Blue Planet Prize

FOR IMMEDIATE RELEASE
June 15, 2022

2022 BLUE PLANET PRIZE: ANNOUNCEMENT OF PRIZE WINNERS

This year marks the 31st awarding of the Blue Planet Prize, the international environmental award sponsored by the Asahi Glass Foundation, chaired by Takuya Shimamura. Every year, the Foundation selects two winners, individuals or organizations who have made significant contributions to the resolution of global environmental problems. The Board of Directors have selected the following 2022 Blue Planet Prize recipients.

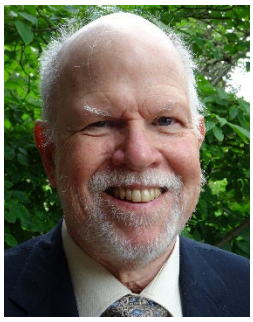
His Majesty Jigme Singye Wangchuck, the Fourth King of Bhutan

Born in the Kingdom of Bhutan, Date of Birth: 11 November, 1955

His Majesty Jigme Singye Wangchuck, the Fourth King of Bhutan, is the visionary leader who introduced the development philosophy of Gross National Happiness (GNH) which places the well being of the people at the heart of development activities and programmes. GNH gives importance to environmental conservation, sustainable and equitable development, and promotion of culture and social values which contribute to collective happiness. Using happiness as a social indicator was taken on by the United Nations and OECD also employed it in their reports, giving inspiration for an alternative paradigm to modern society.

Professor Stephen Carpenter (USA)

Born in the USA, Date of Birth: 5 July, 1952
Emeritus Director of the Center for Limnology,
Stephen Alfred Forbes Professor Emeritus of Integrative Biology, University of Wisconsin-Madison



Professor Stephen Carpenter has conducted research on lake ecosystems for more than 40 years. Through his research on lake eutrophication[1], from nutrients such as phosphorus and nitrogen, he studied the resilience[2] of lakes using mathematical models, providing a new perspective on social-ecological systems. He also worked on the environmental pollution from phosphorus and nitrogen through land use, showing the critical state of the global phosphorus cycle and the need to review human activity from a broad geochemical viewpoint.

- Each recipient is presented with a certificate of merit, a commemorative trophy, and 50 million Japanese yen in prize money.
- We'd like to hold the Blue Planet Prize Award Ceremony and commemorative lectures, which could well be on a smaller scale, while taking proper measures to prevent infection with the new coronavirus. The Award Ceremony is scheduled on Wednesday, October 5, 2022 at Tokyo Kaikan. Commemorative lectures will be given on October 6 and 8, 2022, at the University of Tokyo and at Kyoto University, respectively.
- This press release and the photo of each recipient will be published 11 a.m. on Wednesday June 15 on the website of the Asahi Glass Foundation (www.af-info.or.jp/en).

THE ASAHI GLASS FOUNDATION
2nd Floor, Science Plaza, 5-3 Yonbancho Chiyoda-ku, Tokyo 102-0081 Japan
Tel +81-3-5275-0620 Fax +81-3-5275-0871
E-mail: post@af-info.or.jp URL: https://www.af-info.or.jp

Statements from the Award Recipients upon Notification of Selection

His Majesty Jigme Singye Wangchuck, the Fourth King of Bhutan

I would like to express my deep appreciation to the Asahi Glass Foundation for establishing the Blue Planet Prize to encourage and recognize efforts by committed citizens of the world to protect and restore the health of the Earth's fragile natural environment. The challenges from global warming, air pollution, contaminated water and increasing natural disasters have become so severe that corrective measures require concerted and sustained efforts by nations across the world.

Scientists and economists through their groundbreaking discoveries and research have important roles to play in promoting sustainable ways of balancing economic growth and technological progress along with environmental preservation. Political leadership and their commitment to the efforts of scientists and economists will bring us closer towards planning and taking the steps required to maintain the health of the planet we call home.

Professor Stephen Carpenter (USA)

I am challenged and humbled by the Blue Planet Prize. I deeply believe in the mission of the prize "to repair and preserve the ecosystems that keep us and the multitude of other species with whom we share the Earth alive and well". This mission is the greatest challenge of our time, and we all have much work ahead. I am humbled by the immense accomplishments of past recipients of this prestigious prize, and honored to be among them.

Food and freshwater are essential for all life. The ways we produce food have enormous effects on living systems, including freshwater and the life it supports. With the Blue Planet Prize I will continue my work to build resilience of nature in working landscapes, improve the flow and quality of freshwater, and engage science and the public in the search for transformations that support both life on Earth and human wellbeing.

Report on the Selection Process (2022 Blue Planet Prize)

Nomination forms were sent to approximately 496 nominators in Japan and 847 overseas, and by the deadline, we received a total of 173 nominations. The top three fields represented by the candidates, in order of number, were ecology (37), environmental economics and policy making (35), environmental ethics (23). The candidates represented 49 countries.

After individual evaluation of the 173 candidates by each Selection Committee member, the committee was convened to narrow down the field. The results of their deliberation were examined by the Presentation Committee. The Board of Directors formally decided to award the Prize to **His Majesty Jigme Singye Wangchuck, the Fourth King of Bhutan,** and to **Professor Stephen Carpenter**.

Laureates (1992-2022)

1992	Syukuro Manabe (USA) International Institute for Environment and Development (UK)
1993	Charles D. Keeling (USA) IUCN—The World Conservation Union (headquartered in Switzerland)
1994	Eugen Seibold (Germany) Lester R. Brown (USA)
1995	Bert Bolin (Sweden) Maurice F. Strong (Canada)
1996	Wallace S. Broecker (USA) The M.S. Swaminathan Research Foundation (India)
1997	James E. Lovelock (UK) Conservation International (head-quartered in the USA)
1998	Mikhail I. Budyko (Russia) David R. Brower (USA)
1999	Paul R. Ehrlich (USA) Qu Geping (China)
2000	Theo Colborn (USA) Karl-Henrik Robèrt (Sweden)
2001	Robert May (Australia) Norman Myers (UK)
2002	Harold A. Mooney (USA) J. Gustave Speth (USA)
2003	Gene E. Likens (USA) and F. Herbert Bormann (USA) Vo Quy (Vietnam)
2004	Susan Solomon (USA) Gro Harlem Brundtland (Norway)
2005	Nicholas Shackleton (UK) Gordon Hisashi Sato (USA)
2006	Akira Miyawaki (Japan) Emil Salim (Indonesia)
2007	Joseph L. Sax (USA) Amory B. Lovins (USA)
2008	Claude Lorius (France) José Goldemberg (Brazil)
2009	Hirofumi Uzawa (Japan) Nicholas Stern (UK)
2010	James Hansen (USA) Robert Watson (UK)
2011	Jane Lubchenco (USA) Barefoot College (India)
2012	William E. Rees (Canada) and Mathis Wackernagel (Switzerland) Thomas E. Lovejoy (USA)
2013	Taroh Matsuno (Japan) Daniel Sperling (USA)
2014	Herman Daly (USA) Daniel H. Janzen (USA) and Instituto Nacional de Biodiversidad (INBio)
2015	Partha Dasgupta (UK) Jeffrey D. Sachs (USA)
2016	Pavan Sukhdev (India) Markus Borner (Switzerland)
2017	Hans J. Schellnhuber (Germany) Gretchen C. Daily (USA)
2018	Brian Walker (Australia) Malin Falkenmark (Sweden)
2019	Eric Lambin (Belgium) Jared Diamond (USA)
2020	David Tilman (USA) Simon Stuart (UK)
2021	Veerabhadran Ramanathan (USA) Mohan Munasinghe (Sri Lanka)
2022	Jigme Singye Wangchuck, the Fourth King of Bhutan Stephen Carpenter (USA)

For more information, please contact: Toshihiro Tanuma, PhD

THE ASAHI GLASS FOUNDATION
2nd Floor, Science Plaza, 5-3 Yonbancho Chiyoda-ku,
Tokyo 102-0081 Japan
Phone +81-3-5275-0620, Fax +81-3-5275-0871
e-mail: post@af-info.or.jp, URL: https://www.af-info.or.jp

Supplementary Information
Profiles of the 2022 Blue Planet Prize Recipients

His Majesty Jigme Singye Wangchuck, the Fourth King of Bhutan

Major research achievements and activities

His Majesty Jigme Singye Wangchuck, the Fourth King of Bhutan[1] was the youngest monarch in the world when he came to the throne at the age of 16 in 1972. During his 34 years reign, he brought about unprecedented socio-economic development and political transformation to the small landlocked Himalayan kingdom of Bhutan. His accomplishments and activities are vast, and profoundly instrumental to safeguarding Bhutan's security and sovereignty, and through compassionate governance that kept the people at the center of development.

In the arena of foreign policy, the Fourth King crafted a wise and pragmatic approach to bilateral and international relations. He strengthened friendships with important developmental partners and nurtured good relations with neighbours. A patriot, an astute diplomat and strategist, he time and again secured Bhutan's security and sovereignty through fortitude and resolve.

On the socio-economic front, King Jigme Singye Wangchuck's reign saw great progress bringing a nation into modernity without losing its essence and identity. Rapid development[2] was undertaken anchored by the firm belief that it should be done to improve the quality of life and contentment of his people. The development philosophy of Gross National Happiness came about in order to find that balance. The core areas of focus were, the preservation of a pristine natural environment, Bhutan's rich cultural heritage and value systems to promote social harmony and sense of belonging and well being in the community. Second, was development that was carefully planned to ensure sustainable and equitable benefits across the country. Third and importantly, was good governance that is essential for the successful implementation of policies.

King Jigme Singye Wangchuck's policy on environmental conservation was far ahead of its time. He made certain that Bhutan refrain from exploiting its rich forest resources for short-term gain and instead invested in the preservation of a pristine natural environment for future generations. As a result today, 51.4 percent of Bhutan's total land area has been designated as protected areas and biological corridors and 71% remains under forest cover, which is well above the minimum 60% mandated by the constitution of Bhutan. Bhutan is also one of the few countries that is carbon negative[3] and has committed to remaining carbon neutral.

Equally ahead of its time was a Tourism policy of 'High Value, Low Volume[4]' that would bring in foreign exchange while proactively avoiding the impacts on the cultural landscape and natural environment.

King Jigme Singye Wangchuck's most remarkable decision was the political changes he brought to Bhutan and his abdication at the height of his power and popularity in 2006, after having set the stage for the establishment of parliamentary democracy. Democracy came to Bhutan in a planned manner, starting from the grassroots level with local governments in 1981, and handing over of executive power to the Council of Ministers in 1998, and finally democracy in 2008. His Majesty oversaw the drafting of Bhutan's Constitution, and even took the draft Constitution to be discussed at public meetings in the 20 districts of Bhutan where one member from every household was present, and whose comments were incorporated, and then adopted by parliament.

Enshrined in Bhutan's constitution is the pursuit of Gross National Happiness[5] and all the parameters that enable the contentment of the people. It was the culmination of The Fourth King of Bhutan's many achievements and lessons learnt for the future generations.
Today, His Majesty King Jigme Singye Wangchuck is widely referred to as The Great Fourth by His people.

Notes:

***1 The Kingdom of Bhutan**

The Kingdom of Bhutan is located to the east of Nepal, at the eastern end of the Himalayas, and is bordered by China and India. Its capital is Thimphu. The country's total land area is 38,394 km2 (about the same size as Taiwan) and has a population of approximately 770 thousand (as of 2020).

***2 Bhutan's development plans**

Bhutan has been formulating a five-year Plan (FYP), every five years since 1961. The five-year Plans are the most important economic development plan formulated by the government.

The term "gross national happiness (GNH)" appeared in a FYP for the first time in the 8th FYP (1998-2003). GNH was stipulated as the official guiding principle of Bhutan in the 9th FYP (2003-2008) including the four areas of sustainable & equitable socio-economic development, environmental conservation, preservation & promotion of culture, and good governance, which were later designated as the four pillars of GNH. The nine domains were set forth for the first time in the 10th FYP (2008-2013) as the GNH index for evaluating the progress of GNH.

Reference: Gross National Happiness Commission https://www.gnhc.gov.bt/en/central-five-year-plan/)

***3 Carbon negative**

Carbon negative is a state in which the amount of the greenhouse gases being removed from the atmosphere (e.g., CO_2 absorption by forests) is greater than the amount emitted through human activities. It is also referred to as carbon minus. A state in which both amounts are equivalent is called "carbon neutral."

***4 High Value, Low Volume (Bhutan's tourism industry)**

Ever since Bhutan opened itself to foreign tourists in 1974, the country has been focusing on ecotourism and cultural tourism, promoting "High Value, Low Volume" tourism. Tourism in Bhutan is regarded as a significant driver for enhancing happiness and well-being of its people. Bhutan focuses on sustainable tourism as an industry with potential to contribute to the country's socio-economic development, while minimizing the impact on its nature and culture. In the Kingdom, foreign tourists are not allowed to travel freely in the country (except for passport holders from India, Bangladesh, and Maldives), and all tours to Bhutan are pre-arranged by a licensed Bhutanese tour operator, which requires advance payment of the minimum package tour cost of 250 US dollars per tourist per day, including all the costs for a tour guide, accommodation, and meals. The 57,934 foreign visitors to the country (excluding those from India, Bangladesh, and Maldives) in 2014 brought an income of 73.2 million US dollars to the Royal Government. (Reference: Toyoda, Tetsuya. (2016). Nature Conservation Policy as Tourism Strategy: Possibility of Nature-Human Symbiosis in Bhutan. Journal of the Institute for Asian Studies and Regional Collaboration Akita International University, (3), 1-11)

***5 Gross national happiness (GNH)**

GNH is a concept in which economic growth is not prioritized and instead the happiness and well-being of the people are aspired to with emphasis on traditional culture and society, the will of the people. The concept is based on Buddhist values. GNH has four pillars including environmental conservation and preservation & promotion of culture. The four pillars are further classified into nine domains of GNH. Four nationwide surveys using questions such as if the members of the family really care about each other, if they have lost much sleep over through worry, if they plant trees around their farms and houses, and about the distance to a hospital," have been conducted to date from a preliminary survey in 2006 to the third survey in 2015.

The four pillars of GNH

・Sustainable & equitable socio-economic development

・Environmental conservation

・Preservation & promotion of culture

・Good governance

The nine domains of GNH

Psychological well-being, health, education, cultural resilience and promotion, community vitality, environment, time use, living standards, and good governance

***Examples of using happiness as a social indicator**

Well-being Indicators

The OECD compiled a conceptual framework for "measuring well-being and progress" and published it in 2011 in the Compendium of OECD Well-being Indicators. The Compendium suggests that well-being indicators should include two factors, "material living conditions" and "quality of life." Furthermore, it is stated that the former should consist of three items, 1) housing, 2) income and wealth and 3) jobs and earnings; and the latter, eight items, 1) social connections, 2) education and skills, 3) environmental quality, 4) civic engagement and governance, 5) health status, 6) subjective well-being, 7) personal security, and 8) work and life balance. It is also stated that, in addition to the two factors, although the sustainability of the socio-economic and natural systems should also be included to access the level of well-being, indicators of sustainability have not been employed because suitable indicators for the sustainability have not been developed yet.

(Reference: Cabinet Office. (2017). Heisei nijuhachi nendo kodomo no hinkon ni kansuru aratana shihyou no kaihatsu ni muketa chosakenkyu hokokusho [FY2016 Research Report towards the Development of new Indicators of Children's Poverty].

World Happiness Report

The World Happiness Report is a publication, based on global survey data on how people evaluate their life and happiness in 156 countries worldwide, by the Sustainable Development Solutions Network (SDSN), a UN research organization. The report publishes a world ranking of happiness. The scores are determined based on individuals' own subjective assessments of their lives, as revealed by their answers to the single-item Cantril ladder life-evaluation question. In addition, six key variables of 1) GDP per capita, 2) social

support (including social security systems), 3) healthy life expectancy, 4) freedom, 5) generosity to others, and 6) corruption are presented to explain how they contribute to life evaluations in each country.
(Reference: World Health Report Website:
https://worldhappiness.report/ed/2020/social-environments-for-world-happiness/)

Prof. Stephen Carpenter (USA)

Major research achievements and activities

Lakes are known as a microcosm of global complex systems. Recognizing this, Professor Steve Carpenter and colleagues have studied lakes using whole-ecosystem experiments for more than 40 years. They have shown that lake productivity[3] responds to apex predators that structure the food web[4] as well as nutrients[5] such as phosphorus and nitrogen. This finding established the importance of healthy fish populations and nutrient control to improve the quality of lakes for human uses.

Carpenter led studies to show that runoff from agriculture and residential areas was a major source of excess nutrients that caused loss of oxygen, fish mortality, and harmful blooms of toxic algae in lakes. This research showed that even deep lakes could shift from a clear-water state to a state of persistent algae blooms. Economic analyses that accounted for this shift showed that costs caused by runoff are much larger than previously known. This understanding created an economic incentive to reduce runoff of phosphorus and nitrogen from the land. The finding also adds to the economic benefits of building apex predator stocks to mitigate algae blooms through trophic cascades[6].

For environmental problems including runoff and lake quality Carpenter recognized that uncertainties are poorly known and often underestimated, and that ordinary citizens are left out of technical decision processes. To increase public participation he coordinated scenario processes for our planet during the Millennium Ecosystem Assessment[7] and regionally for the Northern Highlands and also Yahara watershed of Wisconsin. Scenario processes combine stories of the future with art, public discussions, and quantitative analyses to explore future consequences of present actions.

Carpenter participated with international colleagues to calculate the first quantitative estimates of the Planetary Boundary[8] for phosphorus and its interaction with the planetary boundaries for nitrogen and freshwater. A Planetary Boundary is the outer limit of resource use for human habitation of the planet. Carpenter showed that the planetary boundary for phosphorus is beyond the zone of uncertainty, a risk level higher than climate change. This phosphorus problem[9] raised by Professor Carpenter has given us an opportunity to reconsider human behavior from a geochemical perspective. For example, it triggered initiatives to collect and recycle phosphorus in the EU, US, and Japan to prepare for future shortages of phosphorus.

Academic and Career Background

1974 Amherst College, USA (BA, Biology)
1976 University of Wisconsin-Madison, USA (MS, Botany)
1979 University of Wisconsin-Madison, USA (PhD, Botany/Oceanography and Limnology)
1979-1985 Assistant Professor, Department of Biology, University of Notre Dame (USA)
1985-1989 Associate Professor, Department of Biological Sciences, University of Notre Dame (USA)
1991-2009 Professor, Center for Limnology, and Department of Zoology, University of WisconsinMadison
2000-2001 President, Ecological Society of America
2000-2005 Co-Chair, Working Group on Scenarios, Millenium Assessment of World Ecosystems
2009-2017 Director of the Center for Limnology, University of Wisconsin-Madison

Stephen Alfred Forbes Professor of Integrative Biology, University of Wisconsin-Madison
2009-2018 Chair, Program on Ecosystem Change and Society, International Council of Science
2017- Emeritus Director of the Center for Limnology, University of Wisconsin-Madison
Stephen Alfred Forbes Professor Emeritus of Integrative Biology, University of Wisconsin-Madison
2019-2021 Chair, International Science Advisory Council, Stockholm Resilience Centre

Notes

***1 Eutrophication**

Eutrophication is a phenomenon in which a body of water (a pond, lake, or sea) becomes enriched with nutrients (nitrogen, phosphorus, etc.) due to run-off from the outside. Eutrophication causes blooms of phytoplankton and macroalgae such as blue-green algae, leading to the depletion of oxygen dissolved in the water, which eventually results in the death of fish and algae and deterioration of the water environment. In addition, if that body of water is used as a source of drinking water, eutrophication, sometimes causing problems of unusual odor and taste, makes water purification difficult.

***2 Resilience**

Resilience is the capacity of a complex system to absorb shocks and surprises yet still persist with its basic functions intact. The term is used in many fields, but in recent decades it has been applied to the ability of organizations and ecosystems to adapt to and survive environmental changes.

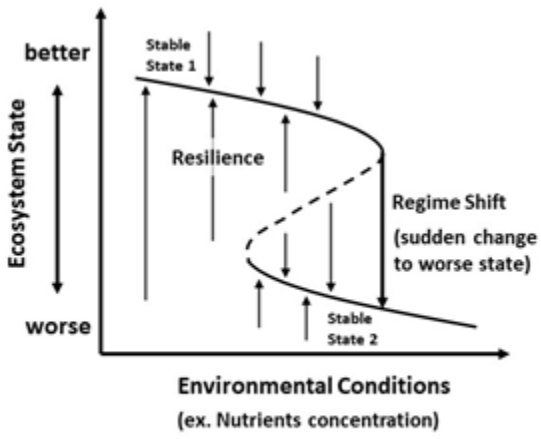


Fig. 1 Bistability, Resilience, and Regime Shift in Ecosystems

In an ecological context, when the resilience of an ecosystem becomes low due to pollution or overharvest, the ecosystem becomes vulnerable to shifting to a different state. Resilience in bistable ecosystems is expressed as the gap between stable and unstable states, and if the disturbance remains within this range, the ecosystem can recover to the original state.

Bistability means that the system has two stable equilibrium states. Since the 1970's, it has been reported that many lake, forest, grassland, and coral reef ecosystems exhibit bistability. Today, multistability (including bistability) is widely recognized in various biotic populations and ecosystems.

The term "regime shift," used in relation to ecosystems means large and abrupt changes in the structure and function of ecosystems from one stable state to a different stable state. It is also called "catastrophic shift." In a bistable ecosystem, even if the system is in a healthy and stable state at present, a slight change in the environment under certain conditions could trigger the system to undergo a regime shift, rapidly degrading to an undesirable state. Furthermore, this change is irreversible; once the state degrades, the state of the ecosystem will not return to the original healthy state, remaining in the undesirable state. Research has been conducted to predict regime shifts using a mathematical model to manage ecosystems.

***3 Productivity**

In the field of ecology, production of organic substances through biological synthesis from carbon dioxide and water is called primary production. It occurs through the process of photosynthesis, a process through which plants produce organic substances using light as its source of energy. However, some bacteria can synthesize organic substances from carbon dioxide without the need for light energy, instead using the oxidation of reducing agents such as ammonia and sulfur as their source of energy (chemosynthesis). Phytoplankton are generally regarded as the primary producers in a lake ecosystem.

***4 Food web**

Food web refers to the overall interconnection of the feeding relationships (who-eats-who) in an ecosystem. This relationship is commonly known as the food chain; but since animals take in a wide range of food in the wild and the interconnections in the food cycle are complicated and more like a web rather than a chain, we thus call it a food web.

***5 Nutrients**

Elements such as silicon, phosphorus, and nitrogen, which are indispensable for the growth and development of phytoplankton, seaweeds, and other plants, exist in seawater mainly in the forms of silicates, phosphates, and nitrates, respectively. These inorganic salts are called nutrients. Nutrients act as fertilizers for the sea and are the foundation of the food chain, because they nurture phytoplankton, which are eaten by zooplankton, and are in turn eaten by fish that feed on zooplankton.

***6 Trophic cascade**

The process of how the predation of fish species at higher levels of the food chain has an impact throughout the food chain structure all the way down to phytoplankton and even water quality, is called the trophic cascade. Improving the water quality and managing the ecosystem through artificial manipulation using this trophic cascade effect is called “biomanipulation.”

***7 Millennium Ecosystem Assessment**

The Millennium Ecosystem Assessment assessed the consequences of ecosystem change for human well-being. From 2001 to 2005, the MA involved the work of more than 1,360 experts worldwide. Their findings provide a state-of-the-art scientific appraisal of the condition and trends in the world’s ecosystems and the services they provide, as well as the scientific basis for action to conserve and use them sustainably. (https://www.millenniumassessment.org/en/Index-2.html)

***8 Planetary boundary**

Planetary boundaries are the limits within which humanity can safely survive on Earth. They provide guidelines for avoiding catastrophic changes in the Earth's environment by quantitatively assessing various human impacts on the planet’s environment and determining critical thresholds. In other words, planetary boundaries are the limits that the Earth can withstand. The concept was proposed in 2009 by a group of global sustainability scientists led by Johan Rockström. They identified, quantified, and assessed the risks associated with nine processes that impact the Earth system: climate change, ocean acidification,

stratospheric ozone depletion, phosphorus and nitrogen cycles, freshwater use, land-system change, changes in biosphere integrity, atmospheric aerosol loading, and chemical pollution.

***9 Phosphorus problems**

Phosphorus is an element indispensable for life, involved in the genetics, cell composition, and various metabolism of living organisms. However, it is normally scarce in many natural ecosystems because most forms of phosphorus are insoluble. Since it is a crucial nutrient for plant growth, phosphorus is contained in chemical fertilizers and used in large amounts for food production. Phosphorus in the soil is adsorbed to particles and difficult to dissolve in water; this is why fertilizers are used excessively. Phosphorus adsorbed to soil particles or contained in human waste and sewage flows into rivers, then eventually lakes and coastal waters, significantly disturbing their ecosystems. This disturbance is triggered by a strong biological response to phosphorus. When large amounts of phosphorus, a substance essential to life, is added to an ecosystem where phosphorus is scarce, the number of plankton increases initially, thereby impacting other species, such as fish in the food chain that eat the plankton. As various species proliferate and consume more oxygen in the water, chemical reactions specific to low oxygen conditions occur and the phosphorus adsorbed to soil particles starts to flow out, further promoting the proliferation of living organisms and in consequence degrading the ecosystem.