

Science and Diplomacy around the Earth: From the Man and Biosphere Programme to the International Geosphere-Biosphere Programme

ABSTRACT

In this article we discuss two phases in the evolution of global environmental programs, namely the Man and Biosphere Programme and the International Geosphere-Biosphere Programme, with the aim of showing their hidden diplomatic ambitions from both US and Soviet perspectives. In the 1960s and 1970s, Soviet views on the biosphere prevailed thanks to the influence of Soviet scientists in the International Council of Scientific Unions and the United Nations Educational, Scientific and Cultural Organization. In the 1980s, the domination of this field by US scientists ushered in the establishment of Earth system science as a new research trend based on Earth observation technologies. We argue that despite the influence of Soviet ecologists in directing international coordination of research on the biosphere, Earth system science did not set in a trajectory of environmental cooperation. This outcome can be explained if we take the environmental and ecological turn that arose during the Cold War as being intertwined with political concerns and national

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The following abbreviations are used: COMECON, Council for Mutual Economic Assistance; FAO, Food and Agriculture Organization; EOS, Earth Observing System; ESS, Earth system science; IBP, International Biological Program; ICSU, International Council of Scientific Unions; IGBP, International Geosphere-Biosphere Programme; IGY, International Geophysical Year; IHDP, International Human Dimension Program; IIASA, International Institute for Applied Systems Analysis; IPCC, Intergovernmental Panel on Climate Change; MAB, Man and Biosphere Programme; NASA, National Aeronautics and Space Administration; SCOPE, Scientific Committee on the Problems of the Environment; UN, United Nations; UNEP, United Nations Environment Programme; UNESCO, The United Nations Educational, Scientific and Cultural Organization; WCRP, World Climate Research Programme; WMO, World Meteorological Organization.

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interests in both the US and the USSR. Security, scientific diplomacy, and geopolitical issues limited East-West collaboration on the interdisciplinary study of the earth, which instead turned into a sort of cooperative antagonism. The transition from biosphere studies to Earth system science reveals a changing strategy toward environmental problems, which in turn reflects changes in Cold War policy.

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KEY WORDS: environmental diplomacy, biosphere studies, Earth system science, US-USSR relations, MAB, IGBP, sustainable development, global change

In the second half of the twentieth century, the earth was the subject of a number of scientific initiatives on a world scale. The most significant, the International Geophysical Year (IGY; 1957–1958), sponsored by the International Council of Scientific Unions (ICSU), became a driving force for a series of additional endeavors. In this article, we would like to trace a line that runs through three distinct global programs inscribed in the IGY legacy: the International Biological Program (IBP; 1964–1974); the United Nations Educational, Scientific and Cultural Organization’s Man and Biosphere Programme (UNESCO, MAB; 1971–present); and the International Geosphere-Biosphere Programme (IGBP; 1987–2015). In the initial steps of the IBP and MAB, Soviet and Eastern European scientists brought environmental issues to the forefront of international research activities and, in so doing, managed to shape the IBP and MAB’s primary goals in line with their own agendas. But the development of Earth system science in the 1980s through the IGBP saw Soviet scientists playing a less prominent role. Indeed, in the passage from the IBP and MAB to the IGBP, the research agenda was predominantly set by US scientists. On the one hand, this is partially due to changes in internal and international Soviet science and policy in the 1970s and 1980s. In particular, Leonid I. Brezhnev’s doctrine privileged strong ideological control of the East European scientific community, thus limiting to some extent international collaboration. On the other hand, the weak participation of the Soviets in Earth system research also resulted from US foreign policy strategies. In fact, as the Soviets gained momentum within UNESCO, heavily promoting research on the biosphere, US scientists established an alternative research program while influencing proceedings at the ICSU more than ever. After the US withdrew from UNESCO in 1984, the IGBP was launched. Its emphasis on novelty,

interdisciplinarity, and on the revolutionary concept of the Earth system partially marginalized Soviet approaches to biosphere studies.

By following this transition, this article shows how different phases of international collaboration on environmental research reflected different diplomatic engagements. These oscillated between Cold War détente efforts and hostility, and affected the type of global environmental knowledge produced at a global level. The first phase, which corresponds to the establishment of the IBP and MAB, is mostly characterized by détente and relaxation between the two superpowers. Brezhnev sought limited collaboration with the US in order to ease tensions and at the same time tried to gradually expand Soviet influence abroad, especially in underdeveloped countries. The Soviets mobilized environmental concerns to promote international cooperation and strengthen their ties with institutions such as UNESCO and the ICSU. The kind of global environmental knowledge produced in this phase enhanced the concept of the biosphere, which had a strong legacy in Russia. The biosphere as a self-organized system featured prominently in the MAB, where the Soviets succeeded in occupying relevant positions, and played a considerable role in planning scientific research.

The second phase is mainly characterized by hostility and tensions, and coincides with US supremacy in global environmental research. In the late 1970s, Brezhnev limited Soviet cooperation with the US in order to reinforce the bloc policy and keep control over Eastern European countries. On the other side of the Iron Curtain, US President Ronald Reagan pursued security, defense strategies, and nuclear state expansion. Preoccupied by Soviet presence at UNESCO, US institutions started to promote a new field of research focused on global change. They established an alternative paradigm accompanied by the rhetoric of innovation and interdisciplinarity, which contrasted with current programs. The kind of knowledge produced during this phase saw the emergence of Earth system science based on remote sensing technologies, which was seen as the most appropriate method for studying the functioning of the Earth system. These two phases show that global environmental research has often been an object of negotiation involving governments, institutions, and scientific experts. Yet, scientists' involvement in these programs also reveals their attempts to pursue international environmental research while freeing themselves from Cold War political objectives and science policy strategies. While these attempts may well have led to better environmental governance, they failed to be implemented, notwithstanding the support of some scientists from both the US and USSR.

ENVIRONMENT, DIPLOMACY AND EAST-WEST COOPERATION AFTER THE IBP

During the Cold War, environmental concerns played a pivotal role in the political debate in both communist and capitalist countries and created the circumstances for transnational collaboration.¹ As Robert Darst has pointed out, participation in East-West environmental cooperation was one way, among others, of expressing the “cooperativeness” necessary for domestic political goals to succeed.² Matthew Evangelista and Egle Rindzevičiūtė have examined the weight that transnational networks and movements had in shaping relevant science and environmental policy in the Cold War era.³ Jacob Darwin Hamblin and Joseph Masco have emphasized how hazy the boundaries between environmental and military questions were in a time in which global nuclear treatises called on scientists, diplomats, and military leaders to shape the conversation on global environment and the whole earth.⁴

It is not only the stances of US and Soviet scientists on the organization and development of research initiatives with global reach, such as the MAB and IGBP, that reveal evolving (at times diverging) questions on environmental and Earth sciences, questions that have been barely recognized in the literature.⁵ Most importantly, the way in which these programs are articulated also reflect the attitudes behind foreign policy at different phases of the blocs’

1. For instance, Astrid Mignon Kirchhof and John R. McNeill, eds., *Nature and the Iron Curtain: Environmental Policy and Social Movements in Communist and Capitalist Countries 1945–1990* (Pittsburgh: The University of Pittsburgh Press); Robert G. Darst, *Smokestack Diplomacy: Cooperation and Conflict in East-West Environmental Politics* (Cambridge, MA: The MIT Press, 2001); Stephen Brain, “The appeal of appearing green: Soviet-American ideological competition and Cold War environmental diplomacy,” *Cold War History* 16, no. 4 (2016): 443–62; Simone Turchetti, *Greening the Alliance, The Diplomacy of NATO’s Science and Environmental Initiatives* (Chicago: University of Chicago Press, 2018).

2. Darst, *Smokestack Diplomacy* (ref. 1), 26.

3. Matthew Evangelista, *Unarmed Forces: The Transnational Movement to End the Cold War* (Ithaca, NY, and London: Cornell University Press, 1999); Egle Rindzevičiūtė, *The Power of System: How Policy Sciences Opened Up the Cold War World* (Ithaca, NY, and London: Cornell University Press, 2016).

4. Jacob D. Hamblin, *Arming Mother Nature: The Birth of Catastrophic Environmentalism* (Oxford: Oxford University Press, 2013); Joseph Masco, *The Theater Of Operation: Natural Security Affect from the Cold War to the War on Terror* (Durham, NC: Duke University Press, 2014).

5. See, for instance, Ola Uhrqvist and Björn-Linnér, “Narratives of the past for Future Earth: The historiography of global environmental change research,” *The Anthropocene Review* 2, no. 2 (2015): 1–15.

confrontation. This provides a key to understanding global environmental history in relation to Cold War history.

MAB advocates emphasized the human responsibility for environmental matters as part of the socio-political context of collaboration in environmental policies within the framework of the United Nations. The UN created the international knowledge infrastructure that made the global environment a political reality subject to governance, and this happened at the height of the Cold War.⁶ Both the IBP and MAB played a crucial role in fostering research on both sides of the Iron Curtain.⁷ The IBP, supported by the ICSU, capitalized on the Geneva summit (1955), which was an important step toward easing Cold War tensions and to the success of the IGY. Meanwhile, the MAB facilitated symmetrical development of new scientific disciplines in a politically divided world. In this sense, the work of actors who played an international role, such as scientists involved with natural science research and diplomats pursuing agreements to strengthen scientific cooperation, was key to both promote specific interests and avoid political tensions.⁸

When Brezhnev replaced Nikita Khrushchev in 1964, he sought to use global environmental concerns to achieve other goals such as the mitigation of East-West hostility and economic development.⁹ Moderate collaboration with the West, in particular the US, aimed to reduce Cold War tensions and stimulate the emergence of a class of experts in ecological research and modelling who were willing to address problems pertaining to environmental sciences while also acting as ambassadors of specific initiatives at the international level. An exemplary case is the foundation of the International Institute for Applied Systems Analysis (IIASA). This was established in Laxenburg (Austria) in 1972 to bridge the East-West gap in order to discuss pressing global issues, from food and water management to energy and the environment, and to create related policies.¹⁰

6. Perrin Selcer, *The Postwar Origins of the Global Environment: How the United Nations Built Spaceship Earth* (New York: Columbia University Press, 2018).

7. John Connelly, *Captive University: The Sovietization of East Germany, Czech, and Polish Higher Education, 1945–1956* (Chapel Hill: The University of North Carolina Press, 2000); Alena Míšková, Martin Franc, and Antonín Kostlán, eds., *Bohemia Docta: K historickým kořenům vědy v českých zemích* (Praha: Academia, 2010).

8. Doubravka Olšáková, “Pugwash in Eastern Europe: The Limits of International Cooperation under Soviet Control in the 1950s and 1960s,” *Journal of Cold War Studies* 20, no. 1 (2018): 210–40.

9. Darst, *Smokestack Diplomacy* (ref. 1), 26; Brain, “The appeal of appearing green” (ref. 1).

10. On the History of IIASA, see Rindzevičiūtė, *The Power of System* (ref. 3); see also Detlof von Winterfeldt, “IIASA: An Institute for Diplomacy Through Science,” *International Affairs* 57 (2011): 141–52.

Environmental cooperation with the US gave Brezhnev wiggle room to pursue his political goals of consolidating national prestige within the Soviet bloc and simultaneously increasing Soviet influence abroad. After the Soviets opened up to international collaboration through a series of Geneva conferences in 1955, they then sought to gain influence within international scientific institutions by placing some of their most prominent scientists in key positions within organizations devoted to the coordination of global environmental monitoring and research. One of the most relevant to our case is Viktor A. Kovda, a notable soil scientist at Moscow University who became head of the UNESCO Department of Natural Sciences. Moreover, biochemist Vladimir A. Engelhardt was ICSU's vice-chairman, and plant physiologist Andrey L. Kursanov was an executive committee member of the International Union of Biological Sciences (IUBS). They represented, together with other scientists from the Soviet bloc engaging in international activities, a very powerful lobby. To coordinate and maintain power in the countries of the Soviet bloc was an easy task thanks to the sovietization of science and technology that began already in the 1950s. The Academy of Sciences of the USSR, which was comprised of various institutes with identical hierarchies, was ideal for putting together a coherent group of researchers involved in international programs and familiar with the Soviet system and its science policy.¹¹

The role of the Soviet bloc during the IBP's preparatory stages was indeed fundamental, as its scientists sought to slightly adjust the original focus of the program, on human genetics and its relation to the environment, toward a greater emphasis on "productivity" and "welfare."¹² The IBP was originally supposed to focus on politically charged topics, such as genetics, and more precisely on three areas: human heredity, plant genetics and breeding, and biological communities exposed to modification or destruction. Nevertheless, during the preparatory stage, the Soviet bloc—in particular Engelhardt, Ivan Málek (microbiologist and IUBS's vice-president) and Kursanov—objected to this proposed agenda by arguing that the IBP's subtitle was "The Biological

11. Michael David-Fox and György Péteri, eds., *Academia in Upheaval: Origins, Transfers, and Transformations of the Communist Academic Regime in Russia and East Central Europe* (Westport, CT: Bergin and Garvey, 2000); Nikolai Kremensov, *Stalinist Science* (Princeton, NJ: Princeton University Press, 1997).

12. Doubravka Olšáková, "The International Biological Program in Eastern Europe: Science Diplomacy, Comecon and the Beginnings of Ecology in Czechoslovakia," *Environment and History* 24, no. 4 (2018): 543–67.

Basis of Productivity and Human Welfare.”¹³ The IBP scientific director, Edgar Barthon Worthington, was unimpressed but feared that the Soviet scientists (and those from Eastern Europe) would leave proceedings, therefore he pragmatically accepted this request.¹⁴ The IBP’s final agenda emphasized three main topics: human genetics, nature conservation, and the improvement of natural resources exploitation, a topic that was central to the Soviet agenda.¹⁵

The IBP was probably the most important program to foster cooperation on the global environment after the IGY. By coordinating research on five major biomes, the IBP represented a major effort toward the establishment of global ecological studies, even though the trajectory that Soviet representatives sought to give to novel research greatly limited its effectiveness.¹⁶

If international research on the global environment appeared noble and realistic, it did not really work in practice, where a mixture of cooperation and antagonism prevented the achievement of expected goals. “Cooperative antagonism” was especially reflected in the over proliferation of environmental initiatives that followed the IBP.¹⁷ Discontinuities and ruptures in coordinating international programs with overlapping research targets show that behind this proliferation of initiatives lurked hidden competitions that diplomacy helped disguise.

THE DEBUT OF BIOSPHERE STUDIES AT MAB

MAB was established in 1971, but its planning began in 1968 with the Biosphere Conference, chaired by French ecologist François Bourlière and

13. Edgar Barthon Worthington, ed., *The Evolution of IBP* (Cambridge: Cambridge University Press, 1975), on 5.

14. *Ibid.*, 6.

15. Incidentally, this research agenda aligned the Soviet stance to the methods and practices of Lysenkoism, which was only officially abandoned in the USSR in 1964. David Joravsky, *The Lysenko Affair* (Chicago: University of Chicago Press, 1986); Kremensov, *Stalinist Science* (ref. II); Michael D. Gordin, “Lysenko Unemployed: Soviet Genetics after the Aftermath” *Isis* 109, no. 1 (2018): 56–78. On Stalinist environmentalism, see, for example, Stephen Brain, *Song of the Forest: Russian Forestry and Stalinist Environmentalism* (Pittsburgh: The University of Pittsburgh Press, 2001).

16. Elena Aronova et al., “Big Science and Big Data in Biology: From the International Geophysical Year through the International Biological Program to the Long Term Ecological Research (LTER) Network, 1957,” *Historical Studies in the Natural Sciences* 40, no. 2 (2010): 183–24.

17. See Lynton Caldwell’s discussion of “antagonistic cooperation” in “Cooperation and Conflict,” *Environment* 27, no. 1 (1958): 6–12.

attended by delegates from sixty-three countries. The man behind the establishment of the Biosphere Conference was Michael Batisse, secretary general of the intergovernmental conference of experts on the “Scientific Basis for the Rational Use and Conservation of the Resources of the Biosphere” (the conference’s longer title) and director of UNESCO’s Natural Science Division.

Like the IBP, the MAB encompassed a broad range of objectives that went far beyond those related to the conservation of nature, including environmental education, biosphere sustainability, the investigation of integrated biosphere functions, and human interferences.¹⁸ MAB was an interdisciplinary endeavor emphasizing that an ecological approach to studying the interrelationships between humanity and the environment had to encompass a number of related issues. These included the study of the structure and functioning of the biosphere and its subsystems, the effects of changes in resource management upon human health and the economy, and the inclusion of education—an issue already present in the IBP agenda—which could form the basis of a new awareness of the importance of using natural resources rationally.

But MAB’s research objectives also appeared as fertile ground to propagandize a Soviet understanding of the biosphere as a whole-earth concept congenial to its scientific and diplomatic ambitions. Brezhnev’s new doctrine in the Soviet bloc now advocated socialist unity, and a set of bilateral agreements with East European countries was signed in order to strengthen their relations with Moscow. This shift of the Soviet diplomatic agenda in the late 1960s resulted from, among other events, the Prague Spring and served to prevent, from 1968, a “Czechoslovak path to Socialism” (a program that suggested that the Czechoslovak Republic builds its socialism instead of following the Soviet Union). Additionally, this shift entailed Soviet scientists and diplomats to more carefully select international collaborative programs, thus reshaping the boundaries of their “cooperative antagonism.” For example, the Soviet Union withdrew from the UN Conference on the Human Environment in Stockholm, which took place in 1972 (one year after the establishment of the MAB), and encouraged all Soviet bloc countries to do the same, claiming East Germany had been unfairly rejected from participation. Yet Brezhnev continued to work toward détente with the US, and in May 1972, the Soviets signed the bilateral

18. Robert Boardman, *International Organization and the Conservation of Nature* (London: Palgrave MacMillan, 1981), 65. Craig Davis, “The World Council for the Biosphere / International Society for Environmental Education,” *Environmental Conservation* 10, no. 4 (1983): 353–54.

US-USSR Agreement on Cooperation in the Field of Environmental Protection.¹⁹ We know that US President Richard Nixon, who visited Moscow and signed the treaty, supported environmental diplomacy in the context of his international political agenda.²⁰ With respect to the bloc policy, the withdrawal of the Soviets from the UN Conference on the Human Environment may have marked the return from global to Soviet national interests, restarting a period of bloc competition.²¹

The Soviets did not really regret their absence in Stockholm since not enough was at stake there (in their view), but decided to sign the bilateral agreements as they probably hoped to gain much more through this treaty. For a similar reason they also tried to exercise greater influence on the MAB proceedings, especially as shown by the profile and activities of their representative, Victor Kovda.

While still director of UNESCO's Department of Natural Science, Kovda was appointed as the head of the Fifth Commission of the International Society of Soil Science (ISSS), serving as president from 1968 to 1974. He also became scientific secretary of the UN Scientific Committee on Science and Technology and its Application for the Advancement of Developing Countries. Eager to improve international collaboration with the Western world, Kovda was concurrently a member of the Communist Party and a staunch supporter of the Stalin Plan for the Transformation of Nature. Formerly promoting Lysenkoism as a part of Stalinist scientific paradigms,²² Kovda was shrewd enough, diplomatically speaking, to lead the ICSU's Scientific Committee on the Problems of the Environment (SCOPE) from 1973 to 1976. However, his engagement in environmental sciences was not only the result

19. Darst does not examine the Soviet sabotage of the UN conference in his *Smokestack Diplomacy* (ref. 1); nevertheless, the fact that it happened in the same year as the establishment of environmental agreement with the US reinforces Darst's arguments on instrumental manipulation of environmental cooperation.

20. In his analysis of the birth of modern American environmental diplomacy, J. Brooks Flippen also does not link the bilateral US-USSR agreement to the boycott of the 1972 conference by the Soviets (which most countries of the Socialist bloc joined). Such approach does not take into account real impact on bloc policy and evaluates the importance of both events exclusively on the level of most important actors of the Cold War: US and USSR. See J. Brooks Flippen, "Richard Nixon, Russell Train, and the Birth of Modern American Environmental Diplomacy," *Diplomatic History* 32, no. 4 (2008): 613-38.

21. Paul R. Josephson, Nicolai Dronin, Aleh Cherp, Ruben Mnatsakanian, Dmitry Efrementko, and Vladislav Larin, *An Environmental History of Russia* (Cambridge: Cambridge University Press, 2013).

22. Kremontsov, *Stalinist Science* (ref. 11); Gordin, "Lysenko Unemployed" (ref. 15).

of government pressure. Kovda was preoccupied about soil degradation and desertification in southern Russia and Asia, and put a lot of effort into developing soil research in the Soviet Union. During his six years at UNESCO, he initiated a number of international projects, such as the Soil Map of the World, in concert with the Food and Agricultural Organization (FAO).²³ This scheme focused on soils, lands, and waters, as components of the earth's biogeochemical system, and not only from the point of view of agriculture and food production. Kovda often recalled the merits of "the Soviet school," especially emphasizing the theory that terrestrial and shoal soils are a major component of the biosphere.²⁴ In line with this legacy, he popularized the work of Vasily V. Dokuchaev (1846–1903), the Russian geographer and geologist acknowledged as the founding father of "pedology" (*Pochvovedenie*), and Vladimir I. Vernadsky (1863–1945), the initiator of the modern concept of "biosphere," as well as of the idea that humanity is turning the biosphere into a human-made sphere, the *noosphere*, due to human global impact on earth.²⁵ Leading UK limnologist George Evelyn Hutchinson sought to introduce Vernadsky's biosphere theory to US ecologists and biologists within the circle of his colleagues at Yale University,²⁶ but Kovda went much further. He popularized Vernadsky during the first biosphere conference, when the agenda of the MAB was originally set out.²⁷

Kovda focused on soil as a key biospheric component, on biogeochemical cycles, on energy and matter, and on Earth's landscapes, and did not consider these aspects in isolation. The International Congress of Pedologists in Moscow (1974) and the SCOPE International Conference (1975) brought them together. Kovda pointed out that periods of accelerated change have taken place at multiple points in the general evolutionary history of the planet. His

23. Selcer, *The Postwar Origins* (ref. 6).

24. Viktor Kovda, "The Earth's Living Matter: Biosphere and Soils," *Environmental Conservation* 20, no. 3 (1993): 199–204, on 201.

25. Vladimir Vernadsky, *The Biosphere* (New York: Copernicus/Springer-Verlag, 1998); See also Vernadsky, *Scientific Thought as a Planetary Phenomenon*, (Moscow: Nongovernmental Ecological V.I. Vernadsky Foundation, 1997).

26. George S. Levit, *Biogeochemistry—Biosphere—Noosphere: The Growth of the Theoretical System of Vladimir Ivanovich Vernadsky* (Berlin: VWB-Verlag für Wissenschaft und Bildung, Studien zur Theorie der Biologie, 2001); George E. Hutchinson, "The Biosphere," *Scientific American* 223, no. 3 (1970): 45–53.

27. Marc Elie, "La biosphère dans l'écologie globale: Viktor Kovda et l'héritage scientifique de Vernadsky lors du 'Tournant écologique' des années 1970 en URSS," in *Vernadsky, la France et l'Europe*, ed. Guennady Aksenov et al. (Bordeaux: MSHA, 2016).

analysis and understanding of these changes were fully in line with contemporary research in the Soviet Union, where the study of humanity's impact on the earth's crust revealed that a new geological epoch nowadays acknowledged as "Anthropocene" had already started during the Holocene.²⁸

Kovda observed that human-driven changes of the biosphere happened over thousands of years, while the changes induced in nature by economic activities have occurred during one or two centuries, or even decades. "As in the past the biosphere as a system is 'self-governing' but in new conditions and with new components."²⁹ Kovda's concerns included the polluting impact of chemicals, resource depletion, the development of a new fertilization regime with profound repercussions on the composition of soils, the deposition of toxic by-products, etc. The biosphere is a self-regulated system that now bears the footprint of human industry and economy, which have only brought degradation. Kovda argued for new projects integrating national economic developments. Only with such an effort, he claimed, would a "universal reduction of negative after-effects of local and global significance" be achieved.³⁰

With Kovda as the MAB agenda-setter, the international cooperative initiative soon became a minefield, partly because of the implication of agricultural and biological research in development assistance to Third World countries, which became a fundamental political issue already at the beginning of the Cold War, escalating with time. As documented by Stephen Macekura, foreign aid to developing nations represented a central component of US foreign policy in an effort to limit Soviet influence in African states.³¹ Funds were also meant to consolidate environmental regulation policies. Since the 1960s, Western conservation organizations such as the International Union for Conservation of Nature (IUCN), which involved mostly European and US members, had taken control of management strategies at African natural reserves and parks. In many areas of the African territories protected by conservation laws, local populations did not even gain access rights. These policies

28. Simon L. Lewis and Mark A. Maslin, *The Human Planet: How We Created the Anthropocene* (London: Penguin Books, 2018).

29. Viktor Kovda, "Biosphere, Soil Cover and their Changes," in *Technology and the Future*, eds. Evgeny P. Velikhov et al. (London: Pergamon Press, 1980), 410.

30. Ibid.

31. Between 1958 and 1962, only the US increased contributions on development assistance from \$110 million to \$519 million. An example often mentioned is the US foreign aid to Tanganyika. See Stephen J. Macekura, *Of Limits and Growth: The Rise of Global Sustainable Development in the Twentieth Century* (Cambridge: Cambridge University Press, 2015).

removed locals from their natural habitat and “marginalized their methods of land tenure.”³² National leaders of Third World countries had an interest in supporting national development plans because US foreign aid promised economic growth by increasing industrial and agricultural production, while giving national leaders the power to intervene in local affairs.

As for environmental cooperation, important motivation behind hidden antagonism was the creation of different “clienteles” in participating countries that depended on specific organizations for securing their policies on matters like agriculture, land use, forestry, and conservation, as well as to keep foreign financial aid.³³ In particular, the Soviets benefited from supporting those Third World countries with which they kept very close relations.³⁴ For instance, the Soviet bloc was responsible for the education agenda of most large-scale international programs, including the IBP and MAB. Close relations and networks, established at the training centers in Eastern Europe, were periodically reinforced at preliminary meetings that usually took place before the general meetings. By the 1960s, the Soviet UNESCO presence in Africa counted experts in several countries and the building of two educational institutions in Mali and Tunisia. By contrast, in the sector of biosphere research, Kovda along with others enabled the communist bloc “to shape the missions of 130 experts in over forty countries as well as the programs of over ten institutes of higher education receiving UN Special Fund.”³⁵ It seems that the USSR sought to rival the West in the organization. Drawing on Vernadsky and his biosphere-noosphere theory, the Soviet strategy to attain visibility through the MAB was to promote a biosphere model in which development and environmental sustainability overlapped education and culture. In fact, the MAB emphasized the need for an environmental cooperation that replaced “technical assistance” with “scientific partnerships.”³⁶ It emphasized the participation of

32. *Ibid.*, 62.

33. Francesco di Castri, “Twenty Years of International Programmes on Ecosystems and the Biosphere: An Overview of Achievements, Shortcomings and Possible New Perspectives,” in *Global Change*, eds. Thomas F. Malone and Juan J. Roederer (Cambridge: Cambridge University Press, on the behalf of ICSU Press, 1985), 314–31. See also Petr Zidek and Karel Sieber, *Československo a subsaharská Afrika v letech 1948–1989* (Praha: Ústav mezinárodních vztahů, 2007).

34. Jon A. Armstrong, “The Soviet Attitude Toward UNESCO,” *International Organization* 8, no. 2 (1954): 217–33.

35. Louis H. Porter, *Cold War Internationalism: The USSR in UNESCO 1945–1967* (PhD dissertation, University of North Carolina, 2018): 476. See also Hilliard Roderick, “The Future Natural Sciences Programme of UNESCO,” *Nature* 195 (1962): 215–22.

36. Di Castri, “Twenty Years” (ref. 33).

local populations in its planning, and addressed issues of basic research as well as applied research in science and the social sciences. Insisting on scientific planning, economic development and education were aligned with the Soviet model and its wish to propagandize an alternative to the US “technical assistance” schemes.

To develop this model, MAB set specific goals that were achievable with the help of ecosystems modelling to predict the effects of stresses upon the biosphere, the biogeochemical equilibrium, and the influence of humankind on the environment.³⁷ Terrestrial ecology was one among a bundle of integrated perspectives that included the acquisition of advanced technologies. However, the MAB failed in reaching most of these objectives. Kovda’s ambitious call for a program that would integrate analysis of the relations between humankind and the biosphere was too high-reaching with respect to resources available for international collaboration.³⁸ It also unnerved US representatives. Hilliard Roderick, the American deputy director in the UNESCO Department of Natural Sciences, complained about the power Kovda accrued over international scientific cooperation and development. Indeed, the US government threatened UNESCO that it would withdraw from the organization, and Kovda took advantage of this claim to question US intentions.³⁹ The diplomatic altercation brewing at MAB would lead to a rupture only much later, in 1984, when the US withdrew from UNESCO (followed by the UK).⁴⁰ On this occasion, Amadou Mahtar M’Bow, then the UNESCO director general, was accused of supporting the Soviet bloc against the Reagan administration.⁴¹ He countered the accusation stating that he had denied Soviet control over Third World countries, and defended a principle of international cooperation against the Western monopoly on culture and information.⁴²

37. UNESCO MAB, *International Co-ordinating Council of the Programme on Man and the Biosphere (MAB): Final Report* (Paris, 25 Feb 1972), 43.

38. Francesco di Castri, Malcolm Hadley, and Jeanne Damlamian, “MAB: The Man and the Biosphere Program as an Evolving System,” special issue, *Ambio* 10, no. 2/3 (1981): 52–57.

39. Porter, *Cold War Internationalism* (ref. 35).

40. Michel Batisse, “The Silver Jubilee of MAB and Its Revival,” *Environmental Conservation* 20, no. 2 (1993): 107–12.

41. Altaf Gauhar and Amadou Mahtar M’Bow, “Amadou Mahtar M’Bow,” *Third World Quarterly* 6, no. 2 (1984): 265–71.

42. The US and the UK nevertheless maintained their participation in the MAB Programme, although no longer contributed financially. See Flora Lewis, “Foreign Affairs: Airing UNESCO’s Closets,” *The New York Times* (Archives, 1984).

The matter was not settled until much later, and US scientists had already become more passive at the MAB, while at the same time seeking to influence the development of global environmental research from within different international organizations. The opportunity to propagandize a different approach to the global environment came with the IGBP establishment.

THE DEBUT OF EARTH SYSTEM SCIENCE AT THE IGBP

Notwithstanding the lineage that ties the IGBP to all previous and contemporary initiatives, the program was announced as an entirely new research endeavor to study global change, spurred by a US initiative and sponsored by the ICSU in close connection with US federal agencies. Global change research developed in the 1980s, driven primarily by two endeavors: the study of the depletion of the ozone layer due to greenhouse gases emissions, leading to climate change studies, and research undertaken by James Lovelock on the biochemical regulation of the earth that became known as the Gaia hypothesis.⁴³

Based on the long-term monitoring and analysis of data, the IGBP drew on complex models, simulation, and the Earth Observing System (EOS). From the very beginning, the ICSU president, British biochemist John Kendrew, put a great emphasis on the novelty of this project. He defined the IGBP as “the most ambitious, the most wide-ranging and, in its impacts on our understanding of the future possibilities for mankind, the most important project that the ICSU has ever undertaken.”⁴⁴ This rhetoric was central to the constitution of the IGBP and served to attract scientists from many countries. Interdisciplinarity was key to the IGBP’s legitimation in the policy and scientific world.⁴⁵ Since ICSU launched the program, it had to be international in scope, but this partially collided with what seemed to be an initiative supported solely by US government agencies.

Although established in 1986 at the twenty-first ICSU general assembly (in Bern, Switzerland), the IGBP’s planning process started in the 1970s when

43. W. Steffen, K. Richardson, J. Rockström, J., et al., “The emergence and evolution of Earth System Science,” *Nature Reviews Earth & Environment* 1 (2020): 54–63.

44. Sybil P. Seitzinger et al., “International Geosphere-Biosphere Programme and Earth system science: Three decades of co-evolution,” *Anthropocene* 12 (2015): 3–16, on 5.

45. Chunglin Kwa, “The programming of interdisciplinary research through informal science-policy interactions,” *Science and Public Policy* 33, no. 6 (2006): 457–67.

there was a lot of uncertainty and tension over which disciplines had to be included and what trajectories it had to follow.⁴⁶ Preparatory talks at the international level had started at the previous assembly in Ottawa, and by October 1985, four working groups were established: (1) terrestrial ecosystems and atmospheric interactions, (2) sea ecosystems and atmospheric interactions, (3) geological processes in the past and today, (4) upper atmosphere levels and near cosmic space. Results from the ICSU's Committee on Space Research and Remote Sensing (COSPAR) informed preliminary discussions, too.⁴⁷

Like the MAB, the IGBP emphasized the notions of biosphere and geosphere, stressing the focus on biogeochemical apparatus and climate system. But when it came to the topic of climate, its promoters essentially deferred to the work of the World Meteorological Organization (WMO).⁴⁸ The IGBP arose in connection with the World Climate Research Programme (WCRP), established in 1980, jointly sponsored by ICSU, WMO, and (only later) UNESCO.

IGBP scientists sponsored new disciplines in environmental and earth sciences more than interdisciplinary efforts to solve the land-use problems that were so central to the MAB. As Thomas Rosswall argued, during the IBP it was very difficult to get communication going among zoologists, botanists, hydrologists, and others in the push to shape ecosystem science. But with the IGBP, it became possible to expand the horizons.⁴⁹ Breaking off from the previous programs, John Kendrew, Herbert Friedman, and Thomas Malone proposed a view of the earth intended to revise the general understanding of the biosphere.

This understanding was facilitated by the IGBP's scientific and institutional intertwinement with Earth system science (ESS), which originated in the 1983 NASA Earth System Sciences Committee, chaired by meteorologist Francis Bretherton. The committee prepared a report with the goal of obtaining a scientific understanding of the Earth system by describing how its interactive parts have evolved, "how they function, and how they may expect to continue

46. Chunglin Kwa, "Local Ecologies and Global Science: Discourses and Strategies of the International Geosphere-Biosphere Programme," *Social Studies of Science* 35, no. 6 (2005): 923–50.

47. Miloslav Kopecký et al., eds., *Geosféra-biosféra-globální změny = Geosphere-Biosphere-Global Changes. International Programme of the ICSU: Přípravná konf. Čes. Budějovice 27.-28. 5. 1987, Nár. komitét IGBP ČSAV: Sborník ref. Mezinárodní program ICSU.* (Ondřejov: ČSAV, Astronomický ústav, 1988), 4.

48. WMO, *A Response to the Weather and Climate Challenge: The World Weather Watch*, WMO-No. 821 (Geneva: WMO, 1995).

49. "Reflections on Earth-system Science," *IGBP'S Global Change Magazine* 84 (Nov 2015): 8–13.

to evolve on all timescales.”⁵⁰ The approach underlying the establishment of ESS countered the one promoted by Kovda and inspired by Vernadsky’s biogeochemistry. ESS developed a mechanistic understanding of the Earth system, understood as a uniform, linear system portrayed by the 1986 Bretherton diagram. Adopted for at least ten years after the establishment of the IGBP, it illustrated the Earth system as a simple physical circuit in which the impact of humanity on the Earth system processes—well emphasized by Vernadsky’s biosphere-noosphere theory—played a rather marginal, passive role.⁵¹ The annexed report asserted that the main challenge for ESS was to develop the capacity to predict changes that would occur over the next decades, “both naturally and in response to human activity.”⁵² NASA pursued these tasks by using space to observe the earth through remote sensing technologies. Research, analysis, and modelling of the earth used data acquired from at least fifty NASA satellites (for example, Landsat, EOS)—a set of Earth observations that would disentangle the complex relations between the earthly components. Earth system research was thus oriented toward a wide application of space surveillance and monitoring, which constituted the main research line within the IGBP as well.

NASA’s Herbert Friedman and Thomas Malone endorsed the research shift toward remote sensing. Friedman was a solar physicist and a former member of Nixon’s Science Advisory Committee, of the General Advisory Committee to the Atomic Energy Commission, and of the Space Science and Governing Boards of the US National Academy of Sciences.⁵³ He was born to a Jewish family with strong Zionist beliefs, and his mother came from Russia.⁵⁴ He pioneered research on radioactive dust as an indicator of nuclear explosions. Indeed, he helped detect the first nuclear explosion in the USSR, providing such detailed information that at one point Stalin believed there was a spy in

50. National Research Council, *Earth System Science: Overview: A Program for Global Change* (Washington, DC: The National Academies Press, 1986); <https://doi.org/10.17226/19210>.

51. Ola Uhrqvista and Eva Lövbrand, “Rendering global change problematic: The constitutive effects of Earth System research in the IGBP and the IHDP,” *Environmental Politics* 23, no. 2 (2014): 339–56.

52. National Research Council, *Earth System Science* (ref. 50).

53. Friedman had been an organizer of the International Geophysical Year in 1957–58, and 25 years later he intended to organize another collaborative scientific effort like it.

54. Friedman recalled in one of his interviews that he often asked her to translate Russian articles for him. See Herbert Friedman, Interview by Richard F. Hirsh, Niels Bohr Library & Archives, American Institute of Physics, College Park, MD USA, www.aip.org/history-programs/niels-bohr-library/oral-histories/4613 (21 Aug 1980).

his bomb program.⁵⁵ Friedman collaborated with NASA for many years on building the first satellite for astronomical observation, and was a member of NASA's top advisory committee. At the same time, he was a key scientist in the US defense program.⁵⁶ Friedman was the man behind the NASA-backed constitution of the IGBP, which he proposed in 1982. But his interests were definitely not in environmental sciences or planetary ecology; they were rather in space science, sounding rocketry, and nuclear energy. Nevertheless, defending the principle of environmental cooperation and the urgency of addressing global change was a political desideratum. He had learned the art of diplomacy during his time within Nixon's Science Advisory Committee.

The second important figure in the IGBP, Thomas Malone, president of both the American Meteorological Society and the American Geophysical Union, was SCOPE's secretary general when the program was established. Malone also played an important role in the foundation of the Intergovernmental Panel on Climate Change (IPCC) in 1988. He praised Vernadsky's ideas as a source of inspiration, mentioning the MAB in the first International Symposium of Global Change, held in Ottawa, but he also believed that the IGBP should go in a different research direction.⁵⁷

When the IGBP was promoted, East-West environmental cooperation had already given way to mutual suspicion. Détente efforts had become less effective (partly due to the quarrel about Third World countries), and peace talks abruptly stopped when the Soviet forces invaded Afghanistan in 1979.⁵⁸ In 1983, Reagan launched the Strategic Defense Initiative (SDI), further undermining East-West relations. This resulted in strong deterioration of the détente and opened a phase of renewed tensions and especially of nuclear rivalry. When the US announced their withdrawal from UNESCO in 1984, the main concern was that the Soviets would use this as an opportunity to gain even more influence in those arenas in which they were already strong.

55. Frank Press, "Biographical Memoirs, Herbert Friedman," *Proceedings of the American Philosophical Society* 146 (2002): 196–204.

56. *Ibid.*

57. Malone and Roederer, *Global Change* (ref. 33); Thomas Malone, "Global Change," in *The Biosphere and Noosphere Reader*, ed. Paul R. Samson and David Pitt (London: Routledge, 1999), 131–34.

58. See Rindzevičiūtė, *The Power of System* (ref. 3); Evangelista, *Unarmed Forces* (ref. 3); and Raymond L. Garthoff, *Détente and Confrontation: American-Soviet Relations from Nixon to Reagan* (Washington, DC: Brookings Institutions, 1985.)

In the report that examined possible Soviet reactions to the US withdrawal, these concerns emerged clearly. US Directorate of Intelligence and analysts in the Office of Global Issues estimated that the Soviets had leadership in the education sector because they headed the International Institute for Education Planning and the UNESCO library. Moreover, a Soviet Armenian, Sema Tanguiane, was Assistant Director General for Education. Most importantly, the Soviets and the Eastern bloc controlled much of the natural sciences agenda through the MAB, a program that they had politicized, according to the memorandum, turning it into a Soviet initiative that propagandized research on ecological consequences of the nuclear war and the Nuclear Winter.⁵⁹

Thus, the IGBP evolved in a divisive situation where US-Soviet scientific collaboration coupled with political antagonism. These circumstances made US scientists more eager to find ways to use the IGBP as a diplomacy device to counter the Soviet ascendancy in MAB specifically and in the UNESCO natural sciences sector more generally. While the IGBP did not target the Third World directly, in different phases of its development and articulation, questions of economic development, biodiversity, and resource management featured prominently. For example, the IGBP plan intended to build a network of regional research centers in the developing world.⁶⁰ Moreover, another IGBP scientist, geologist William S. Fyfe, concluded his presentation by maintaining that the IGBP would allow the establishment of monitoring stations that would provide a new stimulus for education in the developing world and contribute to better management of the biosphere.⁶¹ At the 1984 Global Change Symposium in Ottawa, Kendrew insisted that a global approach to the world's environmental problems and its connection with development was the main IGBP objective. But Kendrew did not persuade everybody in the audience. Some participants claimed not to know if new studies were needed. For example, Tim Beardsley reported that the program would divert attention and resources from the WCRP.⁶²

In 1985, after the Ottawa meeting, US scientists in their country's IGBP Committee expressed their wish to lead the IGBP and that pilot programs

59. CIA Directorate of Intelligence, "Soviet Response to US Withdrawal from UNESCO," memorandum (Washington, DC, 18 Oct 1984).

60. Steffen et al, "The emergence and evolution" (ref. 43).

61. William Fyfe, "The International Geosphere-Biosphere Programme," in Malone and Roederer, *Global Change* (ref. 33), 507.

62. Tim Beardsley, "Future Imperfect: Concern about global climate percolates up to government," *Scientific American* 260, no. 2 (1989): 14-16.

should start prior to the approval of the ICSU.⁶³ The US government did not seem to be concerned about the ICSU reaction; extra US grants to make up for its withdrawal from UNESCO secured its support.⁶⁴ At the same time, the USSR adopted a new strategy to promote and stimulate the development of environmental sciences. Although it remained in line with the bilateral framework of the US-USSR Agreement on Cooperation in the Field of Environmental Protection from 1972, the beginning of perestroika shaped proceedings. The Soviets wished to maintain the hegemonic control of Soviet bloc countries. Yet, instead of investing in global institutions and infrastructures, they decided to restructure the environmental cooperation within the COMECON and adopt the IGBP program as a part of the COMECON science and technology agenda.⁶⁵

Eastern European states interested in taking part in the program were allowed to join; nevertheless their participation was limited to local research and local projects, without obvious ambitions to understand the global challenge the IGBP brought to the table. The USSR was much more cautious toward international ambitions of small Eastern European states and thus limited necessary information to a minimum. For instance, the Czechoslovak IGBP report was largely based on Western European and American literature, whereas Soviet sources, reports, and academic papers were hardly ever mentioned (lacking reference even to Vernadsky and Soviet biosphere theories).⁶⁶

The US IGBP committee sought instead to use the program to acquire a global consensus on its own approach. Its scientists used the ICSU as a platform of legitimization to reinforce the narrative of the program's "globalism"⁶⁷

63. US Committee for an International Geosphere-Biosphere Program, *Global Change in the Geosphere-Biosphere: Goals for International Action, Draft Report* (1985); quoted in Kwa, "The programming of interdisciplinary research" (ref. 46).

64. Frank Greenaway, *Science International: A History of the International Council of Scientific Unions* (Cambridge: Cambridge University Press, 1996), 187.

65. Michael Charles Kaser, *Comecon: Integration problems of the planned economies* (London: Oxford University Press, 1965); Doubavka Olšáková, "Im globalen Netzwerk? Die Planung der wissenschaftlich-technischen Entwicklung der Tschechoslowakei von der Sowjetisierung bis zu den ersten Integrationsversuchen in den sozialistischen Block." *Bohemia: Zeitschrift für Geschichte und Kultur der böhmischen Länder* 57, no. 2 (2017): 25–54.

66. Kopecky et al., eds., *Geosféra-biosféra-globální změny = Geosphere-Biosphere-Global Changes* (ref. 47).

67. On different meanings and approaches of "global" and "globality," see Rindzevičiūtė, *The Power of System* (ref. 3). According to Rindzevičiūtė, Soviet scientists were already using the word "global" in the 1950s to refer to geophysical, ecological, and planetary processes, and used the word "globalism" in a negative way, especially to refer to the US ambition for world hegemony.

through a series of agreements at international and national levels. Malone was very influential within the ICSU, first as its treasurer until 1982 and later as a member of the board. He used his role at the ICSU as a vehicle to legitimize the IGBP internationally. However, once signed by the IGBP's committee, these agreements did not always lead to implementation.⁶⁸ The promoters sought to persuade the world's top environmental and earth scientists by making the "biosphere" appear as an old-fashioned notion based on an obsolete paradigm that lagged behind, both scientifically as well as technologically, the US-American concept of the Earth system. According to this view, the biosphere should be integrated into contemporary studies, using innovative technologies of remote sensing provided by NASA.⁶⁹

A specialist in geography and cryospheric research, Vladimir M. Kotlyakov, headed the Soviet IGBP national committee.⁷⁰ Its reports emphasized achievements in polar science and glaciology rather than in biosphere modelling, atmospheric sciences, or climate change. Kotlyakov had been a key contributor to glaciological studies and to the development of modern, remote-sensing glaciological techniques, which had been used in the Soviet exploration of Antarctica. In the running of these studies he had worked together with British and US colleagues, embracing their techniques and modelling to chart ice flow.

Contrary to Kotlyakov, Soviet scientists who supported biosphere studies, such as Nikita N. Moiseev, a member of SCOPE and a full participant in the MAB,⁷¹ and his collaborators (Vladimir V. Aleksandrov, Georgii L. Stenichkov, and Alexander M. Tarko), never took part in the IGBP. Tarko attended

See also Robert O. Keohane and Joseph S. Nye, "Introduction," in *Governance in a Globalizing World*, eds. Joseph F. Nye and John Donahue (Cambridge, MA: Brookings Institution Press, 2000).

68. Caldwell, "Cooperation and Conflict" (ref. 17).

69. Fyfe, "The International Geosphere-Biosphere Programme" (ref. 61). This tension is otherwise documented by the fact that two Soviet representatives at ICSU, V. K. Dobroselsky and A. A. Kokoshin, both prominent science diplomats who were granted the right to travel for scientific purposes by the Soviet government, were denied access to the Global Change Symposium in Ottawa. This made Canadian officials anxious and produced international concerns over the ICSU commitment. See Tim Beardsley, "Visas Denied," *Nature* 311 (1984): 402.

70. Natalia M. Bogolyubova and Julia B. Nikoaleva, *Mezhhkul'turnaya Kommunikatsiya y Mezhdunarodnij Kul'turnij Obmen* (Moscow: Litres, 2017).

71. "Basic Concepts of Environmental Education," *Connect: UNESCO-UNEP Environmental Education Newsletter* 15, no. 2 (1990): 1-4, <http://unesdoc.unesco.org/images/0015/001535/153573eo.pdf>.

the 1984 Global Change Symposium in Ottawa, but did not offer any contribution when the IGBP was officially established.⁷²

INTEGRATING THE BIOSPHERE AND THE EARTH SYSTEM

When the IGBP was launched at the twenty-first assembly of the ICSU in 1986, the MAB was not even mentioned—a surprise to some participants.⁷³ The lack of international scientific coordination between the two programs in the early planning years partly derived from the overlap of different research priorities revolving around atmospheric and climate sciences. If a holistic notion of the Earth system and its biogeochemical structure was the major focus of the IGBP (as IGBP advocate William Fye also claimed in his presentation), research promoted within the MAB could have certainly contributed to these efforts. We assume that limiting the Soviets' involvement in the IGBP was, then, a move intended to concentrate the efforts of constituting an Earth system program in the hands of NASA and the National Science Foundation. Moreover, Soviet work on climate change and modelling was increasingly marginalized in the 1980s, during the foundational work of the IPCC.⁷⁴ At the same time, US IGBP scientists tried to foster international networks of cooperation, but these efforts were tangential to the IGBP's agenda.⁷⁵ Political tensions lay behind what we term the “marginalization” of biosphere studies within the IGBP, which involved the roles played by UNESCO and the ICSU in the Cold War geopolitical context.

Another interesting example is the 1988 publication of the article entitled “Global Change: Geographical approaches,” a review prepared by Kotlyakov and Gilbert F. White, discussing the historical roots of the Earth system conception,

72. Jesse Ausubel (a leader of climate research at the East-West think tank, International Institute for Applied Systems Analysis) learned about the Russian work on biosphere studies from Kovda, and invited Moiseev and colleagues to write an article on “Biosphere Models” for a special issue of *SCOPE*, which he co-edited with Robert Kates and John Wiley. See N. N. Moiseev, Yu. M. Svirezhev, V. F. Krapivin, and A. M. Tarko, “Biosphere Models,” in “Climate Impact Assessment,” ed. Robert W. Kates et al., special issue, *SCOPE* 27 (1985): 493–510.

73. Jacques Grinevald, email correspondence with Giulia Rispoli, 19 Jul 2018.

74. Jonathan Oldfield, “Imagining climates past, present and future: Soviet contributions to the science of anthropogenic climate change, 1953–1991,” *Journal of Historical Geography* 60 (2018): 41–51.

75. Lack of cooperation with the UNEP and the need to increase research in biodiversity were highlighted by the bureau of external evaluators of the IGBP. See Kwa, “Local Ecologies” (ref. 46).

the role of UNESCO in fostering biosphere studies through the MAB, and the need for the IGBP to embrace wider research trajectories. The authors lamented the lack of focus in the IGBP on the study of landscape heterogeneity.⁷⁶ This report documented the discussions that US and Soviet scientists had in Moscow, Washington, and Portland (OR) between April and July 1987. It represented a chance to focus on questions such as evolutionary geography, terrestrial landscapes, and ecosystem modelling that needed to overcome simplistic physical assumptions made by the NASA committee. The Soviets took advantage of this reductionist approach to insist on a more robust and active contribution by the IGBP social scientists in an effort to emphasize the MAB's orientation around culture and education. Indeed, the IGBP failed to include enough social sciences and humanities in the study of global change, and this was seen as a weakness.⁷⁷

A notable attempt at providing an integrated study of the biosphere and the Earth system was the program Sustainable Development of the Biosphere,⁷⁸ promoted and coordinated by William C. Clark, an American ecologist and environmental policy analyst. Established in 1985 under the aegis of the IIASA, the scheme led to a series of meetings in the US, the Soviet Union, Canada, and Germany.⁷⁹ Its three main objectives consisted of explaining in policy terms the global ecological and geophysical systems as linked with industrial and resource development activities, and ways of promoting interactions between the global environment and regional development.⁸⁰

At one of Moscow's more significant planning meetings, it was agreed to change the project's title to Ecologically Sustainable Development of the Biosphere to emphasize its ecological dimension. Yuri Izrael (an influential WMO climate change researcher) and the IIASA director Thomas Lee signed the 1985 memorandum for collaboration between Soviet and IIASA scientists. The research program was launched as a new biosphere project emphasizing biogeochemical processes and their connections with climate. The plurality of the perspectives in focus as well as the interest in exploring historical attempts

76. V. M. Kotlyakov, J. R. Mather, G. V. Sdasyuk, and G. H. White, "Global change: Geographical approaches (A Review)," *Proceedings of the National Academy of Sciences USA* 85 (1988): 5986–91, on 5987. V. M. Kotlyakov, *Nauka, Obshchestvo, Okruzhayushchaya Sreda* (Moscow: Nauka, 1997).

77. Uhrqvista and Löwbrand, "Rendering global change problematic" (ref. 51).

78. William C. Clark and Robert E. Munn, eds., *Sustainable Development of the Biosphere* (Cambridge: Cambridge University Press, 1986).

79. Ibid.

80. Ibid.

to articulate human-environment interaction was clear from the very beginning. As stressed by Richard E. Munn, the leader of the IIASA environment program, “the Project on Ecologically Sustainable Development of the Biosphere seeks to clarify the policy implications of long-term, large-scale interactions between the world’s economy and its environment.”⁸¹ They have emphasized the need to integrate human and social sciences into Earth system management studies to increase the awareness of the importance of sustainability practices.⁸² The case studies launched within the IIASA project on sustainable development aimed to gain such a general overview of possible scenarios for future development and to “identify meaningful policy options, including institutional, technological and research/monitoring responses, that should be pursued to deal with these effects.”⁸³

The IIASA program meant to overcome the shortcomings present in both the MAB and the IGBP. The focus on local ecologies of the former would prevent a real approach to address global concerns, while the IGBP’s exclusive focus on global views would disregard local and regional studies. In the 1987–88 MAB report, these shortcomings surfaced more clearly, as “the importance of global environmental change has led MAB to pitch research at a larger scale than hitherto and seek to cooperate closely with emerging global programs such as the IGBP, *although the precise range of IGBP activities is still to be determined and do not include human and social sciences.*”⁸⁴

Now, if the difference between the IBP (a non-governmental program focused on life-support systems and genetic resources, and coordinated by the ICSU) and the MAB (an inter-governmental program bringing into focus the urban context and human-made transformations of the biosphere, and coordinated by UNESCO) was somewhat clear, US research on global change, which turned into the IGBP, was instead characterized by looser and more confused objectives in its initial phase.⁸⁵

81. Richard E. Munn, Foreword to *Social and Economic Consequences of Forest Decline in Czechoslovakia*, by Jaroslav Stoklasa and Peter Duinker (working paper WP-88-28, IIASA, Laxenburg, 1988), on 5.

82. William C. Clark and Nancy M. Dickson, “Sustainability science: The emerging research program,” *Proceedings of the National Academy of Sciences* 100, no. 14, (2003): 8059–61.

83. B. R. Doos, Foreword to Harald Thomasius, Mario Marsch, and Jörg Wollmerstädt, *A Model to Explore Responses of Spruce Stands to Air-Pollution Stress in Europe* (working paper WP-89-93, IIASA, Laxenburg, 1989), on 5.

84. *Man and the Biosphere (MAB) Programme Biennial Report, 1987–1988* (UNESCO, 1989) (emphasis added).

85. Kwa, “Local Ecologies” (ref. 46).

At the symposium that marked the debut of the IGBP in 1984, Italian ecologist Francesco di Castri, the secretary of the international coordinating council of the MAB and SCOPE vice-president, opened the proceedings by saying that the same research topics introduced by UNESCO many years before were often re-proposed in different contexts as new trends.⁸⁶ According to di Castri there was a considerable overlap of program objectives exacerbated by the new orientation of SCOPE and the MAB.⁸⁷ Repetitions and thematic overlaps among large-scale international programs was evidence that cooperation had not been a priority, but rather an tool to attain political influence abroad.⁸⁸

Robert Kates, professor emeritus at Brown University, and Martin Price from the National Center for Atmospheric Research (NCAR) stressed that more cooperation between existing programs—in particular the MAB, SCOPE (which they thought needed to be updated with studies of climate-society interaction), and the IGBP—was necessary “to limit redundancy and competition and build on proven strengths.”⁸⁹ In his extended comment entitled “The Human Use of the Biosphere” that appeared in the proceedings of the Global Change Symposium,⁹⁰ Kates pointed out that environment-oriented human sciences should meet with policy-oriented Earth sciences to forge interdisciplinary knowledge. Furthermore, such cooperation should be expanded by the program on the Sustainable Development of the Biosphere. Kates noted that there was a true shortage of first-class human scientists prepared to devote themselves to a truly interdisciplinary program interested in the interdependencies of nature, technology, and society, but their absence was a negative portent for the emerging IGBP.⁹¹ Like Gilbert White, Robert Kates was also softly dissenting from the IGBP’s national agenda. In their work, they both addressed issues of human use and exploitation of natural resources, and anthropogenic hazard and mitigation that were more aligned to MAB’s objectives, whereas the focus on earth’s monitoring seemed to enlarge

86. Di Castri, “Twenty Years” (ref. 33).

87. Martin F. Price, “Humankind in the Biosphere: The evolution of international interdisciplinary research,” *Global Environmental Change* 1 (1990): 3–13.

88. Di Castri, “Twenty Years” (ref. 33).

89. Price, “Humankind in the Biosphere” (ref. 87), 13.

90. Robert Kates, “Human Use of the Biosphere,” in Malone and Roederer, *Global Change* (ref. 33), 491–93.

91. *Ibid.*

the distance and divert attention from concrete problems of economic development and environmental sustainability.

CONCLUSION

This article has shown that the articulation of global environmental research during the Cold War—especially through three programs, the IBP, MAB, and IGBP—reflects phases of détente and hostility between the US and the USSR. Even though international environmental research seems to have an independent life that is not entirely subjugated to Cold War geopolitical competition (also given the genuine engagements of some scientists involved in environmental agenda), it ended up being instrumental to achieve US-USSR foreign policy objectives. For example, we have shown how the role and prominence of Soviet and Eastern European scientists in the IBP and the MAB was highly recognized and had quite a significant impact on the international socio-ecological research. After the opening of international cooperation across the Iron Curtain, the Soviets started to use non-communist international organizations such UN, UNESCO, or ICSU as a legitimated means for multilateral diplomacy on the global environment, especially through their promotion of biosphere studies within UNESCO. They were successful, considering that researchers such as Viktor Kovda significantly influenced the agenda of life and environmental sciences in 1960s and 1970s.

With the IGBP and the debut of Earth system science, the involvement of the Soviets met some apparent limitations. Before the IGBP was established, important political events happened. The US left UNESCO, and among other reasons, there was a preoccupation about the growing Soviet influence on natural science research, education, and communication in developing countries. Détente was compromised as the Soviets invaded Afghanistan and Reagan launched the Strategic Defense Initiative in 1983. The USSR reacted by focusing on a purely Soviet-style model, focusing on Eastern European bloc policy as a way to consolidate its power in the Cold War political order. The US jumped on the occasion and countered the international influence of Soviet science in biosphere research by establishing the Earth system enterprise.

US scientists involved in the IGBP program insisted on a revolutionary Earth system notion, which can be seen as an alternative model to the Soviet idea of the biosphere. It could also serve to reduce the influence that biosphere studies might play in global affairs and especially in Third World countries,

where the Soviets had been trying to gain influence by promoting long-term projects that contemplated environmental education as a part of a larger program of economic development and planning.

The diplomacy angle of this scientific development was that US-sponsored organizations such as NASA took advantage of the Soviet loss of institutional footing to strengthen global consensus around Earth system science. International scientific policy concerning the Earth system was primarily shaped and set on its path by US scientists and institutions, notwithstanding the initial claims about promoting and pursuing truly international cooperation. The problem of a technological gap between the use and understanding of large research infrastructures in the West and in the East, seems to play a certain role too.

US experts presented Earth system science to the world and propagandized global change as a new research trend, partly thanks to the promotion and use of innovative technologies for environmental monitoring through remote sensing that would allow for a big step forward in the environmental sciences.

Finally, the article has shown that while the MAB and IGBP were, to some extent, used to achieve nation-state objectives within a framework of cooperative antagonism, other research pathways surfaced in the 1980s. One of them was the program Sustainable Development of the Biosphere, which never really took off, although it could have offered an occasion to overcome shortcomings present in both the MAB and IGBP in order to unite the biosphere and the Earth system model.

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