a permanent community of practice to sustain the network formed during the course. Second, the integration of participants into future regional initiatives, such as those managed by ADAC, to monitor the operationalisation of learned interdisciplinary frameworks. The primary student outputs from the current cohort are three co-authored posters (one per field group), which synthesise negotiated research questions and serve as tangible evidence of competency acquisition.

Participant feedback reflected both the transformative potential and the inherent challenges of the ambitious course design. On the value of interdisciplinary confrontation, one participant noted, "This training largely exceeded my expectations, allowing me to acquire new scientific knowledge and discover the richness of interdisciplinarity. However, I would recommend extending the duration to better deepen the themes addressed." Conversely, highlighting methodological gaps, another stated, "What struck me most was the complexity of working in a multidisciplinary team; a difficult but highly enriching exercise. Yet, to improve the training, a work plan with clear guidelines should be established before going into the field to gain efficiency and coherence." Finally, reflecting on the tension between disciplinary habits and systemic needs, a participant observed during the last day debrief: "Once in the field, we fell back into our disciplinary silos; there was a lack of understanding regarding *why* others chose their specific *methods*. We saw the debate of information, but on the ground, we did not interrogate that information as critically as we would have within our own disciplines."

Practical implications

In the collective cross-site integration meetings, participants noted that, despite time and data constraints, the interdisciplinary fieldwork supported critical reflexivity and meaning making across disciplines and expertise. Based on the complex multisite logistics and multidisciplinary challenges, the main practical lesson is to embed stronger theoretical grounding early, to help integrate methods and challenge assumptions. As such, it aligns with teaching interdisciplinarity in applied landscape ecology (Zerbe, 2020), as well as in the broader landscape approach (Denier et al., 2015), following emerging trends in sustainability sciences (Sahle et al., 2024). More generally, the co-design process lays the foundations for a trainers' course designed to be replicable and to consolidate long-term dissemination.

Further practical implications concern scientific communication and co-dissemination opportunities (Horn et al., 2022). The course outcomes include interdisciplinary observations of soil, vegetation, production systems, and local social and political systems across the study sites. These can inform a shared redefinition of a cross-site research problem. Additional opportunities include extending the course model to other dryland regions, leveraging the consortium formed, and embedding findings into undergraduate and doctoral curricula to strengthen regional

interdisciplinary land restoration education. Moreover, disseminating interdisciplinary perspectives on land degradation and restoration across Sahel countries involved in the Great Green Wall can foster the creation of a scientific community of practice among the early career researchers to follow-up on the operationalisation of the lessons learned.

Theoretical implications

Land management projects observed in the field were designed in different periods and with differing objectives. The overall course, its co-design process, and the interactions among participants and with the field highlighted an epistemic shift. By confronting the effects of sedentarisation and resource control policies, particularly regarding water and land management, participants observed how sectoral diagnostics may overlook systemic inequities and shared dynamics. A few days in the field were entirely insufficient to generate reliable evidence. However, the learning process enabled participants to understand that an interdisciplinary perspective on land degradation and restoration requires reframing the interpretation of sustainability. This reframing that bridged biophysical degradation and social marginalisation offers a preliminary foundation for future pedagogical and research initiatives aiming to address dryland restoration through integrated, context-sensitive research approaches. In this vein, the course emerged as an intermediary object between academic actors and policymaking, supporting the development of a cross-sectoral approach to sustainable resource management and land system transformation.

AI use statement. *The authors used Euria (Infomaniak) solely for refining, correcting, copyediting, and translating text to improve clarity. Hosted exclusively in Switzerland, Euria ensures strict data sovereignty: submitted text is never used for model training nor shared with third parties, guaranteeing zero risk of data leakage or confidentiality breaches. All scientific intellectual input remains entirely human.*

Funding. *The doctoral course was funded by ADAC, IRD (EFR, CoSav "Terres et Sols", and ResetGMV), with further contributions from CERD. D.R. received support from ANR (grant n. ANR-22-CPJ1-0050-01), IRD and the University of Montpellier Experimental Public Institution Excellence Programme (UM EPE) as a contribution to the Junior Professorship in Landscape Agronomy.*

Acknowledgments. *The Authors acknowledge the relevant contribution of the many colleagues who contributed to the design and development of the course. We also thank the PhD students, early-career researchers, and practitioners for their commitment, as well as the local hosts and actors who shared their time and knowledge about the Grand Bara region. A revised version of this manuscript is under preparation with some of them.*

References

- Bouma, J., Pinto-Correia, T., & Veerman, C. (2021). Assessing the Role of Soils When Developing Sustainable Agricultural Production Systems Focused on Achieving the UN-SDGs and the EU Green Deal. *Soil Systems*, 5(3), Article 3. <https://doi.org/10.3390/soilsystems5030056>
- Chung, F.-L., Chung, H.-H., & Lin, S.-M. (2024). Current themes and future directions of the sustainable development goals in higher education. *International Journal of Sustainability in Higher Education*, 25(8), 1980–1994. <https://doi.org/10.1108/IJSHE-07-2023-0308>
- DeFries, R., & Nagendra, H. (2017). Ecosystem management as a wicked problem. *Science*, 356(6335), 265–270. <https://doi.org/10.1126/science.aal1950>
- Denier, L., Scherr, S., Shames, S., Chatterton, P., Hovani, L., & Stam, N. (2015). *The Little Sustainable Landscapes Book. Achieving sustainable development through integrated landscape management*. Global Canopy Programme. http://globalcanopy.org/sites/default/files/documents/resources/GCP_LSLB_English.pdf
- Dia, A., & Niang, A. M. (2012). Introduction. L'Initiative africaine de la Grande Muraille Verte (IAGMV): Contexte, vision et opérationnalisation. In A. Dia & R. Duponnois (Eds), *La Grande Muraille Verte* (pp. 9–35). IRD Éditions. <https://doi.org/10.4000/books.irdeditions.3289>
- Diop, S., Guisse, A., Sene, C., Cisse, B., Diop, N. R., Ka, S. D., Cisse, A. G., Sambou, S., Ndiaye, O., Fandohan, A. B., Chao, F., Guoqin, W., & Yongdong, W. (2018). Combating Desertification and Improving Local Livelihoods through the GWWI in the Sahel Region: The Example of Senegal. *Journal of Resources and Ecology*, 9(3), 257–265. <https://doi.org/10.5814/j.issn.1674-764x.2018.03.005>
- Enengel, B., Muhar, A., Penker, M., Freyer, B., Drlik, S., & Ritter, F. (2012). Co-production of knowledge in transdisciplinary doctoral theses on landscape development—An analysis of actor roles and knowledge types in different research phases. *Landscape and Urban Planning*, 105(1–2), 106–117. <https://doi.org/10.1016/j.landurbplan.2011.12.004>
- Gadzama, N. M. (2017). Attenuation of the effects of desertification through sustainable development of Great Green Wall in the Sahel of Africa. *World Journal of Science, Technology and Sustainable Development*, 14(4), 279–289. (world). <https://doi.org/10.1108/WJSTSD-02-2016-0021>
- Horn, A., Scheffelaar, A., Urias, E., & Zweekhorst, M. B. M. (2022). Training students for complex sustainability issues: A literature review on the design of inter- and transdisciplinary higher education. *International Journal of Sustainability in Higher Education*, 24(1), 1–27. <https://doi.org/10.1108/IJSHE-03-2021-0111>
- Howlett, C., Ferreira, J.-A., & Blomfield, J. (2016). Teaching sustainable development in higher education: Building critical, reflective thinkers through an interdisciplinary approach. *International Journal of Sustainability in Higher Education*, 17(3), 305–321. <https://doi.org/10.1108/IJSHE-07-2014-0102>
- Kolb, D. (1984). The process of experiential learning. In *Journal of Business Ethics* (Vol. 1, pp. 20–38). Prentice-Hall.
- Mezirow, J. (1997). Transformative Learning: Theory to Practice. *New Directions for Adult and Continuing Education*, Summer 1997(74), 5–12. <https://doi.org/10.1002/ace.7401>

- Moussa Omar, G., Paturel, J.-E., Salles, C., Mahé, G., & Jalludin, M. (2021). Caractérisation hydro-climatique, analyse comparative des termes du bilan hydrologique du bassin versant d'Ambouli (République de Djibouti). *Proceedings of IAHS*, 384, 225–231. <https://doi.org/10.5194/piahs-384-225-2021>
- Mutio, M. J., Njoroge, R., Kebeney, S., Ng'etich, W., Churu, H., Alkamoi, B., Mugaa, D., & Wamalwa, F. (2025). Agropastoralist Community-led Restoration of Degraded Drylands: Factors Influencing Adoption of Soil Conservation Practices in Semi-arid Regions of Kenya. *Indian Journal of Agricultural Research*, 59(2). <https://doi.org/10.18805/IJARE.AF-860>
- Neely, I., Trautmann, S., Parramon-Gurney, M., Milne, E., Kindt, R., Winowiecki, L. A., Karambiri, M., Bourne, M., Vagen, T.-G., & Lemann, T. (2024). *Exploring the resilience of restoration efforts under climate change. The value of applying foresight analysis for accelerating the impacts of the Great Green Wall initiative* (Regreening Africa, p. 20) [Brief]. WOCAT. https://www.wocat.net/documents/1238/SHARED-Foresight-Brief_20_12_23-FINAL.pdf
- Pederson, J. G., Lettner-Rust, H. G., Dowling Fink, A. D., Fink, M. L., Renee Gutierrez, A., Kinman, E. L., Koski, C. M., Mergen, M. J., Poplin, P. L., Rhoten, M. C., Roberts, B. S., & Znosko, J. B. (2022). The Field Immersion Framework: A Transformative Pedagogy for Experiential Civic Education. *Journal of Transformative Education*, 20(3), 189–205. <https://doi.org/10.1177/15413446221103175>
- Redman, A., Wiek, A., & Barth, M. (2021). Current practice of assessing students' sustainability competencies: A review of tools. *Sustainability Science*, 16(1), 117–135. <https://doi.org/10.1007/s11625-020-00855-1>
- Richelle, L., Brauman, A., Romagny, B., Venot, J.-P., Masse, D., Cournac, L., Léonard, E., Imache, A., & Rizzo, D. (2024). A reflexive collaborative workshop on agroecology narratives and researchers' postures. *Natures Sciences Sociétés*, 32(4), 8. <https://doi.org/10.1051/nss/2025012>
- Sahle, M., Lahoti, S. A., Lee, S.-Y., Brundiers, K., van Riper, C. J., Pohl, C., Chien, H., Bohnet, I. C., Aguilar-Rivera, N., Edwards, P., Pradhan, P., Plieninger, T., Boonstra, W. J., Flor, A. G., Di Fabio, A., Scheidel, A., Gordon, C., Abson, D. J., Andersson, E., ... Takeuchi, K. (2024). Revisiting the sustainability science research agenda. *Sustainability Science*. <https://doi.org/10.1007/s11625-024-01586-3>
- Scherr, S. J., Shames, S., & Friedman, R. (2012). From climate-smart agriculture to climate-smart landscapes. *Agriculture & Food Security*, 1(1), 1–15. <https://doi.org/10.1186/2048-7010-1-12>
- Transforming Our World: The 2030 Agenda for Sustainable Development, A/RES/70/1 15-16301 (E) § Department of Economic and Social Affairs (2015). <https://undocs.org/en/A/RES/70/1> Agenda items 15 and 116
- Tress, B., Tress, G., & Fry, G. (2009). Integrative research on environmental and landscape change: PhD students' motivations and challenges. *Journal of Environmental Management, Environmental and Landscape Change: Addressing an Interdisciplinary Agenda*, 90(9), 2921–2929. <https://doi.org/10.1016/j.jenvman.2008.03.015>
- Zerbe, S. (2020). Teaching applied landscape ecology in interdisciplinary and intercultural student groups. Experiences from a 10-years study abroad program. *Landscape Online*, 81–81. <https://doi.org/10.3097/LO.202081>