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SDGs at the halfway point: How the 17 global goals address risks and wicked problems

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In 2015, all 193 member states of the United Nations (UN) agreed on the 2030 Agenda for Sustainable Development. An ambitious, all-encompassing, global agreement addressing a multitude of major challenges of our time including poverty and equity, health, environmental degradation, biodiversity loss, urbanization, and sustainable economies. The agreement comprises 17 Sustainable Development Goals (SDGs), specified by 169 individual targets, and a common understanding that these global goals need to be treated as being interconnected and interdependent rather than handled separately or even confined in silos (Dodds et al. 2017; UN 2022a). Like their predecessor—the Millennium Development Goals (MDGs)—the SDGs were designed to be clear, time-bound and measurable, but while the MDGs could be considered aimed at 'rich donors helping poor recipients' (Matthews 2020), the SDGs are more universal and expected to be implemented in every country. Furthermore, they are inspired by the intention to overcome the gap between conserving resources and limiting emissions on one side and on the other side providing incentives for further economic development. Thereby, they constitute an attempt to shift the world onto a more sustainable but also transformative path. The years 2022–2023 mark the halfway point for the implementation of the 2030 Agenda, providing a unique opportunity to analyze implementation challenges during the 7 years of SDG implementation so far and provide recommendations for the second half of the period towards 2030 (Biermann et al. 2022a). The time left to avoid or postpone implementation gaps is rapidly shortening. The world was reminded about vulnerabilities and how fast things can change during the COVID-19 pandemic, which e.g. deleted more than four years of progress on poverty eradication and resulted in 93 million more people pushed into extreme poverty in 2020 (UN 2022b).

The implementation of the ambitious 2030 Agenda is characterized by a considerable level of uncertainty, not least, since the SDGs are interconnected (Rockström and Sukhdev 2016; Nilsson et al. 2018) and the achievement or failure to achieve individual goals, will cascade down the likelihood of achieving others. Hence, working towards the SDGs to a large extent is about reducing or controlling risks (Cham et al. 2019). The SDGs address multiple actions and they encompass, in addition, key areas of risk governance such as risk prevention, risk–benefit balancing, communication, uncertainty management, and compensation for risks (Renn 2008, 2020; Florin 2014). Hence, achieving the SDGs will require more advanced, multifaceted and rigorous analyses of risk governance. Despite this need, risk assessments and/or management issues are largely ignored in the SDG context; they are barely mentioned in the formulation of goals, and a risk management strategy is lacking. Both the individual SDGs and associated targets address risks incoherently.

It is crucial to create a shared understanding on risks in the context of the SDGs. Addressing the interlinkages between SDGs and risk requires analyses of structures and processes for monitoring and other means of knowledge generation, anticipation, and foresight, as well as understanding management and governance barriers and opportunities (Fukuda-Parr et al. 2013; Homer-Dixon et al. 2022). Additionally, more can be done to understand how different tools are used for SDG evaluation and risk assessment, and how they are governed and implemented in national, regional, and local settings, to inform policy on measures and management procedures for handling them.

Due to their interconnected character and their reference to multiple sectors, a vital requirement for achieving the SDGs is policy integration and alignment, which remains a hurdle for policy makers. As Mickwitz et al. (2009, p. 83)

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concluded on climate policy integration more than a decade ago: "Whilst the need for climate policy integration is easy to recognize, attaining it in practice is challenging… There is a huge need to evaluate stated climate policy integration claims and to extend such evaluation from general strategies to specific actions". Likewise, the idea of accounting for the environment as an economic asset: the SDGs hold both broad level goals (e.g. SDGs 12, 15, 17) and targets (e.g. 12.2; 15.9) that are actionable, yet their implementation requires national government measures that go beyond what we are seeing up to this day (e.g. Terama et al. 2016; Llanos et al. 2022). Achieving specific SDGs without consideration of other targets may cause negative, unintended side effects and lead to a net-dis-benefit overall (e.g. Brand et al. 2021). For instance, some choices of actions on Zero Hunger (SDG2) to increase agricultural yields through intensified use of agro-chemicals will jeopardize the achievement of goals such as 'Clean water and sanitation' (SDG6), 'Life under water' (SDG14) and 'Life on Land' (SDG15). There is a clear need for multi-criteria or multi-attribute assessment and decision models that have been pioneered in much of the decision analytic literature of the past but still lacks implementation when making risk or impact assessments on the basis of the SDGs (D'Adamo & Gastaldi 2022).

The research constituting the basis of the special section originates from research implemented in the research project 'Sustainable Development Goals: Tackling and managing risks with SDGs (PEER-TRISD, 2019–2021)'.[1] PEER is a research partnership of eight of the largest European environmental research centers, representing multiple disciplines and with many of the affiliated researchers accustomed to working inter-disciplinary. The special section contains the following articles:

The special section opens with a conceptual article (Eckert et al. 2023) discussing the surprising fact that the risk concept is almost absent in the SDGs, and similarly, most risks assessments are narrowed down to sectoral approaches without references to the SDGs. A broadening of the mathematical definition of risks to embrace a more systemic perspective, aimed at maintaining socio-environmental systems within their domain can be done through applying the risk assessment methodology and engaging in multi-dimensional risk minimization.

The article by Lyytimäki et al. (2023) analyses how risks are either recognized and framed, or non-recognized, in the implementation of SDG framework. Some risks are well-recognized like e.g. lack of data availability and siloed preparation of indicators, while examples of risks receiving less attention are ritualistic reporting without critical evaluation of the limitations of the SDG framework itself, and narrow focus on one-way communication.

Based on a case study on the risks of snow avalanches, Eckert and Giacona (2023) find that risk assessments and mitigation actions within this particular field, is dominated by deterministic, hazard-oriented and stationary approaches that are not comprehensive enough. They propose a more comprehensive paradigm relying on formal statistical modelling.

Armenteras et al. (2023) analyse local stakeholder perceptions of forest degradation in a Colombian case study. They are able to identify a common overall perception of the problem, but they also observe that miscommunication and misunderstandings occur between local- and national-level actors regarding their views on responsibilities and rates of change. The results point towards the need for cross-scale governance.

Lepenies et al. (2023) classify national indicator systems along four dimensions: indicator selection, appraisal landscape, participatory nature, and political communication. They explore the dimensions in a comparative study of four European national sustainability indicator systems. They find considerable variation and posit that the differences correspond to different national interpretations of sustainability.

Finally, Dorber et al. (2023) use a new indicator to quantify the loss of 'functional habitat' and thereby show that the real impact of renewable energy is far larger than previously assumed. Construction of hydropower reservoirs in South Norway cause a loss of functional habitat for wild reindeer that is substantially larger than assumed. In other words, striving for SDG7 (Affordable and clean energy) can hamper progress on SDG 15 (Life on land).

Do the SDGs facilitate a prudent and comprehensive handling of risks and wicked problems regarding sustainability then? Yes, to some degree, but there are substantial barriers. One of the main strengths of the SDGs is that they provide a globally shared vocabulary that can connect different actors, sectors, and levels of society from local to global. However, a risk is that elements remain unattended or overlooked because of this common vocabulary. As highlighted by the articles presented above, the success of SDG implementation is not so much to be identified from the actions aimed at implementing individual SDGs or targets, but more from integrative actions purposefully, or incidentally, directing attention to win–win solutions and avoidance of trade-offs between SDGs (see e.g. Dorber et al. 2023; Eckert and Giacona 2023; Lyytimäki et al. 2023).

The articles also point out that further attention is needed to the analysis of interconnections and interactions beyond the obvious ones; those that are indirect, long-term, and often hidden from policy attention. Operationalization

[1] https://www.peer.eu/projects/peer-research-on-sustainable-development-goals-peer-trisd.

of the globally agreed SDGs to national-level contexts shows a large variation across countries, regions, and sectors (see also Biermann et al. 2022b). There are comprehensive national differences in how the SDGs are used in national strategies, national indicator systems etc. More research into the implications of these differences is needed to understand when differences are justifiable due to different context conditions and when they turn into barriers that endangers implementing Agenda 2030 (Lepenies et al. 2023). Furthermore, there can be challenges in communicating the SDGs between national and local level (Armenteras et al. 2023). This also underlines the importance of engaging a larger audience in the SDGs (Dorber et al. 2023; Lyytimäki et al. 2023).

The SDG framework is based on a scientific understanding of the grand challenges of humanity, but the framework is also essentially a political compromise between all countries in the world that is very likely to fail in recognizing all relevant risks or emerging threats. A better understanding of the variability of risks related to the SDG framework would assist in recognizing those risks that are partially or completely lurking outside the SDG framework. Dealing with such risks is becoming more topical as the target year of the SDGs is approaching. This points towards the need for an explicit joint agenda for risks and SDGs (Eckert et al. 2023; Lyytimäki et al. 2023).

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REFERENCES

Armenteras, D., T.M. González-Delgado, J.D. González-Trujillo, and M.C. Meza-Elizalde. 2023. Local stakeholder perceptions of forest degradation: Keys to sustainable tropical forest management. *Ambio*. https://doi.org/10.1007/s13280-022-01797-x.

Biermann, F., T. Hickmann, and C.-A. Sénit, eds. 2022a. *The political impact of the Sustainable Development Goals: Transforming governance through global goals?* Cambridge: Cambridge University Press.

Biermann, F., T. Hickmann, C.-A. Sénit, M. Beisheim, S. Bernstein, P. Chasek, L. Grob, R.E. Kim, et al. 2022b. Scientific evidence on the political impact of the Sustainable Development Goals. *Nature Sustainability* 5: 795–800.

Brand, A., M. Furness, and N. Keijzer. 2021. Promoting policy coherence within the 2030 Agenda framework: Externalities, trade-offs and politics. *Politics and Governance* 9: 108–118.

Chan, S., I. Boran, H. van Asselt, G. Iacobuta, N. Niles, K. Rietig, M. Scobie, J.S. Bansard, et al. 2019. Promises and risks of nonstate action in climate and sustainability governance. *Wiley Interdisciplinary Reviews: Climate Change* 10: e572.

D'Adamo, I., and M. Gastaldi. 2022. Sustainable Development Goals: A regional overview based on multi-criteria decision analysis. *Sustainability* 14: 9779.

Dodds, F., A.D. Donoghue, and J.L. Roesch. 2017. *Negotiating the Sustainable Development Goals: A transformational agenda for an insecure world*, 240. London: Routledge.

Dorber, M., M. Panzacchi, O. Strand, and B. van Moorter. 2023. New indicator of habitat functionality reveals high risk of underestimating trade-offs among sustainable development goals: The case of wild reindeer and hydropower. *Ambio*. https://doi.org/10.1007/s13280-022-01824-x

Eckert, N., and F. Giacona. 2023. Towards a holistic paradigm for long-term snow avalanche risk assessment and mitigation. *Ambio*. https://doi.org/10.1007/s13280-022-01804-1.

Eckert, N., G. Rusch, J. Lyytimäki, R. Lepenies, F. Giacona, M. Panzacchi, C. Mosoni, A.B. Pedersen, et al. 2023. Sustainable Development Goals and risks: The Yin and the Yang of the paths towards sustainability. *Ambio*. https://doi.org/10.1007/s13280-022-01800-5.

Florin, M.-V. 2014. Dealing with the challenge of evidence-based decision-making in situations of uncertainty and emergency. *European Journal of Risk Regulation* 5: 303–308.

Fukuda-Parr, S., J. Greenstein, and D. Stewart. 2013. How should MDG success and failure be judged: Faster progress or achieving the targets? *World Development* 41: 19–30.

Homer-Dixon, T., O. Renn, J. Rockström, J.-F. Donges, and S. Janzwood. 2022. A call for an international research program on the risk of a global polycrisis. *SSRN*. https://doi.org/10.2139/ssrn.4058592.

Lepenies, R., L. Büttner, I. Bärlund, K. Jax, J. Lyytimäki, A.B. Pedersen, H.Ø. Nielsen, C. Mosoni, et al. 2023. The politics of national SDG indicator systems: A comparison of four European countries. *Ambio*. https://doi.org/10.1007/s13280-022-01809-w.

Llanos, A.O., R. Raven, M. Bexell, B. Botchwey, B. Bornemann, J. Censoro, M. Christen, L. Díaz, et al. 2022. Implementation at multiple levels. In *The political impact of the Sustainable Development Goals: Transforming governance through global goals?*, ed. F. Biermann, T. Hickmann, and C.-A. Sénit, 55–91. Cambridge: Cambridge University Press.

Lyytimäki, J., N. Eckert, R. Lepenies, C. Mosoni, J. Mustajoki, and A.B. Pedersen. 2023. Assuming accuracy, pretending influence? Risks of measuring, monitoring and reporting sustainable development goals. *Ambio*. https://doi.org/10.1007/s13280-022-01787-z.

Matthews, A. 2020. The new CAP must be linked more closely to the UN Sustainable Development Goals. *Agricultural and Food Economics* 8: 19. https://doi.org/10.1186/s40100-020-00163-3.

Mickwitz, P., F. Aix, S. Beck, D. Carss, N. Ferrand, C. Görg, A. Jensen, P. Kivimaa, et al. 2009. *climate policy integration, coherence and governance*. Helsinki: Partnership for European Environmental Research PEER. 92 pp. https://pure.au.dk/portal/files/56076592/PEER_Report2.pdf.

Nilsson, M., E. Chisholm, D. Griggs, P. Howden-Chapman, D. McCollum, P. Messerli, B. Neumann, A.-S. Stevance, et al. 2018. Mapping interactions between the sustainable development goals: Lessons learned and ways forward. *Sustainability* 13: 1489–1503.

Renn, O. 2008. Concept of risk: An interdisciplinary review—Part 2: Integrative approaches. *GAIA—Ecological Perspectives for Science and Society* 17: 196–204.
Renn, O. 2020. New challenges for risk analysts: Systemic risks. *Journal of Risk Research* 2: 4. https://doi.org/10.1080/13669877.2020.1779787.
Rockström, J., and P. Sukhdev. 2016. How food connects to all SDGs. Page Presentation at the Stockholm EAT Forum. Stockholm Resilience Centre.
Terama, E., B. Milligan, R. Jimenez-Aybar, G.M. Mace, and P. Ekins. 2016. Accounting for the environment as an economic asset: Global progress and realizing the 2030 Agenda for Sustainable Development. *Sustainability Science* 11: 945–950. https://doi.org/10.1007/s11625-015-0350-4.
UN. 2022a. The 17 goals. https://sdgs.un.org/goals.
UN. 2022b. The Sustainable Development Goals Report 2022. https://unstats.un.org/sdgs/report/2022b/The-Sustainable-Development-Goals-Report-2022.pdf.

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