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Establishment and development of the World Association for Sedimentation and Erosion Research

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ABSTRACT

Problems of soil erosion and sedimentation are issues of global concern. With the intensification of global change and the impacts of human activities, many countries are facing severe challenges from wideranging sediment-related problems. The prevention and control of sediment disasters and the rational use of soil and sediment resources are important requirements for the sustainable development strategies of all countries. As sediment problems are closely related to social, economic, and other human activities, the effective solution of sediment problems requires the concerted efforts of experts in different fields and thus an interdisciplinary approach is essential. In view of the increasing recognition of sediment as a topic of global significance and the need to promote interdisciplinary research in this field, the World Association for Sedimentation and Erosion Research (WASER) was inaugurated in 2004. In this paper the history of the establishment of WASER is reviewed and its main activities are briefly summarized. The series of International Symposia on River Sedimentation (ISRS) has served as the official symposium of WASER since 2004. These triennial technical events have been held in China, Russia, Japan, South Africa, and Germany with about 2,000 participants. In addition to sponsoring the ISRS, WASER has to date also sponsored/organized or co-sponsored/co-organized over 30 other international conferences, workshops, training courses, and study tours besides sponsoring the ISRSs. The adoption of the International Journal of Sediment Research (IISR) as the official journal of WASER in 2004 has also played an important role in increasing the exposure of the Association. These activities have served to raise WASER's profile as well as promoting collaboration with agencies and other organizations working in the field of erosion and sedimentation. Three types of prizes and honors are awarded by WASER. These include the International Qian Ning Prize for Erosion and Sedimentation Technology, the IISR Award for Distinguished Contributions to Sediment Research and Honorary Membership. Through its activities, WASER aims to strengthen the development of education and capacity building in the field of sustainable sediment management in global water management, promote sharing of information, on related data, the results of scientific research, and management methods, and advances in the study of erosion and sedimentation.

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1. Introduction

Problems associated with soil erosion and sedimentation are issues of global concern, since they can pose major problems for the sustainable development of Earth's soil and water resources and they are difficult to solve (Sundborg & Rapp, 1986). With the intensification of global change, particularly climate change, and the many adverse impacts of human activities on the Earth system, many countries are facing severe challenges from sediment problems in river management, flood prevention, and disaster reduction; water resource development and utilization; and ecological environmental protection. According to the current sediment data available for the world, the annual erosion of surface soil from river basins amounts to ca. 75 billion tonnes (Syvitski et al., 2022). In the process, as much as 5–7 million ha of farmland are seriously degraded annually and about 1% of the precious storage capacity of

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the world's reservoirs is lost annually to deposition. There are countless examples of the loss of cultivated land caused by soil erosion, the aggravation of floods and the deterioration of the ecological environment caused by erosion, and sedimentation in various countries around the world. The prevention and control of sediment disasters and the rational use of sediment resources are directly related to the rational use of water and soil resources in a river basin, flood control, and the protection of the ecological environment. It represents an important part of the sustainable development strategy for all countries (Lin et al., 2003).

Although sediment problems can reflect natural events, they are frequently closely related to social, economic, and other human activities. Therefore, the sound solution of sediment problems must involve the concerted efforts of experts in the various fields concerned and requires an interdisciplinary approach. The disciplines involved may include soil conservation, environmental science and engineering, ecology, hydrology, fluvial geomorphology and hydraulics, applied mathematics, geography, sedimentology, hydraulic engineering, hydro-power engineering, agriculture, water supply, irrigation and drainage engineering, navigation, forestry, coastal engineering, isotope hydrology, remote sensing, chemistry, soil science, biology, municipal engineering, economics, sociology, political science, and history, among others (Walling, 2005). Many international organizations also direct attention to sediment problems. However, the scope of the involvement of these organizations is often limited to the specific topics of interest to the individual organizations. It is necessary to establish a truly comprehensive interdisciplinary organization for promotion of sediment research and to successfully address sediment problems.

In view of the increasing recognition of sediment as a topic of global significance and the need for an interdisciplinary organization, the World Association for Sedimentation and Erosion Research (WASER) was established and launched in 2004 (WASER, 2004a). The establishment of WASER and its activities are introduced and reviewed in this contribution.

2. Conception and establishment of WASER

2.1. Preparation for establishing a new association

The idea of establishing a new international association focusing on erosion and sedimentation was conceived at the end of the 20th century. As indicated by Prof. Des Walling, the first President of WASER, the 1st International Symposium on River Sedimentation (1st ISRS) held in Beijing in 1980 can be seen as having sown the seed for WASER. The 1st ISRS, which was conceived and promoted by Prof. Ning Qian (Ning Chien), was held in Beijing from March 24 to 29, 1980. "It was probably the first truly multidisciplinary international gathering of scientists working on erosion and sedimentation" (Walling, 2005). Prof. Ning Qian (1922-1986) was a highly respected international authority in the field of erosion and sedimentation research, who also initiated the establishment of the International Research and Training Center on Erosion and Sedimentation (IRTCES), which was the first water-related Category II Center to be established by United Nations Educational, Scientific, and Cultural Organization (UNESCO) and Government of the People's Republic of China in July, 1984, and the publication of the International Journal of Sediment Research (IJSR) (IRTCES, 1987).

Initiated and promoted by Prof. Bingnan Lin, the then-Chairman of the Advisory Council of IRTCES, IRTCES had committed itself to establishing a new international association in 1998. The establishment of a new international association focusing on erosion and sedimentation was first proposed and discussed at the 4th Advisory Council meeting of IRTCES held in October, 1998. Shortly after this, the proposal was discussed further at a meeting of over 20 sediment-related scientists and engineers held during the 7th ISRS which took place in Hong Kong, China in December, 1998. The proposal attracted strong support. A further meeting to explore the establishment of the new association was convened by Prof. Zhaoyin Wang during the 28th International Association for Hydro-Environment Engineering and Research (IAHR) Congress held in Graz, Austria in August, 1999. The 28 participants including the then-President, Vice Presidents and Executive Director of IAHR, and the then-Chairpersons of the IAHR Divisions of Geophysical Hydraulics and Fluvial Hydraulics, discussed the proposal and expressed their approvals or concerns. Subsequently, comments and opinions were sought both internationally and domestically, by making use of opportunities such as meetings, conferences and visits. Most responses were positive and many good suggestions were received. During the visit of the then-President of IAHR Prof. Forest Holly and the then-Executive Director, Dr. Christopher George, to IRTCES in September 2001, Prof. Bingnan Lin introduced the goals of the new association and the willingness to strengthen collaboration with IAHR.

The proposal relating to establishment of the new international association was formally drafted in 2002 (Lin et al., 2003). This proposal was circulated widely within the international community of scientists and engineers in the fields of erosion and sedimentation studies during 2002 and 2003 by sending letters and emails. About 220 scientists and engineers from 40 countries and regions replied in response to the proposal and expressed their support for the new association (WASER, 2004b). Several international organizations and bodies, including UNESCO and the International Association of Hydrological Sciences (IAHS), were very supportive of the proposal.

2.2. Inauguration of WASER

With the strong support of the Chinese government, especially the Ministry of Water Resources, the first Council meeting of the WASER was held in Beijing on October 16, 2004. Fifteen members of the Council and representatives of the UNESCO Beijing Office, the Ministry of Water Resources of China, and IRTCES attended the meeting. The meeting approved the statutes and future plans, confirmed the logo and elected the President, Vice Presidents, Council members, and Secretary General of the Association. The then-Minister and Vice Minister of Water Resources of China, Mr. Shucheng Wang and Mr. Lisheng Suo, met with the Council members of WASER in Yichang on October 18, 2004.

WASER was inaugurated on October 19, 2004 during the 9th ISRS held in Yichang, China. About 400 participants in the 9th ISRS attended the inauguration ceremony, which was chaired by the then-Vice President of WASER Prof. Giampaolo Di Silvio. The then-Secretary General of WASER Prof. Zhaoyin Wang reported the background to the formation of the Association and its inauguration and, in his speech, the then-President of WASER, Prof. Des Walling, emphasized the explicit and unique role of WASER in promoting and facilitating cooperation and collaboration between scientists, engineers, and managers with interests in river sedimentation and erosion, including civil engineers, hydraulic engineers, soil scientists, geomorphologists, geochemists, agricultural engineers, soil conservation specialists, watershed and river basin managers, social scientists, and environmental managers. The then-Director of IRTCES Prof. Jizhang Gao formally inaugurated the Association and announced the members of the first Council. Dr. Andras Szollosi-Nagy on behalf of UNESCO, Dr. Christopher George on behalf of the International Association for Hydraulic Engineering Research (IAHR), Dr. Kuni Takeuchi on behalf of the International Association of Hydrological Sciences (IAHS), Ms. Zhimin Meng on

behalf of the Ministry of Water Resources of China, and Prof. George Gergov on behalf of the World Association of Soil and Water Conservation (WASWAC) then addressed the inauguration ceremony and congratulated the Association on its establishment (Liu, 2004; WASER, 2004a).

WASER was registered as a non-governmental organization by the Ministry of Civil Affairs of China (MCA) in July, 2009 and has subsequently been subject to annual inspections and evaluations.

3. Objectives, governance, and membership of WASER

3.1. Objectives and mission

WASER is an independent, non-governmental, non-political, and non-profit organization, at all times free of racial, gender, or national prejudice. The objectives of WASER are to promote the study and development of the science of erosion and sedimentation and to foster the dissemination and application of this knowledge. The mission of WASER is to further the understanding and its application in the field of erosion and sedimentation, through international contacts among scientists, engineers, organizations, institutions, and governments (WASER, 2005). To achieve its mission, the Association may: organize international or regional seminars, conferences, and meetings; organize research and training programmes on theoretical and practical aspects of erosion and sediment transport; foster the evaluation of techniques and models in the field of erosion and sedimentation; publish scientific periodicals and books, reports and newsletters, independently or in cooperation with other organizations; and collaborate with other bodies with similar objectives.

3.2. Council

The Council of WASER plays a key role in developing and promoting the Association. The general policy of WASER is defined by the Council and the activities and other matters proposed by the President are debated and approved by the Council. Membership dues are determined by the Council and the budget of the Association is approved by the Council, with the advice of the Secretariat.

To date, seven Councils have been established through the triennial elections. These constitute the 1st and 2nd terms with Prof. Des Walling (UK) as President, the 3rd and 4th terms with Prof. Giampaolo Di Silvio (Italy) as President, the 5th and 6th terms with Prof. Zhaoying Wang (China) as President, and 7th term with Prof. Helmut Habersack (Austria) as President. Table 1 shows the Officers, Council Members, and Secretariat for each term.

3.3. Membership

Members of WASER comprise both individuals and corporate bodies. Any individual (institution, organization, or agency), who has been actively engaged in scientific research and engineering practice in the field of erosion and sedimentation, interpreted in its widest sense, is eligible for approval as an individual member (or corporate member) by the Council or by the authorized Secretariat, after application and payment of the required membership fee. All members are entitled to the customary rights and privileges, including reduced registration fees when attending international meetings organized by the Association and purchase of publications at a preferential price.

In order to attract greater interest in the activities of WASER among the international community, the Council decided to invite individuals to join the 'WASER Community', without the need to pay a subscription fee, since the end of 2015. Members of the WASER Community are entitled to free receipt of the WASER quarterly Newsletter and other communications as received by the regular members, but are not eligible for discounted registration for the ISRSs and other international conferences organized by WASER or preferential prices when purchasing the IJSR and other WASER publications. Including both fully paid up members and members of the WASER Community, at the end of 2022, there were over 400 members of WASER. These members came from over 40 countries and represented a wide range of disciplines and geographical areas.

3.4. Secretariat

The Secretariat of WASER is based in IRTCES, Beijing, China, which is the administrative headquarters of the Association. The Secretariat is responsible for the day-to-day management of the Association, and is responsible for the routine work and for the execution of the decisions of the Council and related work assigned by the President (Table 1).

The Secretariat, under the leadership of the Secretary-Generals, is heavily involved in serving the members, organizing Council meetings and Assemblies, coordinating WASER sponsored/cosponsored conferences, workshops, and other activities, maintaining the WASER Website and regularly publishing Newsletters.

China is one of the countries with the most serious sediment problem in the world. The Yellow River, the river with the greatest recorded annual sediment load of any of the world's rivers and arguably the most difficult to control, is located in China. Because of its long-term involvement in river and river basin management, China has accumulated a wealth of experience and technology related to sediment research and sediment management, and has become one of the world's most advanced nations in this field. Many countries, and especially developing countries, with sediment problems wish to share the results of sediment research undertaken in China. The Secretariat has helped developing countries learn from China's research and practical experience related to sediment management and soil conservation, and promoted research on sediment problems and their resolution in various countries. The strong support of the Chinese government, especially the Ministry of Water Resources, for the Secretariat provides a guarantee for the continued existence of the Association.

4. Main activities of WASER

Almost 20 years have passed since WASER was established and launched in 2004. Under the leadership of the past Presidents and Councils, and with the active involvement of its members, and the strong support of its Secretariat, WASER has successfully developed from a newly formed Association into a fully functioning international hydro-science organization with worldwide influence. Its main activities and achievements to date are summarized as a prelude to assessing current progress and reviewing plans for its future development.

4.1. Official Symposia – ISRS

The series of International Symposia on River Sedimentation (ISRS) has served as the official symposium of WASER since 2004. Six ISRS have been co-sponsored by the Association and IRTCES since then (Table 2).

The 9th ISRS with the main theme of 'Interactions between Fluvial Systems and Hydraulic Projects and Pertinent Environment Impacts' was held in Yichang, China from October 18–21, 2004. A total of 450 scientists, engineers, managers, and decision makers from 40 countries attended the important event. The inauguration of WASER was a key component of the programme (Liu, 2004). The then-Minister and Vice Minister of Water Resources of China, Mr.

Table 1

Officers,	Council	members,	and	Secretariat	of WASER.

Term	President	Vice president	Member	Secretariat
1st, 2004–2007	Des Walling (UK)	C. Ted Yang (USA); Giampaolo Di Silvio (Italy)	Marcello Gavimo Novilo (Argentina); Helmut Scheuerlein (Austria); Edwin D. Ongley (Canada); Bingnan Lin (China); Erich J. Plate (Germany); K. G. Ranga Raju (India); Farhad Yazdandoost (Iran); Syunsuke Ikeda (Japan); Wojciech Froehich (Poland); Roman S. Chalov (Russia); Gerrit Basson (South Africa); Leo C. van Rijn (the Netherlands); Andras Szollosi-Nagy (UNESCO); Sam S. Y. Wang (USA); John R. Gray (USA)	Zhaoyin Wang (Secretary-General)
2nd, 2007—2010	Des Walling (UK)	Giampaolo Di Silvio (Italy); C. Ted Yang (USA)	Chunhong Hu (China); Zhaoyin Wang (China); Ulrich C.E. Zanke (Germany); Siba Prasad Sen (India); Farhad Yazdandoost (Iran); Hajime Nakagawa(Japan); Jim Bogen (Norway); Wojciech Froehich (Poland); Roman S. Chalov (Russia); Gerrit Basson (South Africa); Sam S. Y. Wang (USA); John R. Gray (USA); Andras Szollosi-Nagy (IINFSCO)	Qiyang Yu (Secretary-General); Xiaoying Liu (Treasurer & Secretary)
3rd, 2010–2013	Giampaolo Di Silvio (Italy)	Zhaoyin Wang (China); Gerrit Basson (South Africa); Ulrich C.E. Zanke (Germany)	Grant Douglas (Australia); Geraldo Wilson Junior (Brazil); Guangqian Wang (China); Subhasish Dey (India); Hajime Nakagawa (Japan); Jim Bogen (Norway); Nikolay Ivanovitch Alexeevsky (Russia); M.J.M. Romkens (USA); Des Walling ^a (UK); C. Ted Yang ^a (USA)	Chunhong Hu ^a (Secretary-General); Xiaoying Liu (Treasurer & Secretary)
4th, 2013–2016	Giampaolo Di Silvio (Italy)	Zhaoyin Wang (China); Ulrich C.E. Zanke (Germany)	Grant Douglas (Australia); Helmut Habersack (Austria); Geraldo Wilson Junior (Brazil); Yitian Li (China); Shoji Fukuoka (Japan); Silke Wieprecht (Germany); Nikolay Ivanovitch Alexeevsky (Russia); Mustafa Altinakar (USA); M.J.M. Romkens (USA); Des Walling ^a (UK); C. Ted Yang ^a (USA); Gerrit Basson ^a (South Africa)	Chunhong Hu ^a (Secretary-General); Xiaoying Liu (Treasurer & Secretary, to September, 2015); Cheng Liu (Executive Secretary General & Treasurer, from September, 2015)
5th, 2016–2019	Zhaoyin Wang (China)	Helmut Habersack (Austria); Hajime Nakagawa (Japan)	Jos Brils (the Netherlands); Stefano Lanzoni (Italy); Yitian Li (China); Mohamed Meddi (Algeria); Bruce Melville (New Zealand); Jean P. G. Minella (Brazil); M.J.M. Romkens (USA); Silke Wieprecht (Germany); Kejun Yang (China); Hongwei Fang ^b (Editor IJSR, China); Des Walling ^a (UK); Giampaolo Di Silvio ^a (Italy); Ulrich C.E. Zanke ^a (Germany)	Guangquan Liu (Secretary-General); Cheng Liu (Executive Secretary Genera & Treasurer)
6th, 2019–2022	Zhaoyin Wang (China)	Helmut Habersack (Austria); Hajime Nakagawa (Japan); Subhasish Dey (India)	Jos Brils (the Netherlands); Valentin Golosov (Russia); Mohamed Meddi (Algeria); Bruce Melville (New Zealand); Jean P. G. Minella (Brazil); Luca Solari (Italy); Silke Wieprecht (Germany); Weiming Wu (USA); Hongwei Fang ^b (Editor of IJSR, China); Wensheng Zhang ^b (China); Des Walling ^a (UK); Giampaolo Di Silvio (Italy) ^a ; Ulrich C.E. Zanke ^a (Germany); Keiun Yang ^a (China)	Guangquan Liu ^b (Secretary-General); Cheng Liu ^b (Executive Secretary General & Treasurer)
7th, 2022–2025	Helmut Habersack (Austria)	Subhasish Dey (India); Cheng Liu (China); Weiming Wu (USA)	Jos Brils (the Netherlands); Valentin Golosov (Russia); Qing He (China); Bruce Melville (New Zealand); Jean P. G. Minella (Brazil); Luca Solari (Italy); Benjamin van der Waal (South Africa), Mengzhen Xu (China); Hongwei Fang ^b (Editor of IJSR, China); Wensheng Zhang ^b (China); Des Walling ^a (UK); Giampaolo Di Silvio ^a (Italy); Junke Guo ^a (USA)	Guangquan Liu ^b (Secretary-General); Cheng Liu (Executive Secretary); Hongling Shi (Treasurer); Ying Zhao (Secretary)

Table 2

WASER sponsored/organized	and co-sponsored/co-organ	nized meetings and activities.

wisht sponsorea/organized and co sponsorea/co organized me	etings und detivitie			
Meeting and activity	Role	Venue	Duration	Number of participants
9th International Symposium on River Sedimentation (ISRS)	Sponsor	Yichang, China	October 18-21, 2004	450
10th ISRS	Sponsor	Moscow, Russia	August 1–4, 2007	237
11th ISRS	Sponsor	Stellenbosch, South Africa	September 6–9, 2010	164
12th ISRS	Sponsor	Kyoto, Japan	September 2–5, 2013	380
13th ISRS	Sponsor	Stuttgart, Germany	September 19–22, 2016	300
14th ISRS	Sponsor	Chengdu, China	September 16–19, 2019	458
15th ISRS	Sponsor	Florence, Italy	September 5–8, 2023	200
2nd International Conference on Estuaries and Coasts (ICEC)	Sponsor	Guangzhou, China	November 28–30, 2006	260
	Sponsor	Sendal, Japan	September 14–16, 2009	120
	Sponsor	Hallol, viethalli	October 8–11, 2012	200
Still ICEC	Sponsor	Muscal, Olliali	August 20, 22, 2018	150
7th ICEC	Sponsor	Shanghai China	August 20-23, 2018	260 ± 200 (opline)
1st Workshop on International Sediment Advancements	Organizer	Kyoto Japan	September 3, 2013	200 + 300 (011111e)
(WISA)	organizer		September 5, 2015	150
2nd WISA	Organizer	Stuttgart, Germany	September 20, 2016	150
Study tour to the Three Gorges Project	Organizer	Yichang, China	August 8–15, 2005	27
Round-Table Meeting of Leaders of Water-related International Organizations	Sponsor	Beijing, China	October 17, 2018	60
1st International Conference on the Status and Future of the World's Large Rivers (World's Large Rivers Conference)	Co-sponsor	Vienna, Austria	April 11–14, 2011	400
2nd World's Large Rivers Conference	Co-sponsor	Manaus, Brazil	July 21–25, 2014	200
3rd World's Large Rivers Conference	Co-sponsor	New Delhi, India	April 18–21, 2017	200
4th World's Large Rivers Conference (online)	Co-sponsor	Moscow, Russia	August 3–6, 2021	439
5th World's Large Rivers Conference	Co-sponsor	Vienna, Austria	August 21–25, 2023	
USA-China Workshop on Advanced Computational	Co-organizer	Oxford, USA	September 19–21, 2005	70
Modeling in Hydro-science and Engineering				
International Training Workshop on Watershed Eco- environment and Water Resources Management	Co-organizer	Beijing, China	September 11–19, 2005	28
International Symposium on Erosion and Torrent Control as a Factor in Sustainable River Basin Management	Co-sponsor	Belgrade, Serbia	September 25–28, 2007	
Third USA-China Workshop on Advanced Computational Modeling	Co-organizer	Hawaii, USA	May 13, 2008	40
8th International Conference on Hydro-Science and Engineering	Co-sponsor	Nagoya, Japan	September 9–12, 2008	
Training Workshop on Reservoir Conservation	Co-sponsor	Beijing, China	September 18–28, 2008	30
High-level International Forum on Water Resources and	Co-sponsor	Beijing, China	October 17–18, 2008	
Hydropower		3 0.		
LANDCON Symposium 'Global Change – Challenges for Soil Management'	Co-sponsor	Tara Mountain, Serbia	May 26-30, 2009	150
Advanced Training Workshop on Integrated River Basin	Co-organizer	Beijing, China	July 27–August 3, 2009	51
International Workshop on Sediment Problems and	Co-sponsor	Hyderabad, India	September 7–8, 2009	55
International Advanced Training Workshop on Water and	Co-organizer	Beijing, China	Sept. 13, 2011	30
Soil Conservation	_			
Inter-organizational "Forum on Water Security"	Co-sponsor	Chengdu, China	September 9, 2013	
1st World Conference on Soil and Water Conservation	Co-sponsor	Lleida, Spain	June 12–16, 2017	230
under Global Change (CONSOWA) FRIEND 2018FRIEND 2018 — International Conference on	Co-sponsor	Staoueli, Algeria	May 6–9, 2018	150
African Large River Basin Hydrology 13th International Conference on Hydroscience &	Co-sponsor	Chongqing, China	June 18–22, 2018	200
Engineering				
UNESCO International Training Workshop on Integrated Sediment Management in River Basins	Co-sponsor	Beijing, China	November 6–10, 2018	40
International Conference on Silk-road Disaster Risk Reduction and Sustainable Development	Co-sponsor	Beijing, China	May 11–12, 2019	780
International Workshop on RESCON 2 and Numerical	Co-sponsor	Chengdu, China	September 17, 2019	40
Modeling for Assessment of Sediment Management				
Alternatives	6	Delline Chine	Lub 5 0 2021	070 (222
UNESCO-ISI Unline Training Workshop on Sediment	Co-sponsor	Beijing, China	July 5–9, 2021	870 (223 registered)
IAHS/ICCE International Symposium on River Sediment	Co-sponsor	Bydgoszcz Poland	October 17-21 2022	
Quality and Quantity	C0-3p011301	by agoszcz, i olanu	Secoler 17 21, 2022	

Shucheng Wang and Mr. Lisheng Suo; the then-Deputy Assistant Director General of the UNESCO, Dr. A. Szollosi Nagy; the then-Executive Director of IAHR, Dr. Christopher George; the then-President of IAHS, Prof. Kuniyoshi Takeuchi; the then-President of WASWAC, Prof. George Gergov; and the newly elected President of WASER Prof. Des Walling and other VIPs attended the Symposium and made opening addresses. Prof. Des Walling, then-Secretary General Prof. Zhaoyin Wang, and then-WASER Council members Prof. Sam S. Wang, Prof. Leo C. van Rijn, and Prof. K.G. Ranga Raju made Keynote Presentations in the Symposium.

The 10th ISRS with the main theme 'Effects of River Sediment and Channel Processes on Social, Economic, and Environmental Safety' was held in Moscow, Russia from August 1–4, 2007. A total of 237 participants from 30 countries and regions attended the Symposium. The then-President Prof. Des Walling, then-Council members Prof. Roman S. Chalov, Prof. Sam S. Wang, and Mr. John R. Gray made Keynote Presentations in the Symposium.

The 11th ISRS with the main theme of 'Sedimentation and Sustainable Use of River Systems' was held in Stellenbosch, South Africa from September 6–9, 2010. Over 160 registered participants from 30 countries and regions attended the Symposium. The then-Council members Prof. Zhaoyin Wang, and Prof. M.J.M. Romkens made Keynote Presentations in the Symposium.

The 12th ISRS with the main theme of 'Integrated Sediment Management for River Basin Sustainability: Challenges & Prospects towards Mid-21st Century' was held in Kyoto, Japan from September 2–5, 2013. More than 370 registered participants from over 30 countries and regions attended the Symposium. The then-Council member Prof. Yitian Li, and the past President Prof. Des Walling made Keynote Presentations in the Symposium. The 1st Workshop on International Sediment Advancements (WISA), an inter-organizational event proposed by Prof. G. Di Silvio, the then-President of WASER, was organized during the Symposium, six invited representatives of WASER, IAHR (International Association for Hydro-Environment Engineering and Research), IAHS (International Association of Hydrological Sciences), ICOLD (International Commission on Large Dams), and the International Sediment Initiative (ISI) of UNESCO contributed and discussed the most significant advances and different priorities in their fields.

The 13th ISRS with the main theme of 'Sediment on the Move – Innovative Management Strategies in Riverine Systems: From Old Problems to New Solutions' was held in Stuttgart, Germany from September 19–22, 2016. About 300 participants from 51 countries and regions attended the Symposium. The then-Council member Prof. Bruce W. Melville made a Keynote Presentation in the Symposium. The 2nd WISA was organized during the Symposium, and presentations were made and discussed by representatives of WASER, IAHR, IAHS, World Conference on Soil and Water Conservation under Global Change (CONSOWA) and the UNESCO ISI, promoting interdisciplinary interaction and collaboration.

The 14th ISRS with the main theme of 'Integrated Sediment Management in Rivers and Coasts' was held in Chengdu, China from September 16–19, 2019. More than 400 participants from 25 countries and regions attended the Symposium. The then-

President Prof. Zhaoying Wang, and then-Vice President Prof. Hajime Nakagawa made Keynote Presentations in the Symposium.

The 15th ISRS with the main theme of 'Sustainable Sediment Management in a changing Environment' was held in Florence, Italy during September 16–19, 2023. The Symposium has been postponed from its original date from 2022 to 2023, due to the COVID-19 Pandemic. Past President Prof. Zhaoying Wang and the Council member Prof. Junke Guo made Keynote Presentations in the Symposium.

4.2. Official journal – IJSR

The adoption in 2004 of the *International Journal of Sediment Research* (IJSR), which was founded by IRTCES in 1986, as the official journal of WASER has played an important role in increasing the exposure of the Association. IJSR is co-owned and sponsored by the IRTCES, the China Institute of Water Resources and Hydropower Research (IWHR) and Tsinghua University. It is an international, peer reviewed journal, focusing on publication of original contributions related to theoretical advances, numerical modeling, field observational, and laboratory studies and reviews dealing with processes, products, and techniques in the field of sedimentation and erosion. Due to a significant increase in the quantity and quality of manuscript submissions, the IJSR changed from a quarterly to a bimonthly journal from 2019.

The IJSR has progressively increased its influence in the field of erosion and sedimentation thanks to the efforts of the Chief Editors Prof. Zhaoying Wang (-2014) and Prof. Hongwei Fang (2015–), the Associate Editors, the Review Board, and the Editorial Office in raising the international profile of the Journal. The number of annual published paper progressively increased from 25 in 2004 to 70 in 2022. The journal has been indexed by the Science Citation Index Expanded (SCIE) since 2007, and received its first official Impact Factor (IF) 0.908 for 2009. The IF has since steadily increased to 3.6 for 2022 (Fig. 1).

4.3. Other cosponsored meetings and activities

WASER also sponsored/organized or co-sponsored/coorganized over 30 other international conferences, workshops,



Fig. 1. Journal impact factors for IJSR.

Table 3

Recipients of the international Qian Ning prize for erosion and sedimentation technology.

Year of award	Recipient
2007	Des Walling (UK); Sam S. Y. Wang (USA)
2010	Chih Ted Yang (USA); Albert Rooseboom (South Africa)
2013	Giampaolo Di Silvio (Italy); Hajime Nakagawa (Japan)
2019	Silke Wieprecht (Germany); Marwan Hassan (Canada)

training courses and study tours, besides sponsoring the ISRSs (Table 2). This has served to raise WASER's profile as well as promoting collaboration with agencies and other organizations working in the field of erosion and sedimentation.

The series of International Conference on Estuaries and Coasts (ICEC) was initiated and sponsored by IRTCES and the 1st ICEC was held in Hangzhou, China in 2003. Six further ICECs have been sponsored by WASER and IRTCES since 2003. These include refer to the 5th and the 2nd ICEC held in Guangzhou, China during November 28–30, 2006, with over 260 participants; the 3rd ICEC

held in Sendai, Japan during September 14–16, 2009, with over 120 participants; the 4th ICEC held in Hanoi, Vietnam during October 8–11, 2012, with over 200 participants; the 5th ICEC held in Muscat, Oman during November 2–4, 2015, with over 150 participants; the 6th ICEC held in Caen, France during August 20–23, 2018, with over 150 participants; and the 7th ICEC held in Shanghai, China during October 18–21, 2021, with 260 onsite and 300 online participants. The 8th ICEC will be held in Quebec, Canada in 2024.

WASER has also co-sponsored the series of International Conference on the Status and Future of the World's Large Rivers, which forms part of the UNESCO World's Large Rivers Initiative, coordinated by UNESCO Chair and current WASER President Prof. Helmut Habersack. The 1st—5th World's Large Rivers Conferences were held in Austria in 2011, Brazil in 2014, India in 2017, Russia in 2021 (online), and Austria in 2023.

WASER has organized and co-sponsored several study tours and training workshops. The ISI Online Training Workshop on Sediment Transport Measurement and Monitoring, co-sponsored by WASER, was held from July 5–9, 2021. A total of 223 participants from 61 countries and regions, including the 15 lecturers/organizers and

Table 4

IJSR award for distinguished contributions to sediment research.

Year of the prize	Paper title	Author	Published in
2022	Characterization of horseshoe vortex in a developing scour hole at a cylindrical bridge pier.	Dawei Guan, Yee-Meng Chiew, Maoxing Wei, Shih-Chun Hsieh	2019, Vol. 34, No. 2, pp. 118–124
	Artificial neural network simulation for prediction of suspended sediment concentration in the River Ramganga, Ganges Basin, India.	Mohd Yawar Ali Khan, Fuqiang Tian, Faisal Hasan, Govind Joseph Chakrapani	2019, Vol. 34, No. 2, pp. 95–107
	Response of nephelometric turbidity to hydrodynamic particle size of fine suspended sediment.	Christina Bright, Sarah Mager, Sophie Horton	2020, Vol. 35, No. 5, pp. 444-454
2019	An experimental study on the effects of physical, mechanical, and electrochemical properties of natural cohesive soils on critical shear stress and erosion rate.	Navid Kimiaghalam, Shawn P. Clark, Habib Ahmari	2016, Vol. 31, No. 1, pp. 1–15
	Analyses of trends and causes for variations in runoff and sediment load of the Yellow River.	Hongling Shi, Chunhong Hu, Yangui Wang, Cheng Liu, Huimei Li	2017, Vol. 32, No. 2, pp. 171–179
	LES-DEM simulations of sediment transport.	Husam Elghannay, Danesh Tafti	2018, Vol. 33, No. 2, pp. 137–148
2016	Sediment loads response to climate change: A	Xixi Lu, Lishan Ran, Song Liu, Tong Jiang, Shurong Zhang, Jianjun Wang	2013, Vol. 28, No. 1, pp. 1–14
	Biofilm effects on size gradation, drag coefficient and settling velocity of sediment particles.	Qianqian Shang, Hongwei Fang, Huiming Zhao, Guojian He, Zhenghui Cui	2014, Vol. 29, No. 4, pp. 471–480
	Seasonal biostabilization and erosion behavior of fluvial biofilms under different hydrodynamic and light conditions.	Moritz Thom, Holger Schmidt, Sabine U. Gerbersdorf, Silke Wieprecht	2015, Vol. 30, No. 4, pp. 273–284
2013	Bed load transport under different streambed conditions – a field experimental study in a mountain stream	Guoan Yu, Zhaoyin Wang, Heqing Huang, Huaixiang Liu, Brendon Blue, Kang Zhang	2012, Vol. 27, No. 4, pp. 426–438
	Delayed response model for bankfull discharge predictions in the Yellow River.	Baosheng Wu, Lingyun Li	2011, Vol. 26, No. 4, pp. 445–459
	Investigation of turbulence characteristics in channel with dense vegetation.	Hossein Afzalimehr, Razieh Moghebel, Jacques Gallichand, Jueyi Sui	2011, Vol. 26, No. 3, pp. 269–282
	Bed morphology and grain size characteristics around a spur dyke.	Hao Zhang, Hajime Nakagawa, Hideaki Mizutani	2012, Vol. 27, No. 2, pp. 141–157
2010	An analytical solution for calculating the initiation of sediment motion.	Thomas Luckner, Ulrich Zanke	2007, Vol. 22, No. 2, pp. 87–102
	Effect of streambed sediment on benthic ecology.	Xuehua Duan, Zhaoyin Wang, Mengzhen Xu, Kang Zhang	2009, Vol. 24, No. 3, pp. 325–338
	Prediction of the grain size of suspended sediment: Implications for calculating suspended sediment concentrations using single frequency acoustic backscatter.	Roger A. Kuhnle, Daniel G. Wren, James P. Chambers	2007, Vol. 22, No. 1, pp. 1–15
	Protection of bridge piers against scouring with tetrahedral frames.	Hongwu Tang, Bing Ding, Yee-Meng Chiew, Shilong Fang.	2009, Vol. 24, No. 4, pp. 385–399
2007	Kinetic modeling of constitutive relations for particle motion in low to moderately concentrated flows.	Guangqian Wang, Xudong Fu, Xingkui Wang	2005, Vol. 20, No. 4, pp. 305–318
	Depth averaged 2-D calculation of tidal flow, salinity and cohesive sediment transport in estuaries.	Weiming Wu, Sam S.Y. Wang	2004, Vol. 19, No. 3, pp. 172–190
	On the influence of turbulence on the initiation of sediment motion.	U.C.E. Zanke	2003, Vol. 18, No. 1, pp. 17–31
2004	Three papers published in IJSR during 2002 and 2004.		

208 registered trainee participants, attended the workshop. Among these, 176 (85%) of the trainee participants, were from developing countries and female participants accounted for 41% of the total. Over 870 persons including unregistered participants joined in the online training. The workshop had been designed for, and was open to, young engineers, scientists, and managers, who wished to improve their knowledge and understanding of fluvial sediment measurement and monitoring. Five training lectures and one concluding perspective lecture were delivered over 5 days (http://isi-unesco.iahr.org).

4.4. Prize awarding

Three types of prize are awarded by WASER. These include, the International Qian Ning Prize for Erosion and Sedimentation Technology, the IJSR Award for Distinguished Contributions to Sediment Research, and Honorary Membership.

The International Qian Ning Prize is awarded to persons who have (1) made outstanding scientific or technological contributions in the fields of erosion and sedimentation research, and/or related work on project planning, design and implementation; (2) made outstanding contributions to promoting scientific and technological training of personnel in the field of erosion and sedimentation; and (3) have an outstanding record of achievement in the management and/or technical exchange of science and technology and its social benefits, as related to erosion and sedimentation. Professor Qian Ning (1922–1986) was a highly respected international authority in the field of erosion and sedimentation research. To commemorate his outstanding contribution to research on erosion and sedimentation, foster further advancement of the state-of-the art and recognize current leadership and major contributions in the field of erosion and sedimentation research, WASER and the Chinese Qian Ning Prize Foundation Committee decided to jointly establish the International Qian Ning Prize and the prize was first awarded in 2007. Eight persons have received the award since then (Table 3).

The IJSR Award for Distinguished Contributions to Sediment Research aims to provide international recognition for distinguished contributions to the field of sedimentation and erosion research, through original and illuminating research papers published in the *International Journal of Sediment Research*. The award was established by IRTCES in 2001 (IRTCES, 2002) and was first awarded to the authors of three IJSR papers in 2004. The paper or papers to receive the award are selected by the IJSR Editorial Board based on a procedure involving identifying candidate papers and voting by a selection committee. To date, the Award has been made seven times since 2004 and has recognized a total of 23 outstanding papers (Table 4). It represents an important link between the Association and its journal.

Honorary Membership of WASER is awarded to the members of the Association who have made outstanding contributions to the development and work of the Association and to eminent scientists and engineers in the field of erosion and sedimentation. The Council

Table 5

Recipients of honorary membership of WASER.

Year of award	Recipient
2007 2010	Bingnan Lin (China); Erich J. Plate (Germany) Dingzhong Dai (China); Sam S. Y. Wang (USA); Roman S.
	Chalov (Russia)
2013	Des Walling (UK)
2016	Chih Ted Yang (USA)
2022	Giampaolo Di Silvio (Italy); Zhaoyin Wang (China);
	Chunhong Hu (China)

determines whether a nominee is to receive honorary membership. Ten members have received this honor to date (Table 5).

5. Concluding remarks

Nearly 20 years after its inauguration, WASER has now become a well-known and respected International Association that plays an important role within the international scientific community in the field of erosion and sedimentation. Through WASER's activities, the Association seeks to strengthen education and capacity building to support sustainable sediment management in global water management, promote information sharing related to data, scientific research results and management methods, and advance the progress of studies on erosion and sedimentation.

Sediment plays an important role in the geomorphic processes affecting rivers and estuaries and the wider landscape, including: (1) erosion, the detachment of soil particles; (2) sediment transport, the movement of eroded soil particles in flowing water; and (3) sediment deposition, the settling of eroded soil particles to the bottom of a water body (Wang et al., 2013). There are many topics in sediment research which continue to attract the interests of researchers, including: erosion processes and sediment yield; sediment sources; sediment transport; landscape connectivity, erosion and sedimentation in estuarine and coastal areas; reservoir sedimentation; environmental and ecological implications of sediment; fluvial processes and morphodynamics; sediment related disasters; integrated sediment management, etc.; and significant progresses in these and other topics continue to be made.

Recently, sediment research has entered a new era and is facing new challenges following increasing awareness of the co-existence of humans and nature. Besides continuing further studies on conventional sediment issues and problems, new topics of sediment research linked to the impact of the global change could include: hydrological-morphological processes against a background of changes in the runoff and sediment loads of major rivers; interdisciplinary sediment studies involving environmental and ecological aspects; theory and methods of integrated management of water, sediment and ecology in rivers; causes and prevention of sediment related disasters; and the unique channel morphodynamics of rivers in the Qinghai–Tibet Plateau. These studies will promote the further development of sediment research and promote the progress of sediment management practices (Hu, 2014; Noack et al., 2018; Wang, 2007; Wang & Lin, 2003). WASER can play a leading role in future studies on erosion and sedimentation through the contributions of its members who represent many different areas of the world and a diversity of scientific and engineering backgrounds and perspectives. WASER has a website: http://www.waser.cn, and an active Secretariat based in IRTCES, Beijing, China. All persons interested in erosion and sedimentation and sediment management are welcome to become a member of the Association.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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