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The Earth System Governance Project as a network organization: a critical assessment after ten years

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The social sciences have engaged since the late 1980s in international collaborative programmes to study questions of sustainability and global change. This article offers an in-depth analysis of the largest long-standing social-science network in this field: the Earth System Governance Project. Originating as a core project of the former International Human Dimensions Programme on Global Environmental Change, the Earth System Governance Project has matured into a global, self-sustaining research network, with annual conferences, numerous taskforces, research centers, regional research fellow meetings, three book series, an open access flagship journal, and a lively presence in social media. The article critically reviews the experiences of the Earth System Governance network and its integration and interactions with other programmes over the last decade.

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Introduction

The social sciences have engaged since the late 1980s in international collaborative programmes to study questions of sustainability and global environmental change. Our article offers a reflection of what is currently the largest long-standing social-science network in this field: the Earth System Governance Project. This network originated in 2008 as a core project of the former International Human Dimensions Programme on Global Environmental Change (IHDP), after having been developed in an international consultative planning process from 2006 onwards. After ten years of operation, the Earth System Governance Project has matured into a global, self-sustaining network of thousands of scientists, with annual conferences, numerous taskforces, affiliated research centers, regional fellow networks, three book series, its own peer-reviewed flagship journal, an affiliated foundation, and a lively presence in social media. On this basis, the Project is set to continue its operations for the foreseeable future, in contrast to many similar global change projects, especially in the social sciences, which have usually ended after around ten years of operation.

What are the experiences of the earth system governance research community? Where did the community succeed and fail, what innovations flourished or did not take off, and which strategies achieved what they were designed for? What lessons can be drawn for building, maintaining and transforming research networks in global change and sustainability science? How can global research networks become more global, in terms of both membership and capacity building—what mechanisms work, and which ones result in merely symbolic success? Can academic networks create the much-needed solution-orientation and policy impact? This review attempts to address these vital questions for the governance of global research networks.

Connecting people and places for the planet

The evolution and growth of the Earth System Governance Project, and the way it has gone from strength to strength even after the demise of its original IHDP

sponsor, constitute a puzzle. While most global change projects closed after a decade of operation, the Earth System Governance Project has just elected a new leadership committee and published a new Science and Implementation Plan for the 2019–2028 period [1**]; and the community is all set to further expand its operations, following its motto developed in 2007: *connecting people and places for the planet*.

A network of people

We explain this success of the Earth System Governance Project, first, by a deliberate strategy of forming an open but integrated community of scholars – a network of people – who share a vision of global research collaboration beyond the constraints of narrow disciplines, traditional professional associations and isolated local research communities.

One mechanism employed to build this community is the Project's long-standing practice of inviting scholars from all over the world to become formally affiliated as 'research fellows' [2,3]. Research fellows organize their own activities, including summer schools, research visits, online training sites and in some regions elect their own representatives. Mid-level and full professors are affiliated with the Project as 'senior research fellows'. In addition, the Project launched early on its 'Lead Faculty', a small global community of the most senior scholars in the field of earth system governance [4,3]. While research fellows may apply to join the Project on their own initiative, Lead Faculty are invited through a formal nomination and appointment process, undertaken by the Project's Scientific Steering Committee. The Lead Faculty, hence, follow the more traditional mores of national academies, furthering the engagement of the most prominent scholars in the field. This membership structure of the Project allows involvement and formal affiliation for scholars of all career stages, from research fellows, senior research fellows up to Lead Faculty, in a system that combines global research and openness with a degree of formal affiliation.

This community of people thrive through the annual open science conferences that the Earth System Governance Project organizes. These annual conferences rotate between different continents, and have ranged from Amsterdam to Colorado, Lund, Tokyo, East Anglia, Canberra, Nairobi, and most recently Utrecht. These conferences are important gathering venues for the earth system governance research community, with many discussions being carried on from conference to conference over the years. The annual conferences strive for academic excellence, notably through the double-blind abstract review that involves five anonymous reviewers per abstract. They also support the global openness of the community by inviting scholars outside the network as keynote speakers, by hosting summer or winter schools for early career scholars, and by providing open space for

subprojects, writing events and policy engagement. A special early career award – the Oran Young Award – rewards the best conference papers and further supports and stimulates younger scholars.

Finally, as a network organization the Earth System Governance Project has invested in global community outreach from the outset, with an extensive website [5], a Facebook presence [6], several Twitter accounts [7], a LinkedIn group [8], a newsletter, the hosting of receptions and dinners at partner alliances and various other means. All in all, this has allowed the network to further grow and to cumulatively reach several thousand scientists, practitioners and increasingly the general public.

A network of places

In a world of continuous struggle for research funding and the increasing precariousness of academic careers, any transnational academic network benefits from a strong backbone of globally leading research institutions that support and sponsor the diverse scholarly community. Since 2009, the Global Alliance of Earth System Governance Research Centers fulfils this vital role [3]. This alliance brings together a dozen major research units in the field of earth system governance research. In addition to advancing the Earth System Governance Science Plans, research centers typically host the annual conferences of the network, and many of their scientists are fellows or Lead Faculty of the Project as well. They support – also financially – a variety of events, including by 'co-hosting' conferences held by other partners, as well as by engaging in further collaboration, for example in the development of joint teaching programmes.

A focus on the planet

No network can survive and grow without a sense of purpose. The Earth System Governance Project has been purposefully built around a novel concept that was advanced by the Project's founder in the mid-2000s, 'earth system' governance [9]. The notion of earth system governance expressed a new vision beyond 'environmental' politics, expanding this traditional research domain to focus on broader planetary transformation processes, novel global interdependencies, new understandings of nature-society relations, and multiple and expanding spatial teleconnections [10]. Earth system governance also brings in a new perspective on integrated socio-ecological systems, and emphasizes a research focus on systemic challenges such as the global water system, ocean acidification, desertification, sea-level rise, food security, global trade flows, and many other issues of often global, 'earth-system' relevance and interconnectivity [11**]. Today, a web search for 'earth system governance' delivers around 100 000 hits.

The paradigmatic move to center the project around 'earth system' governance brought several advantages. It added a

new voice and concept that builds on previous work in environmental and development studies while adding a planetary perspective that opened the debate to notions of planetary justice, global democracy, and the interdependence and community of all people, including future generations [12,13]. The concept aligned the governance research in the social sciences with the earth system science approaches that were developed in the late 1990s and allowed for close links with integrated interdisciplinary research communities for instance on the global carbon cycle, the global water system or food systems [14–16]. In contrast, the conceptual focus on ‘earth system’ governance initially created a misunderstanding that the project would address only global institutions. Among those who follow the Earth System Governance Project only from afar and hence base their assessment only on their reading of its title, misleading associations are sometimes drawn with planetary engineering, a ‘proto-bio-political regime’ [17], technocratic imaginaries [18], and an alleged tunnel vision of global ‘cockpit-ism’ [19]. The empirical reality of the Earth System Governance Project tells a very different story, with much scholarship by the community studying local, national or multi-level governance and often with emphasis on polycentric, networked or experimental governance as opposed to central steering—yet all typically with a planetary concern and a global perspective. Most scholarship in the Earth System Governance Project also is far from top-down managerial approaches but rather focusses on key social concerns or processes, such as justice, power, democracy, and legitimacy, and this often from a critical, emancipatory perspective. This position of the community is also extensively reflected in the two science plans of the Project from 2009 and 2018 [1**].

Challenges and strategic choices

What can be learned from the experiences of the Earth System Governance Project, as an example of a self-sustaining and successful global research network? Here, we present some of the core challenges faced by any global research network and reflect on how the Earth System Governance Project has positioned itself to address these challenges.

Diversity versus formal representation

It is a foundational tenet of sustainability science that legitimate, credible and useful science requires a globally inclusive approach and perspective [20,21]. The 2009 Science and Implementation Plan of the Earth System Governance Project [22**] was explicit in its statement that the ‘globalization of problems can be countered only by the globalization of research’. By broad measure, the core challenge here is the dominant representation of scientists and research organizations from only a few countries in Europe and North America. This bias in global change science toward the wealthier industrialized countries has been widely documented, especially with a view to global environmental

assessment institutions such as the Intergovernmental Panel on Climate Change, and it has not been significantly changed despite the longstanding and important efforts by START International, the Inter-American Institute for Global Change Research and other supporting programmes. Also, within the Earth System Governance Project, it is no secret that at any annual conference, one will find more paper submissions from Sweden than from China. An additional bias follows traditional language barriers, leading to a stronger representation of the anglophone science communities (including smaller European nations in Scandinavia and the Benelux). Overall, the largest national communities in the Earth System Governance Project, in terms of formally registered project members, are at present the United States of America, the Netherlands, Australia, Germany, Sweden, United Kingdom, Canada, Brazil, Belgium, Japan, Nigeria, and Switzerland.

Given the strong biases and imbalances in global science, the Earth System Governance Project has worked hard over the last decade to expand its global reach and create a truly global community—within the constraints of an essentially unfunded network organization. For one, diversity and inclusiveness have been strong criteria in all decisions that involved the selection of people and places, notably the composition of the scientific steering committee, the appointment of the Project’s select Lead Faculty and the choice of keynote speakers at the annual conferences. Also, travel stipends for participants from underrepresented regions have been provided to the extent that funding was available. One highlight was the Project’s 2016 annual conference, which was held on the campus of the University of Nairobi, hosted by the Wangari Maathai Institute for Peace and Environmental Studies [23]. Academically, the Project has consistently supported research on questions of global justice as well as on the impacts of earth system transformations on food security, land management and many other key concerns in the Global South.

The Project also has followed a more nuanced interpretation of ‘representation’, having to accept that for a variety of reasons earth system governance research is overwhelmingly pursued in international research universities in a few countries in the Global North, with strong geographical clusters in Australia, Canada, The Netherlands, and Scandinavia. While the Project has developed and supported policies to push toward more global diversity and inclusiveness, it has also avoided the risk of becoming just another United Nations-style organization with strict country quotas and bickering over seating arrangements and agenda timing.

Informality versus formal structure

The Earth System Governance Project has avoided the trap of becoming another highly formalized international research organization also by maintaining a high degree of purposeful informality and community-focus. While the

Project has operated for ten years, attracted thousands of scientists to its annual conferences and co-hosted and endorsed events in places that range from Siberia to Ghana and Chile, it has worked with very little in terms of formal rules, voting procedures, membership criteria, or legal squabbles. There are no formal by-laws or terms of reference and its scientific steering committee has operated essentially by mutual agreement and consensus. This is a major difference with some larger programmes, such as the global platform Future Earth, which initially concentrated on building global steering capacity with committees and secretariats without engaging much with actual research communities.

The approach of the Earth System Governance Project hence has been from the outset to serve the community and to facilitate research exchange and networking by empowering and engaging subcommunities and individual scholars. Its eventual mode of legitimization could be characterized as output legitimacy: as long as colleagues attend conferences and participate in the Project's various events and activities, the legal standing and institutional formalities of global network management are much less important for a community of scholars such as the Earth System Governance Project—and even rather harmful as they cost time and might attract the wrong type of leaders.

Autonomy versus integration

Related to this is the large degree of autonomy that the Earth System Governance Project has developed over the years. Originally, the Project was set up as a 'core project' of the International Human Dimensions Programme on Global Environmental Change, which appointed a 'scientific planning committee' in 2006 and formally launched the Earth System Governance Project on 16 October 2008. With the termination of IHDP in July 2014, the Earth System Governance Project entered a period of complete autonomy with no 'parent' organization. In October 2015, the Project formally became associated with the new global research platform Future Earth [24], which was originally designed as a successor organization to the earlier global change programmes, such as the IHDP [25,26]. And yet, links between Future Earth and the Earth System Governance Project have remained weak, partially related to the initial emphasis of Future Earth on reshaping the global research landscape by prioritizing the creation of global 'knowledge-action networks'. All current policies and leadership transitions in the Earth System Governance Project are shaped by the network itself, and it generates its own funding.

Overall, the high degree of *de facto* autonomy, combined with the consistent policy of developing structures that maintain such autonomy is the key reason that the Earth System Governance Project has survived and flourished beyond the IHDP era, as the only social-science network that still operates with an affiliation to Future Earth.

Science programming and academic creativity

The Earth System Governance Project continues in the tradition of other global science programmes by aiming to coordinate global research through a 'Science and Implementation Plan'. This sets it apart, for instance, from purely professional membership associations. Unlike some other global science programmes, the Project's two science and implementation plans of 2009 and 2018 are also rather detailed. Both draw on multi-year consultations and reviews within the community. The question arises as to what extent these science plans fulfil their purpose. It is fair to assume that many members of the community have not read any of the science plans in their entirety. Some will use them only selectively, for instance in support of funding proposals.

On the other hand, the core framing of the science plans has helped shape the community's activities. For instance, the focus of the 2009 Science and Implementation Plan [22**] on the '5 As' – Architecture, Agency, Adaptiveness, Access and Allocation, and Accountability and Legitimacy – helped attract, integrate and consolidate major communities and discourses at that time. Institutional political scientists and lawyers debated issues of governance fragmentation and integration under 'architecture'; 'agency' brought in the wave of studies on non-state actors, partnerships, roundtables and so forth; 'adaptiveness' engaged with the well-established sustainability science communities on adaptive management, resilience and adaptation; 'access and allocation' provided a prominent space for debates on social justice that have flourished since then, and have helped to attract scholars from development studies; and the 'accountability and legitimacy' theme added a normative discourse on global and local democracy, informed largely but not exclusively by deliberative approaches. The new 2018 Science and Implementation Plan is structured in a similar manner, seeking to expand the community to engage with theories of transformation, anticipation or inequality while maintaining existing subcommunities that have evolved around the five A's over the last ten years [1**].

Importantly, this ten-year programming was augmented by an equally strong bottom-up programming in the form of specific taskforces set up by Project members or groups of members that address topics as diverse as ocean governance, earth system law or global biodiversity [27]. The taskforces have developed into often powerful and highly effective subnetworks and vehicles of research collaboration, with the result that at the 2018 annual conference, about half of all conference participants stayed on for an extra 'Taskforce and Meeting Day'. The coexistence of global science programming – through the 10-year Science and Implementation Plan – and the thriving bottom-up initiatives of numerous taskforces has not led to a coherent matrix structure. While some taskforces are clearly linked to elements of the science plans – for instance, the taskforce on Planetary Justice reflects

concepts and priorities of both the 2009 and the 2018 science plans – other taskforces are not easily aligned with the larger plan. However, few in the Earth System Governance Project would see this as a problem. Rather, the disparity between the global vision and the local initiative is an indication of the liveliness of debate and energy in the community that is to be facilitated rather than steered.

Disciplinary and transdisciplinarity

Global change science is marked by a trend toward interdisciplinarity and transdisciplinarity, with the latter standing at the core of an integrated sustainability science. The ambition also of the Earth System Governance Project from the very beginning has been to create space for new forms of knowledge generation, knowledge sharing and the provision of novel solutions to complex sustainability problems. The Project has also tried to bridge disciplinary divides and scales in the social sciences, to reach out to the natural sciences and to engage with innovative approaches to transdisciplinarity by codesigning and coproducing research with practitioners.

Overall, the Project has been rather successful in integrating diverse social scientists with a research interest in governance processes and mechanisms, including disciplinary backgrounds from political science, development studies and geography to the humanities, law and system analysis. The integration of natural and social sciences remains a challenge, however, and some issues emphasized as highly urgent by natural scientists – such as the pollination crisis – are only poorly addressed so far in the empirical research of the earth system governance community.

The Project's engagement with practitioners has been less pronounced. While most conferences and events have included engagement with speakers and participants from outside academia—from the heir to the British throne [28] to former leaders of Greenpeace [29], several workshops were held around principles of codesign and coproduction [30], and some political impact of the Project is traceable (for instance in the run-up to the 2012 United Nations Conference on Sustainable Development and the 2030 Agenda for Sustainable Development), it is undeniable that the Earth System Governance Project primarily brings together scholars for the exchange of their research ideas and research findings. To further the engagement with stakeholder communities, the Project has now partnered with one of the central civil society organizations in global sustainability, the Stakeholder Forum for a Sustainable Future (see announcement at Ref. [31]). From 2019 onwards, the secretariat of the Stakeholder Forum will be co-hosted by the Earth System Governance Project at Utrecht University. The 2018 Science and Implementation Plan also emphasizes the broader role of earth system governance scholars in society, the importance of teaching that embodies diverse ways of knowing, and the ongoing

challenge of bridging the science-policy divide to address complex sustainability issues.

Despite the push toward transdisciplinarity, the Earth System Governance Project has continuously ensured the disciplinary alignment of its operations, acknowledging also here its central function of serving its constituting communities and scholars, which are largely affiliated with disciplinary social science university departments. Both the 2009 and the 2018 Science and Implementation Plans, for example, were drafted in a way that offered easy connections to core debates in the broader social science disciplines, such as political science or public administration.

Further institutionalization

Even though the Earth System Governance Project has evolved with a high degree of informality, consensus approaches and bottom-up initiatives, it also developed a portfolio of institutional elements essential for scientific exchange and production. For one, the Project has published numerous special issues of its key findings [32] and maintains three book series with the world's top academic publishers, notably the *Earth System Governance* series with MIT Press launched in 2009 [33,34]; the more recent *Earth System Governance* series with Cambridge University Press focusing on edited volumes and synthesis products from the Project; and the new *Cambridge Elements in Earth System Governance*, which provide a novel outlet for shorter books. In 2018, the Project launched its flagship journal, *Earth System Governance*, as an open access publication with Elsevier [35]. The choice of open-access followed the Project's policy to strengthen its global outreach in a world where millions of scholars lack access to rich university libraries and traditional paywalled journals; articles in *Earth System Governance* are freely accessible to anybody anywhere and at all times [36]. Finally, the network has been strengthened by setting up an independent legal entity [37], the Earth System Governance Foundation, which allows network members to register at diplomatic conferences or to channel donations to network activities, for instance for travel support.

Funding

What has not changed is the funding situation of the Earth System Governance Project. Essentially, the Project cannot rely on any core support from international or national organizations. About USD 15 000 are provided each year by the United States National Science Foundation – via Future Earth – to support annual meetings of the scientific steering committee. More core funding is not expected at present: not from Future Earth, which prioritizes other activities such as global secretariats, committees or 'knowledge-action networks' – nor from the Belmont forum or other international funding agencies.

The core administration of the Project, at least, can rely on an externally funded International Project Office. This office was first located, for one year, with the secretariat of the International Human Dimensions Programme, which provided crucial seed support for the Earth System Governance Project. During 2011–2018, the International Project Office was hosted and fully financed by Lund University, with central support by the Lund University Centre for Sustainability Studies. From 2019 onwards, the Office will be hosted and financed by Utrecht University, with core funding by Utrecht's Faculty of Geosciences, which also supported the 2018 annual conference of the network [38].

While the generous support from Lund University and Utrecht University for the Earth System Governance Project is vital and gratefully acknowledged, it sets a limited planning horizon for global research networks and adds much uncertainty about the future for the network's leadership. In the end, it should not be the function of universities to finance global research networks—this would rather be the function of national science foundations or global funding agencies. The mismatch between the high rhetoric of global and national funding agencies and their actually very limited support for active research collaboration – along with their preference for top–down institution-building – remains one of the major stumbling blocks for those who want to engage in meaningful cooperation toward a globally impactful sustainability science.

Tradition and evolution

When IHDP appointed a scientific planning committee in 2006 to develop a new core project on governance, the traditional idea behind such a core project was that it would operate for ten years, to be replaced maybe by a new project in a similar field, just as the Earth System Governance Project to some extent followed the earlier IHDP Institutional Dimensions of Global Environmental Change core project (1998–2006). Rather early on the community felt that this model was outdated and that the Earth System Governance Project would need to work toward a transition to more stable structures that would maintain and further develop the community.

Inspired by the largely autonomous character and the informal, community-driven and bottom-up tradition in the Earth System Governance Project, the Project's leadership launched in 2015 a New Directions process of consultations. This process identified 22 members of the community who volunteered to draft a new Science and Implementation Plan for the 2019–2028 period. This group then selected a smaller core group of coordinating lead authors, taking account of diversity in terms of geography and discipline. Regarding gender diversity, all selected five coordinating lead authors are female. The five coordinating lead authors became the nucleus of the Project's new scientific steering committee, joined by six additional scholars drawn from the Project's Lead

Faculty, its research fellows and the core institutions of the Global Alliance of Earth System Governance Centers, while maintaining overall balance in view of global diversity, level of seniority and gender. The new scientific steering committee was installed at the 2018 Utrecht Conference on Earth System Governance [39], with the Project's founding leadership stepping down. The new 2018 Science and Implementation Plan, drafted after a two-year consultation and review process, was launched simultaneously [40].

This process of leadership transition is intriguing in many ways: while the Earth System Governance Project is formally part of Future Earth, no involvement in the transition process was envisaged or desired by either side. While representation and diversity were central considerations, no formal votes were taken, no electorate was formed and no formal quotas for subconstituencies agreed. Rather, the overall balance and the overwhelming community support – especially to the all-female group of (relatively young) coordinating lead authors – ensured that the members of the network welcomed and accepted the transition that emerged from these rather deliberative, consensual and informal processes.

In contrast, it remains to be seen whether this informality can be sustained in the years to come, given the continuous growth in the community and the widening portfolio of activities that increasingly also involve educational programmes, fund-raising and decisions that become more 'political' because of rising popularity and attractiveness of the network. The regional subnetworks of research fellows in both Europe and North America have recently opted to select their coordinators by formal elections due to the high competition for such offices. The positive experiences with these processes might point the way to more formalized governance mechanisms in the Earth System Governance Project as a whole—hopefully without the typical problems that overly legalized and politicized global institutions might bring.

In concluding, as the Earth System Governance Project moves into its second decade, it offers a paradigm of how a self-sustaining global research network can balance and draw on both a shared vision and intellectual diversity, on both a bit of formalization and lots of informality. Above all, it shows how the initiative and enthusiasm of a global network's members can be harnessed and reinvigorated in pursuit of finding viable solutions to pressing and urgent sustainability problems.

Conflict of interest statement

Nothing declared.

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References and recommended reading

Papers of particular interest, published within the period of review, have been highlighted as:

●● of outstanding interest

1. Earth System Governance Project: *Earth System Governance*. ●● *Science and Implementation Plan of the Earth System Governance Project*. Earth System Governance Project. 2018.
2. Earth System Governance Project: *Minutes of the Scientific Planning Group Meeting, 27 May 2007*, Amsterdam (Archive Frank Biermann).
3. Earth System Governance Project: *Minutes of the 2nd Meeting of the Scientific Steering Committee, 25–26 April 2009*, Bonn (Archive Frank Biermann).
4. Earth System Governance Project: *Minutes of the 1st Meeting of the Scientific Steering Committee, 17–18 October 2008*, New Delhi (Archive Frank Biermann).
5. See www.earthsystemgovernance.org [last accessed 21 November 2018].
6. See facebook.com/earthsystemgovernance [last accessed 21 November 2018].
7. https://twitter.com/ESG_Project [last accessed 21 November 2018].
8. See <https://www.linkedin.com/company/earth-system-governance-project/> [last accessed 21 November 2018].
9. Biermann F: **'Earth system governance' as a crosscutting theme of global change research**. *Glob Environ Change* 2007, **17**:326-337.
10. Biermann F: *Earth System Governance. Outline of a Possible Research Activity within IHDP*. IHDP; 2007. February [Archive Frank Biermann].
11. Biermann F: *Earth System Governance: World Politics in the Anthropocene*. MIT Press; 2014. This book develops the idea of earth system governance with special relevance for the area of international relations and world politics, advancing a wide range of reform proposals especially for the United Nations system.
12. Dryzek J, Stevenson H: **Global democracy and earth system governance**. *Ecol Econ* 2011, **70**:1865-1874.
13. Biermann F, Gupta A: **Accountability and legitimacy in earth system governance: a research framework**. *Ecol Econ* 2011, **70**:1856-1864.
14. Gupta J, Lebel L: **Access and allocation in earth system governance: water and climate change compared**. *Int Environ Agreements Politics Law Econ* 2010, **10**:377-395 E.g..
15. Nilsson M, Persson Å: **Can earth system interactions be governed? Governance functions for linking climate change mitigation with land use, freshwater and biodiversity protection**. *Ecol Econ* 2012, **75**:61-71.
16. Talberg A, Christoff P, Thomas S, Karoly D: **Geoengineering governance-by-default: an earth system governance perspective**. *Int Environ Agreements Politics Law Econ* 2018, **18**:229-253.
17. Salleh A: *The Idea of Earth System Governance: Unifying Tool? Or Hegemony for a New Capitalist Landnahme? Working Paper 10/2013 der DFG-KollegforscherInnengruppe Postwachstumsgesellschaften*. 2013.
18. Stirling A: *Emancipating Transformations: From Controlling 'the Transition' to Culturing Plural Radical Progress*, *Climate Geoengineering Governance Working Paper Series 012*. University of Sussex; 2014.
19. Hajer M, Nilsson M, Raworth K, Bakker P, Berkhout F, de Boer Y, Rockström J, Ludwig K, Kok M: **Beyond cockpit-ism: four insights to enhance the transformative potential of the sustainable development goals**. *Sustainability* 2015, **7**:1651-1660.
20. Kates RW, Clark WC, Corell R, Hall JM, Jaeger CC, Lowe I, McCarthy JJ, Schellnhuber HJ, Bolin B, Dickson NM et al.: **Sustainability science**. *Science* 2001, **292**:641-642.
21. Jerneck A, Olsson L, Ness B, Anderberg A, Baier M, Clark E, Hickler T, Hornborg A, Kronsell A, Lövbrand E, Persson J: **Structuring sustainability science**. *Sustain Sci* 2011, **6**:69-82.
22. Biermann F, Betsill MM, Gupta J, Kanie N, Lebel L, Liverman D, Schroeder H, Siebenhüner B, with contributions from, Conca K, da Costa Ferreira L, Desai B, Tay S, Zondervan R: *People, Places and the Planet. Science and Implementation Plan of the Earth System Governance Project. The Earth System Governance Project*. 2009. This publication is the first science plan of the Earth System Governance Project, setting out the research agenda for the 2008–2018 period.
23. See <http://earthsystemgovernance.net/nairobi2016/> [last accessed 21 November 2018].
24. See <http://www.futureearth.org/projects/news/earth-system-governance-project-joins-future-earth> [last accessed 21 November 2018].
25. Future Earth Transition Team: **Future earth: research for global sustainability**. *A Framework Document*. International Council for Science; 2012.
26. Beck S: **Coproducing knowledge and politics of the anthropocene: the case of the future earth program**. In *Anthropocene Encounters: New Directions in Green Political Thinking*. Edited by Biermann F, Lövbrand E. Cambridge University Press; 2019:191-211.
27. Earth System Governance Project: *Minutes of the Scientific Steering Group Meeting, 29–30 June 2014*, Norwich, United Kingdom [Archive Frank Biermann].
28. <http://norwich2014.earthsystemgovernance.org/>.
29. <http://www.earthsystemgovernance.net/lund2017/>.
30. **Earth System Governance Project, Hakone vision on governance for sustainability in the 21st century**. *Towards a Charter Moment*. Earth System Governance Project; 2011. See for instance.
31. <https://stakeholderforum.org/2017/12/01/stakeholder-forum-and-earth-system-governance-project-establish-governance-for-global-sustainability-partnership/> [last accessed 21 November 2018].
32. For instance, *Int Environ Agreements: Politics Law Econ* 2010, **10**.
33. Earth System Governance Project: *Minutes of the 2nd Meeting of the Scientific Steering Committee, 25–26 April 2009*, Bonn (Archive Authors).
34. <https://mitpress.mit.edu/books/earth-system-governance> [last accessed 21 November 2018].
35. <https://www.journals.elsevier.com/earth-system-governance> [last accessed 21 November 2018].
36. Biermann F: **Editorial to the inaugural issue of "Earth System Governance"**. *Earth Syst Gov* 2019, **1**.
37. Earth System Governance Project: *Minutes of the 5th Meeting of the Scientific Steering Committee. Action Items and Decisions*, Tokyo, 26–27 January 2013 (Archive Frank Biermann).
38. <https://www.uu.nl/en/news/utrecht-university-will-host-the-earth-system-governance-project-office> [last accessed 21 November 2018].
39. See <http://www.earthsystemgovernance.net/utrecht2018/> [last accessed 21 November 2018].
40. <http://www.earthsystemgovernance.org/news/new-earth-system-governance-science-and-implementation-plan/> [last accessed 21 November 2018].