Blue Planet Prize

FOR IMMEDIATE RELEASE
June 13, 2018

2018 BLUE PLANET PRIZE: ANNOUNCEMENT OF PRIZE WINNERS

This year marks the 27th awarding of the Blue Planet Prize, the international environmental award sponsored by the Asahi Glass Foundation, chaired by Kazuhiko Ishimura. Two Blue Planet Prizes are awarded to individuals or organizations each year that make outstanding achievements in scientific research and its application, and in so doing help to solve global environmental problems. The Board of Directors decided the following recipients for this year.

1. Prof. Brian Walker (Australia)

Hon. Research Fellow of the Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Hon. Professor, Australian National University

He has had a most significant influence on the development of the concept of resilience in social-ecological systems and has highlighted the need to increase it to maintain human society under changing circumstances. His ideas have exerted a significant influence as resilience has been introduced as a fundamental concept and developed in many fields, including environmental conservation, economics, protection, sustainable development and disaster prevention policy. Inspired by his research and leadership, studies on sustainability and resilience have expanded tremendously. He has produced significant achievements as a pioneer of resilience science and has had an enormous impact on society.

2. Prof. Malin Falkenmark (Sweden)

Professor of Applied and International Hydrology
Senior Researcher at Stockholm Resilience Center,
Senior Scientific Advisor to the Stockholm International Water Institute (SIWI)

She has been the most renowned global hydrologist for many years and has placed water problems onto the global policy agenda. Her novel ideas, such as seeing water as the bloodstream of the biosphere, and her wide-ranging activities for making the world more sustainable, have had an enormous impact on today's thinking for solving environmental problems. The Falkenmark index is an essential indicator for comparative water analyses. Her green/blue water concept is currently a standard for analysis of agricultural production, which comprises a significant portion of the Planet's consumptive water use. Since she noticed the relationship between poverty and hunger and water problems in Africa in the 1960's, she has contributed analyses of both global water scarcity and other environmental challenges.

Both recipients will be awarded a certificate of merit, a commemorative trophy and a supplementary award of 50 million yen.

The awards ceremony will be held on October 10, 2018 (Wednesday) at the Palace Hotel Tokyo (Chiyoda Ward, Tokyo). The commemorative lectures by the prize recipients will be held at the United Nations University (Shibuya Ward, Tokyo) on Ocotber 11.

*This press release may also be viewed on our web site at www.af-info.or.jp. from 15:00, June 13, 2018.
The photos of the recipients are available from the web site of the Asahi Glass Foundation.

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Report on the Selection Process (27th Annual Prize, 2018)

A total of 510 nominators from Japan and 780 nominators from other countries recommended 130 candidates. The fields represented by the candidates, in order of number, were environmental economics and policy making (28), ecology (25), atmospheric and earth sciences(19).

The candidates represented 34 countries; 23 persons, 18 percent of the total, were from developing countries.

After individual evaluation of the 130 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, which forwarded its recommendations to the Board of Directors. The Board formally resolved to award the Prize to **Prof. Walker**, and to **Prof. Falkenmark**.

The Laureates

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

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Attachment

Profile of the 2018 Blue Planet Prize Recipient

Prof. Brian Walker (Australia)

Major Research and Activities

In the 1980s, Prof. Walker was a member of a small network of scientists collaborating on research into resilience*[1] and advocating its importance, asserting that it was key to the sustainability of ecosystems. In the 1990s, he began to expand his research on resilience, conducted up to then in the field of natural ecosystems, to include the social sciences. He was among the first to demonstrate that there are also thresholds in linked social-ecological systems*[2] and called for the creation of a human society with high resilience to cope with societal and environmental changes to enable sustainable use of natural capital.

Ecosystems were once commonly thought to return to their original state even if they experience a large disturbance. Under this idea, fishing or forestry resources, for example, would return to their original states by themselves, even if they were heavily fished or logged. However, Prof. Walker and his colleagues found that if the use of resources exceeds some particular limit, the ecosystem will undergo a sudden shift to an alternative state in which it behaves differently and will not return to its original state. He has sent a socially relevant message saying that it was a mistake to think that over-used nature will gradually recover with time and we must regulate the use of nature to allow only development within limits by giving careful attention to the threshold-based resilience of ecosystems, in order to realize a sustainable society. This approach has become one of the foundations of the Planetary Boundaries concept, which focuses on the resilience of the Earth system. The resilience research led by Prof. Walker has expanded remarkably today. The number of published research papers on resilience and the environment, for example, increased from 250 in 2000 to more than 6,000 in 2015, an increase of almost 25 times.

Academic and Career Background

After graduating from the Agricultural Department of the University of Natal, South Africa, in 1961, Prof. Walker received his Ph.D. in Plant Ecology from the University of Saskatchewan, Canada, in 1968. Back in Africa he specialized in the dynamics of ecosystem function and how this related to the resilience of tropical savannas and grazing lands. From 1969 to 1975, he served as Lecturer and Senior Lecturer in Ecology at the University of Rhodesia in the Republic of Zimbabwe. From 1975 to 1985, he served as Professor in the Department of Botany (Head of the Department of Botany from 1983) and Director of the Centre for Resource Ecology at the University of the Witwatersrand in South Africa. From 1985 to 1999 he served as Chief of the Division of Wildlife and Ecology in the Commonwealth Scientific and Industrial Research Organisation (CSIRO)*[3] in Australia. At that time, the International Geosphere-Biosphere Programme (IGBP)*[4] was launched. In response to a request from the International Council for Science, Prof. Walker led the IGBP core project on Global Change and Terrestrial Ecosystems (GCTE)*[5] as Chairman of its Scientific Steering Committee from 1990 to 1997. At the Beijer Institute of Ecological Economics*[6] in the Royal Swedish Academy of Science, he served as a Member of the Board from 1998 to 2000 and Chair of the Board from 2000 to 2003.

He was a founding member of the Resilience Alliance*[7], an international research group working on resilience in social-ecological systems, and served as Chair of the Board from 1999 to 2014. In 2007 the Stockholm Resilience Centre (SRC)*[8] was established in Sweden as a base for resilience research, where Prof. Walker served as Research Fellow and Member of the Advisory Board from 2008 to 2013. During this period, he continued his research mainly on resilience science.
Prof. Walker published numerous essential research papers during this time, and had a considerable influence on younger researchers.

He remains active, serving as Chair of the Advisory Board of the Australian Research Council Centre of Excellence for Coral Reef Studies (since 2010), Fellow of the Beijer Institute of Ecological Economics (since 2007) and working with young scientists in the CSIRO and the Fenner School of Environment and Society in the Australian National University. His next book, Finding Resilience, which will appear early in 2019 (CSIRO Publishing), is written in non-scientific language aimed at a general readership, with the aim of helping to spread a public understanding of what resilience is all about.

Note:

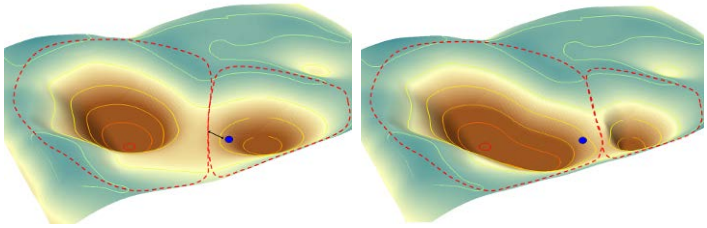
***1 Resilience**

Resilience is the capacity of a system to absorb shocks and disturbance and reorganize so as to avoid an unrecoverable shift to an alternative state. The term resilience originated in physics and is now used also in

ecology, psychology and many other fields - the scope of the concept has expanded. For risk management of economic crises and natural disasters it is considered essential to have the ability to withstand external shocks, to re-organise and continue to function in much the same way.

In contrast to engineering resilience, which Prof. Walker described as “the duration of time until a system returns to the original state upon a disturbance” (return rate from a shock), ecological resilience is defined as “the capacity of a system to absorb a disturbance and re-organise so as to still retain essentially the same function, structure and feedbacks – to have the same identity”.

[The Nature of Resilience (Ball-in-the-Basin Model)]
In his book with science writer David Salt Resilience Thinking, 2006, Prof. Walker explained the nature of resilience using the analogy of the ball at the bottom of the basin. In a deep and large basin, the position of the ball (the state of the system) will remain in the basin, returing to the “attractor”, even if disturbed a lot. However, if the basin somehow becomes shallower and smaller, when it receives an external shock the ball can more easily be moved beyond the edge into an alternative basin and is unable to return to its original state.
Thus, the nature of resilience includes latitude (size of the basin), resistance to being changed (depth of the basin), precariousness (distance from the ball to the edge) and susceptibility of these three elements to external impacts (cross-scale relationship). By crossing the edge of the basin – that is, the threshold - the feedbacks between structure and function change such that the system is attracted towards a different composition. Furthermored, the resilience of the system (size/ shape of the basin) can change such that the threshold (edge of the basin) may cross the position of the ball (state of the system) and the system now tends towards a different composition, even though there has been no change in the state of the system itself (as in the figure below).



***2 Social-ecological systems (SESs)**
A social-ecological system (SES) is an integrated system of ecosystems and human society with reciprocal feedbacks and interdependence. The concept emphasizes the “humans-in-nature” perspective, and focuses on the interaction between the natural world and the world made by humans.
Problems in natural resource management are not necessarily just ecological, social or economic problems, but involve many comprehensive elements that are inextricably linked. The concept assumes that problems in natural resource management are evaluated from the perspective of a wider system that involves both ecological and social elements, complex space-time scales and unexpected dynamics.
Prof. Walker and other researchers have named nine factors as necessary elements for the resilience of social-ecological systems, including 1. Diversity (especially response diversity), 2. Ecological variability,
3. Modularity, 4. Acknowledging slow variables, 5. Tight feedbacks, 6. Social capital, 7. Innovation, 8. Overlap in governance and 9. Ecosystem services.
Response diversity is a key feature of resilience, emphasized by Prof. Walker in his research. It is the diversity of ways in which an important function in the system can be performed, like having several different species of legumes in an ecosystem, all performing the function of fixing nitrogen, but in different ways and with different abilities to respond to environmental disturbances. Striving for efficiency in using a system can unintentionally reduce response diversity.

This concept of resilience lays the foundation for today’s environmental economics, which introduces natural capital, with a great influence on a wide range of fields.

***3 The Commonwealth Scientific and Industrial Research Organisation (CSIRO)**
Established in 1916, CSIRO is Australia’s largest integrated research and development institution under the jurisdiction of the Department of Education, Science and Training of Australia. CSIRO aims to conduct research and development to solve national issues, serving to the country's industries or public interest. The research field covers a broad spectrum of subjects, including agriculture, environment, information communication, health,

materials, manufacturing, minerals and energy. With over 6,000 staff members, CSIRO leads the National Research Flagships, the leading research programs of the Innovation Action Plan promoted by the Australian government.

*4 International Geosphere-Biosphere Programme (IGBP）

Held in Berne in 1986, the 21st General Assembly of the International Council for Science (ICSU) decided to implement the International Geosphere-Biosphere Programme (IGBP), which would conduct a study on global changes. It requested that every participating country responds to this problem, initiating a global effort.
The objective of the IGBP was to describe and understand the interactive physical, chemical, and biological processes that regulate the total Earth system, the unique environment that provides for life. It focuses the changes in the earth system affected by human activities. IGBP stressed research on key fundamental interactions especially those that most affect the biosphere and that are most susceptible to human perturbation on time scales of decades to centuries. They expect the research will lead to practical, predictive capability.
Its research was mainly carried out by core projects or research groups organized for each subsystem of the Earth, and framework activities supporting them, while mutual relations were maintained. Its research findings were reflected mainly in the Intergovernmental Panel on Climate Change (IPCC) and used worldwide as the basis for policy decisions. In 2015, it ended its activities after the compilation of its research and integration of its projects.

*5 Global Change and Terrestrial Ecosystems (GCTE）

Prof Walker was a core member of the overall IGBP Planning Committee (1987 – 1989) and was asked to lead GCTE, one of the IGBP core projects, launched in 1990. GCTE focused on global change in the context of climate, atmospheric composition, and land use effects on the dynamics of terrestrial ecosystems. It was intended to understand and so far as possible predict the effects of global and local changes on terrestrial ecosystems, including agriculture and forestry, and to clarify the mechanism of the feedback influence of such changes on climate systems. Its office was in Pof. Walker's CSIRO Division in Australia.

*6 the Beijer Institute of Ecological Economics

Founded in 1977 and reorganized in 1991, the Beijer Institute of Ecological Economics is an international research institute in Stockholm, Sweden that focuses on ecological economics. It operates under the auspices of the Royal Swedish Academy of Sciences, while its main funding is provided by the Kjell and Märta Beijer Foundation.
Its primary research objective is to promote a deeper understanding of the interplay between ecological systems and social and economic development. It conducts international research programs, publishes research findings, plans and organizes workshops, develops educational programs, engages in scientific policymaking, and so on.

*7 Resilience Alliance (RA)

The Resilience Alliance (RA) is a research organization consisting of natural and social scientists across a wide range of specialties who promote the sharing of knowledge and ideas to explore the dynamics of social-ecological systems. The aggregated knowledge developed by RA incorporates the key concepts of resilience, adaptability and transformability, to provide a basis for policies and practices for sustainable development.
Its members are leaders in ecology and sociology with extensive expertise. The research programs use a participatory approach to regional case studies, applied adaptive management, model development, scenarios and other methods to explore and test the validity of theories. To promote the sharing of knowledge and ideas, the RA continuously searches for ways to develop collaboration between researchers and practitioners. Since its establishment in 1999, RA members have been enrolled in universities, government agencies and NGOs in eight countries and have collaborated with other scientists in many more.

*8 Stockholm Resilience Centre (SRC）

The Stockholm Resilience Centre (SRC) is an international research institute operated as a joint initiative between Stockholm University and the Beijer Institute of Ecological Economics. The Centre is funded by the Swedish Foundation for Strategic Environmental Research, Mistra.
It aims to promote understanding of complex social-ecological systems and to stimulate research to practice ecosystem management and achieve long-term sustainability.
The research themes focus on particular social-ecological systems connected to marine, urban and food-producing landscapes, while the research streams cut across sectors, scales and social-ecological systems.

To date, many prominent researchers have worked here actively and successfully, including Dr. Johan Rockström, Ph.D., Centre director who led the research on Planetary Boundaries; Professor Carl Folke, Research Director of the Centre; Dr. Will Steffen, a colleague of Prof. Walker's from CSIRO; and Prof. Malin Falkenmark in hydrology.

Biographical Summary

Academic and Career Record

1961	BSc in Agriculture, University of Natal, South Africa
1968	Ph.D. in Plant Ecology, University of Saskatchewan, Canada
1969-1975	Lecturer/Senior Lecturer in Ecology, University of Rhodesia, Harare, Republic of Zimbabwe
1975-1985	Professor, Department of Botany (Head, Department of Botany, from 1983), and Director, Centre for Resource Ecology, University of the Witwatersrand, Johannesburg, South Africa
1985-1999	Chief, Division of Wildlife and Ecology, CSIRO, Australia
1990-1997	Chairman, Scientific Steering Committee of IGBP core project on Global Change and Terrestrial Ecosystems (GCTE)
1998-2000	Member of the Board, the Beijer Institute of Ecological Economics, Royal Swedish Academy of Science
2000-2003	Chair of the Board, the Beijer Institute of Ecological Economics, Royal Swedish Academy of Science
1999-2014	Chair of the Board, The Resilience Alliance
2007-	Fellow of the Beijer Institute of Ecological Economics
2008-2013	Research Fellow and Member of the Advisory Board, Stockholm Resilience Centre, University of Stockholm
2010-	Chair of the Advisory Board, Australian Research Council Centre of Excellence for Coral Reef Studies

Awards and Fellowships (Selected)

2013	Fellow of the Australian Academy of Science
2007	(Joint recipient) Nobel Peace Prize awarded to the IPCC
2004	(Joint recipient) Ecological Society of America Sustainability Award
2003	Australian Centenary Medal for Service to Australian Society in Ecology
2001	Foreign Member of the Royal Swedish Academy of Agriculture and Forestry.
1999	Ecological Society of Australia Gold Medal
1991	Fellow of the Australian Academy of Technological Sciences and Engineering.
1986	Distinguished Graduate in Agriculture Award, University of Saskatchewan 75th Anniversary of the College of Agriculture
1971	Charles Bullard Research Fellow, Harvard University
1964 - 1968	Canadian Commonwealth Scholar

Prof. Malin Falkenmark (Sweden)

Major research and activities

From the mid-1960s to the mid 1990's, Prof. Falkenmark was involved in the International Hydrological Decade (IHD) *[9] later International Hydrological Programme (IHP)*[10]During that time, she learned about poverty and water-related problems in developing countries and their seriousness. Since then, she has committed to striving to solve water-related problems and has studied human nature for more than half a century. She explains the reason just as follows: "Why were people in low latitudes so poor, and what did water have to do with it? It turned out water had everything to do with it." *[11]

In 1989, she became the first person to inform the whole world of the status of water-related availability by presenting the Falkenmark Index*[12]for quantifying the degree of water scarcity based on the annual amount of water available per capita in a country or region, or "water crowding" for the number of people sharing every unit of available water. In 1995, she presented the concept of green/blue water*[13] Thus she became the first person in the world to argue that rainwater which is available to plants in the soil (so-called green water), is as important a water resource as groundwater and river water (so-called blue water), which was mostly the focus of hydrology*[14]until that time. Subsequently, she also worked on quantitative estimates around the concept. The study made a significant contribution and become a theoretical basis for today's efforts to analyze global water-related problems using of an integrated water resources management approach. She has put out more than 500 publications and has been deeply involved in the development of the front lines of global water studies.

Prof. Falkenmark also engages in multiple international activities relating to water-related problems. She was elected Rapporteur General of the United Nations Water Conference in Mar del Plata in 1977 *[15] the first global discussion on water-related issues. For 13 years, she chaired the Scientific Programme Committee for the annual Stockholm Water Symposia, subsequently developed into the current World Water Week in Stockholm *[16] She was also involved in developing the Stockholm Water Prize*[17] so-called water version of the Nobel Prize. For a series of years, a symposium in her name has been organized at the World Water Week, in 2016 making crucial recommendations on the importance of green water for the eradication of hunger in Africa.

Academic record and professional career

Prof. Falkenmark majored in mathematics, chemistry and physics at Uppsala University and acquired Fil Mag.(Master's degree) in 1950. In 1953, she joined the Swedish Meteorological and Hydrological Institute before completing her studies, at Uppsala University and Royal Institute of Technology, with specialties in hydrology and hydraulics. In 1964, she became the first person to acquire a licentiate (parallel to today's PhD) in hydrology in Sweden, and co-published her first book, the Swedish "Vattnet I vår värld (Water in our world)". In 1965, she joined the Swedish Natural Sciences Research Council (SNSRC)*[18]as ecutive Secretary of the IHD (later IHP) National Committee which she later chaired from 1986 to 1995. In 1977, she co-published "Water for a Starving World", launched as part of the information program of the UN Water Conference in Mar del Plata, where she was elected Rapporteur General. In 1986, she was promoted to Professor of Applied and International Hydrology. Subsequently, she was also involved in the development of water resources programs at several universities, including Linköping University where she for 15 years acted as part time Professor. In 1989, she co-published the UNESCO book "Comparative hydrology."

In 1991, Prof. Falkenmark joined Stockholm Water Co. for was organizing the annual Stockholm Water Symposium, later developed into World Water Week in Stockholm. She for 13 years chaired its Scientific Programme Committee, and also contributed to the first years of the Stockholm Water Prize. In 1992, she co-wrote a paper for the Dublin Principles*[19]that she presented at the International Conference on Water and the Environment (ICWE)*[20] After the Global Water Partnership (GWP)*[21]as established in 1996, she for 7 years acted as a member of its Technical Advisory Committee , and argued the importance of incorporating the protection of ecosystems in integrated water resources management. In 2004 she co-published the book "Balancing water for humans and nature". In 2007 she joined the new Stockholm Resilience Center, in 2014 co-publishing the book "Water resilience for human prosperity". In 2008, she co-wrote a paper in which she warned that water resources management would no longer be possible under climate change if it remained nothing more than the act of assuming stationarity and learning from the past. At the Malin Falkenmark Symposium held in 2016, she advocated a Green Water Initiative in Africa for achieving the second SDG (no hunger), and published a written request.

As shown by these facts, Prof. Falkenmark has been a leading figure and the global pioneer of hydrology for many years. Today, she acts as a senior scientific advisor to the Stockholm International Water Institute*[22]. Even at 92 years old, she is still active.

Note:

***9 International Hydrological Decade (IHD)**

In 1965, UNESCO established IHD, an international project for collaborative research, with the aim of improving hydrological observation around the world and developing water-related science and education.

***10 International Hydrological Programme (IHP）**

IHP was launched in 1975 to replace IHD. IHP is currently in its eighth phase (2014 - 2021).

***11 "Why were people in low latitudes…"**

"Problems in the developing nations were completely different from the ones we had in Sweden. It was fascinating to me and through my travels my curiosity developed. Why were people in low latitudes so poor and what did water have to do with it? It turned out water had everything to do with it."
Abve note is an excerpt from an interview in the November 2014 issue of WATER FRONT.

***12 Falkenmark Index**

The Falkenmark Index quantitatively shows the degree of water scarcity based on the annual amount of water available per capita in a country or region. It defines the annual amount of water resources per capita below which water can be seen as scarce, 1,700 m^3per person and year country or region in which the amount of water is below this line is considered to be under water stress. If the annual amount of water resources per capita is below 1,000 m^3, it is supposed to be chronic water scarcity. Below 500 m^3, it is considered to be absolute water scarcity.
Today, the Indicator is used by the U.N. Food and Agriculture Organization, UN-Water, the World Bank's World Development Indicators and others to determine water scarcity and water stress at regional and global levels.

$$\text{The Falkenmark indicator} = \frac{\text{Annual Runoff}}{\text{Population Size}}$$

Classification of the Falkenmark Indicator

Category	Index (m^3 per capita)
No Stress	> 1,700
Stress	1,000-1,700
Scarcity	500-1,000
Absolute Scarcity	< 500

Source: Created by the Asahi Glass Foundation in accordance with Falkenmark, M. 1989. The Massive water scarcity now threatening Africa: Why isn't it being addressed? Ambio 18: 112-118.
Falkenmark, M., and J. Lundqvist, and C. Widstrand. 1989. *Macro-scale water scarcity requires micro-scale approaches.* Natural Resources Forum 13: 258-297.

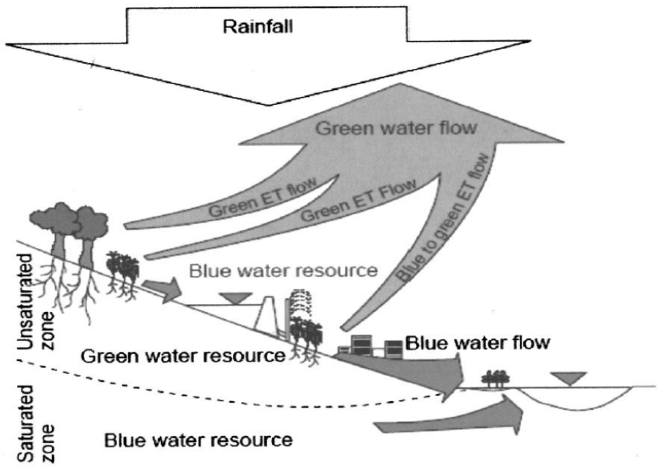
***13 Concept of Green/Blue water**

The concept of Green/Blue water relates to water resources. The idea is epoch-making in that it advocates the importance of green water or rainwater, which is typically used by plants, whereas only blue water (e.g. groundwater and river water) had conventionally been used as water resources. In particular, the concept is vital for the development of agriculture in semi-arid regions that are prone to water scarcity.

Prof. Falkenmark published the concept for the first time in 1995 and developed it by advocating *The New Blue and Green Water Paradigm* in a paper she co-wrote with Dr. Johan Rockström in 2006.

She set out a new framework for the management of water resources based on green waterflow, a departure from the conventional blue waterflow-based practice of managing water resources.

Terminology	Definition
Green Water	Green water refers to the rainwater that seeps into the soil before returning to the atmosphere by evaporation and transpiration and is partly supplied to forests, grass, rain-fed crops and the like.
Green Flow	Green flow is a flow in which rainwater seeps into the soil before returning to the atmosphere by evaporation and transpiration.
Blue Water	Blue water is the water that stays in rivers, lakes, ponds, reservoirs or underground aquifers.
Blue Flow	Blue flow is a flow in which rainwater-generated flow reaches a river or first passes as groundwater through an undergound aquifer or other routes to move to a river, lake, pond, reservoir or the like.



Source: Falkenmark, M., and J. Rockström. 2006. Editorial: The New Blue and Green Water Paradigm: Breaking New Ground for Water Resources Planning and Management.

*14 Hydrology

Daijirin: Hydrology is an area of learning in which the state, distribution and physical and chemical characteristics of water on Earth, its relationship with the environment and other related issues are studied from the perspective of circulation. Hydrology applies to the management of water quality, water rights, water-related laws and other social and economic issues.
Kojien: Hydrology studies the circulation of water to understand the state and change of water on Earth. The main subject of study in hydrology is terrestrial water such as the water in rivers or lakes or under the ground. Knowledge of hydrology is indispensable for the development and maintenance of water resources. The physical aspect is strong in hydrology.
Random House English Dictionary: Hydrology/limnology is a category of geology and is about the generation, circulation and attributes of water on and under the ground and in the atmosphere.
Definition by UNESCO (1965): Hydrology is an area of science regarding water on Earth. The subjects of study in hydrology are the generation and circulation of water and the distribution of water on this planet, the physical and chemical properties of water, the interaction between the physical/biological environments, and water's response to human activities. The scope of study in hydrology spans the entire route of water circulation on Earth (source: Mizukiki Hontono Hanashi (True Stories about Water Crisis)).

*15 United Nations Water Conference in Mar del Plata

The conference is the first intergovernmental event to focus on water as a subject of environmental issues. It took place in 1977 in Mar del Plata, Argentina. The conference adopted the Declaration of Mar del Plata, an action plan that consists of recommendations on essential factors of water management and resolutions concerning different areas.

***16 World Water Week in Stockholm**

Organized by the Stockholm International Water Institute, this is a forum about water-related problems on Earth. The annual one-week conference and exhibition focuses on water, and takes place every August. In 2017, World Water Week had more than 3,300 participants from 130 countries. World Water Week was initiated in 1991 under the name “Stockholm Water Symposium”. In 2001, it was renamed World Water Week in Stockholm.

***17 Stockholm Water Prize**

This prize is awarded to one researcher or NGO every year that has contributed to solving water environment issues. The commendation ceremony is held in the same format as that of the Nobel Prize, and is attended by the King of Sweden.

***18 Swedish Natural Sciences Research Council (SNSRC）**

SNSRC is an agency that aims to fund basic research in the areas of natural science and mathematics. Also, SNSRC provides grants to international scientific research and supports and encourages Swedish researchers and research institutes to take part in efforts that are aimed at facilitating international cooperation.

***19 Dublin Principles**

These are the four principles on water-related problems that were adopted at the International Conference on Water and the Environment (ICWE). The principles consist specifically of four terms below.

(1) Freshwater is a finite resource

(2) Water management should be based on a participatory approach involving all people concerned

(3) Women play a central part in the management of water

(4) Water has an economic value and should be recognized as an economic good.

The principles are also reflected in Chapter 18 of Agenda 21 (Protection of The Quality and Supply Of Freshwater Resources) created at the United Nations Conference on Environment and Development (also known as the Rio Summit) held in the same year. The Dublin Principles have formed the common keynote of international water-related discussions.

***20 International Conference on Water and the Environment (ICWE)**

Held in Dublin, Ireland in 1992, ICWE was an international conference on water-related problems that was attended by nearly 500 persons from 114 countries, 38 NGOs and 28 U.N. agencies. The conference discussed topics such as the conditions of water resources around the world and desirable ways of managing water resources. As a result, four principles were adopted and are known as the Dublin Principles. The conference also discussed the concept of the integration of water resources development and management, which significantly changed the basic idea of water resources management.

***21 Global Water Partnership (GWP）**

In 1977, the UN Water Conference in Mar del Plata became the first conference to focus on water as a subject of environmental issues. The decade from 1981 was designated as the International Drinking Water Supply and Sanitation Decade. In 1992, international conferences on water and the environment took place in Dublin and Rio de Janeiro. After all of these, no significant international actions for water management were taken. Against this backdrop, GWP was established in 1996 as an international network or NGO that is open to all agencies around the world concerned with water management. The mission of GWP is to help each country in facilitating the sustainable management of water resources.

***22 Stockholm International Water Institute (SIWI）**

SIWI is a research institute that discloses the results of research on water-related problems and also provides policy recommendations on the issue. SIWI is based in Sweden and was established for the follow up of two events that took place in Stockholm in 1991, the Stockholm Water Symposium (later World Water Week in Stockholm), and the Stockholm Water Prize. Today, SIWI offers research and advisory services in five major areas that include water governance; transboundary water management; water and climate change; the relationship between water, energy and food; and water economics. The Institute also organizes World Water Week, which is globally recognized as a significant event regarding water-related problems. Numerous researchers and organizations participate in World Water Week from around the world.

Biographical Summary

Academic and professional career

1950 Fil.Mag. at Uppsala University (Master's degree)
1953 Begins working at the Swedish Meteorological and Hydrological Institute (SMHI)
1964 Uppsala University Fil.Lic (Swedish equivalent of current Ph.D.)
1965 Swedish Natural Sciences Research Council and National Committee for International Hydrological Decade (IHD)
1975 Honorary doctorate (Fil Dr honoris causa) from Linköping University
1977 Rapporteur General of the United Nations Water Conference in Mar del Plata
1978 Executive Secretary for International Hydrological Programme (IHP)
1986 Chairperson for the International Hydrological Programme (IHP)
Professor of Applied and International Hydrology
1991 Chair of Scientific Programme Committee for Stockholm Water Symposium
1997 Member of the Technical Advisory Committee of Global Water Partnership (GWP)
2000 Honorary doctorate from Lund University (Techn Dr honoris causa)
2007 Senior Researcher at Stockholm Resilience Center

Major awards

1995 KTH Stora Pris
European Geophysical Society's Henri Darcy medal
1998 Volvo Environment Prize
International Hydrology Prize
2005 Rachel Carson Prize
Crystal Drop Award
2010 Prince Albert II Award

Remarks from the Award Recipients upon Notification of their Selection

Prof. Brian Walker (Australia)

I am deeply honoured by the award of this prestigious Blue Planet Prize, and am most grateful to the Asahi Glass Foundation for considering me a worthy recipient. The aims of this prize are fundamental to the long-term wellbeing of our planet, and they have been a motivating force behind the development of my life's research. I have followed the award of the prize for many years and am always impressed by the calibre and the work of the recipients. I am humbled to now be included amongst them.

In the latter part of my career I have been working to put into practice the theoretical developments that motivated my earlier years. What I am trying to do aligns closely with the aims of the Blue Planet Prize and this award gives me inspiration and renewed energy to further the incorporation of resilience into planetary sustainable development, from local to global scales.

Prof. Malin Falkenmark (Sweden)

I owe my deepest gratitude to the Blue Planet Prize Committee for selecting me for one of the two Blue Planet Prizes 2018, thereby drawing high level attention to the lasting efforts I have since the 1970's devoted to trying to understand the implications of water being the bloodstream of the biosphere.

Water's profound involvement is an issue of essential importance that has partly remained in the shadow of past water resources development efforts.

A contributing reason is that much of the analyses remained in the hands of environmental professionals, mainly focusing on liquid water in rivers and aquifers as a natural resource, but neglecting the invisible water in the soil, and its contribution to the biomass production. A global dilemma is that, meanwhile, human population has been increasing to currently 7 billion, with most of the poor and hungry living in Africa with its dominantly arid climate.