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# PROGRAMME IMPLEMENTATION

Item 6 of the provisional agenda

Summary

This document provides a summary of the implementation of the Programme on:

6.1 Implementation of IHP-VIII (2014-2021);
6.2 Regional activities;
6.4 Cooperation with other UNESCO programmes.

**IMPLEMENTATION OF IHP VIII (Agenda item 6.1)**

1. The following report provides a summary of main achievements in the implementation of IHP VIII since the last session of the IHP Council held in June 2016 through activities performed mainly by the IHP secretariat itself or in in partnership with some centres and Chairs. Activities implemented by the IHP National Committees are missing, so is the case for some C2C and most of the Chairs.

2. **Theme 1: Water-related disasters and hydrological change:** The theme aims at supporting institutions to develop research and training on floods and drought risk management related to climate extremes in order to provide Member States with data, tools and methodologies, as well as policy advice, to improve their adaptation capacity for water-related disaster management. The theme is directly connected to IFI (International Floods Initiative), IDI (International Drought Initiative), FRIEND (Flow Regimes from International Experimental and Network Data), ISI (International Sediment Initiative) and HELP (Hydrology for the Environment, Life and Policy)[1]. The Centres and Chairs which the Secretariat has information on their active contribution to this theme are among others, the International Centre for Water Hazard and Risk Management (ICHARM, Japan), Water Centre for Arid and Semi-Arid Zines of Latin America and the Caribbean (CAZALAC, Chile), International Centre for Integrated Water Resources Management (ICIWaRM, USA) and International Centre for Water Resources and Global Changes (ICWRGC, Germany), Asia Pacific Centre for Ecohydrology (APCE, Indonesia), Regional Centre on Urban Water Management, (RCUWM, Iran), Regional Centre for Integrated River Basin Management (RC-IRBM, Nigeria), Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and the Pacific (HTCKL, Malaysia), Centre for Hydroinformatics (CIH, Brazil/Paraguay), UNESCO Water Chair on Knowledge Systems for IWRM (Pakistan), the UNESCO Chair on Water-related Disaster Risk Reduction (Slovenia) and the UNESCO Chair on Water, Disaster Management and Climate Change (Thailand).

**Focal Area 1.1 – Risk management as adaptation to global changes**

*Floods*

3. Within the framework of the new strategy of IHP-IFI (International Flood Initiative), implementation plans in seven countries (Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka and Vietnam) of the Asia and Pacific Region have been developed with support of ICHARM. As well, various awareness raising and knowledge sharing events have been organized, for example a side event in Jakarta (Indonesia) during the Eighth Meeting of the High-level Experts and Leaders Panel on Water and Disasters (HELP), a workshop during the 9th GEOSS Asia-Pacific Symposium, in January 2017 in Tokyo (Japan) and a side event during the 6th International Conference on Flood Management (ICFM) in September 2017 in Leeds (United Kingdom of Great Britain and Northern Ireland). The amount of participants being 400 (120 women and 280 men). IFI has established a strategic partnership with the HELP Panel[1] and has been strengthened its partnership with the International Conference on Floods Management (ICFM) series.

4. Thanks to IHP, flood risk is better managed in Albania, with a potential to extend the tested approaches in other countries belonging to the Drin River Basin (Greece, Kosovo, the Former Yugoslav Republic of Macedonia and Montenegro). A final report and policy brief document on the impact of crowdsourcing solutions and professional volunteers as human

1 To note that there is the HELP Programme which is a UNESCO initiative on Hydrology for the Environment, Life and Policy and the High-level Experts and Leaders Panel on Water and Disasters (HELP), which was convened at the request of the UN Secretary General's Advisory Board on water and Sanitation (UNSGAB) in 2007.

sensors and reporters on Disaster Risk Reduction (DRR) has been finalized along with a user guide (in English and Albanian) to operationalize the interface of the system.

5. The capacity of relevant Pakistani agencies and Afghani agencies regarding flood management, especially forecasting, warning and hazard analysis has continued been strengthened through the second phase of the project “Strategic strengthening of flood Warning & Management Capacity of Pakistan”. In total capacities of 91 experts of which 27 women strengthened during various training. The capacity of 38 local community members (14 women and 24 men), including farmers, was enhanced on watershed Management for Floods and Droughts during a community-based training held in August 2017 in Sindh Province, Pakistan based on a developed training manual translated into the four local languages of Pakistan namely Urdu, Sindhi, Punjabi and Pashto.

6. More than 150 experts (including 50 women and 100 men) capacitated on methodologies and tools for managing flash floods under the project “Urgent Capacity Development for Managing Natural Disaster Risks of Flash Floods in Egypt, Jordan, Sudan and Yemen” which was successfully completed in 2016. The outcomes of the project, which include flood risk maps, were presented at the Second International Symposium on Flash Floods in Wadi Systems (El Gouna, Egypt, October 2016) and during COP22.

*Droughts*

7. Under the framework of IDI, drought mitigation policies, strategies and plans within SADC at national and basin levels were reviewed and best practices and key recommendations identified and shared during a workshop held in March 2017 in Johannesburg in South Africa. The workshop was attended by twenty experts (7 women and 13 men) including representatives of the SADC countries and river basin commissions.

*Floods and droughts monitoring systems*

8. Under the framework of IDI, IFI and G-WADI, the Africa drought and flood monitoring system was transferred in the Southern African Development Community’s (SADC) region and 35 experts (8 women and 27 men) from hydro-meteorological services of 12 countries (Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Namibia, South Africa, Swaziland, United Republic of Tanzania, Zambia, Zimbabwe) were capacitated during a workshop held in Harare, Zimbabwe in November 2016. Pilot case studies on the use of hydro-climate services by farmer communities in Malawi, Zambia and Zimbabwe and by water managers in Namibia, Botswana have been conducted.

9. Latin American drought and flood monitor and Latin American Drought Atlas were developed and transferred to Member States of the region through various regional workshops. Institutional capacities of 14 officials from 10 countries of LAC on hydrological maxima were enhanced through the workshop “Tools for Management of Hydrological Maximum in a Changing World” held in June 2017 in Montevideo, Uruguay.

*Climate Change*

10. Knowledge disseminated and capacities of 40 experts (6 women and 34 men) from 17 countries in Africa and 34 experts (14 women and 20 men) from 12 countries in Asia Pacific were enhanced on building resilience, climate change risk, vulnerability assessment and early warning during regional workshops respectively held in June 2017 in Niamey, Niger and in July 2017 in Langkawi, Malaysia. Knowledge and best practices shared among more than 100 experts (20 women, 80 men) during the technical session on “Early Warning Systems for water extremes and climate change in Africa” held during the 6$^{th}$ Africa Water Week in July 2016 in Dar es Salaam (United Republic of Tanzania).

**Focal Area 1.2 – Understanding coupled human and natural processes**

*River Basins*

11. Under the framework of FRIEND, knowledge and experiences shared on hydrology of large river systems during the 2nd International conference on African Large River Basins Hydrology organized by FRIEND Western and Central Africa (FRIEND/AOC) and MED-FRIEND and held in November 2016 in Dakar (Senegal). It was attended by 130 (26 women and 104 men, and overall 39 youth) scientific experts, coming from the Sub-Saharan area and from North Africa. The third International conference on Africa large river basins is planned to take place in Algiers from 6-9 May 2018.

12. IHP continued cooperating with the International Sava River Basin Commission for an improved sediment monitoring and data exchange system for the Sava River Basin and to establish an on-line free database on sediment.

**Focal Area 1.3 – Benefiting from global and local earth observation systems**

13. Capacities of 70 (26 women and 44 men) water professionals from 10 LAC countries (Argentina, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Mexico, Nicaragua, Peru and Salvador) were enhanced on the application of satellite remote sensing to support water resources management during a training organized in Foz de Iguazú, Brazil, in July 2016, with the Centre on Hydroinformatics (CIH) and NASA-ARSET (Applied Remote Sensing Training).

14. Knowledge and best practices shared and capacities of 53 experts (15 women and 38 men) from Cambodia, Indonesia, Lao PDR, Malaysia, Philippines, Thailand and Vietnam enhanced during the 3rd ASEAN technical workshop on Remote Sensing Precipitation for Water and Disaster Management held in January 2017.

15. Capacities of 58 water professionals and researchers (15 women and 46 men) from 16 countries of LAC (Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela), strengthened on the use of different remote sensing data to study the characteristics of water basins to support policy and decision-making, during an international training course held in Foz do Iguaçu, Brazil in November 2017.

16. Twenty one Pakistani engineers (4 women and 17 men) were capacitated on precision measurements of river discharges by Acoustic Doppler Current Profiler equipment handed over to Pakistan Council for Research on Water Resources (PCRWR) during an intensive 5 days hands-on training in August 2017.

**Focal Area 1.4 – Addressing uncertainty and improving its communication**

17. Key messages on how to best promote citizen science as an integral element to achieving and monitoring the SDGs were discussed during a workshop held on “Leveraging Science in Water and Climate Information Services to Achieve the Sustainable Development Goals” in Addis Ababa, Ethiopia in May 2017 and attended by 23 participants (7 women and 16 men). The messages can be found at http://paramo.cc.ic.ac.uk/files/Mountain-EVO_insights.pdf

**Focal Area 1.5 – Improving the scientific basis for hydrology and water sciences for preparation and response to extreme hydrological events**

*Glaciers*

18. Knowledge and experiences shared on the Impact of Glaciers Melting on Water Resources in Central Asia in the Context of Climate Change during an international seminar held in November 2016 in Bishkek (Kyrgyzstan), and attended by 58 experts (14 women and 44 men). Capacities of 16 young researchers (4 women and 12 men) from Kyrgyzstan, Tajikistan and Russia enhanced during two summer schools on "Glacier Mass Balance Measurements and Analysis" and "Permafrost and Potentially Dangerous Glacier Lakes", held in July - August 2016 in Kyrgyzstan.

19. Capacities of 40 experts of 14 countries (6 women and 34 men) from Andean region strengthened in adaptation strategies to counteract impacts of glacier retreat in the Andean region during the synthesis meeting of the Glacier Retreat in the Andes project held in August 2017 in Mendoza, Argentina. Achievements of the project and products related to current diagnosis of glaciers in the Andean countries and their vulnerability to climate change were presented and on-going activities of the Working Group on Snow and Ice were discussed. The IHP-LAC Working Group on Snow and ICE met on this occasion to agree on a workplan for the next biennium. Results can be found at http://www.unesco.org/new/en/office-in-montevideo/ciencias-naturales/water-international-hydrological-programme/impact-of-glacier-retreat-in-the-andes/

20. Knowledge and best practices to address the most pressing water challenges under global change shared during the Knowledge Forum on Water Security and Climate Change (https://en.unesco.org/water-climate-knowledge-forum) held at UNESCO in Paris in October 2017, bringing together 124 participants (of which 44 women and 80 men) of more than 25 countries (Austria, Belgium, Bolivia, Canada, Chile, China, France, Germany, Indonesia, Italy, Japan, Kazakhstan, Netherlands, Niger, Nigeria, Norway, Paraguay, Poland, Republic of Korea, Senegal, Serbia, Sudan, Suisse, Tunisia, United Kingdom, Uruguay, USA, Zimbabwe). The contributions from young researchers and professionals were highlighted.

21. Following the session on "Future directions and revitalizing of FRIEND Programme in line with IHP-VIII and Agenda 2030" held in January 2017 in Paris, a call for the renew of regional FRIEND teams for the majority of FRIEND regional networks has been launched with the expectation of having new coordination teams by the 8th FRIEND Global Conference to be held in Beijing in November 2018. In reinforcing the network, the FRIEND page was opened on the website ResearchGate in February 2017 (https://www.researchgate.net/project/FRIEND-Flow-Regimes-from-International-Experimental-and-Network-Data) to better connect researchers and scientists and better disseminate the results. The ResearchGate page for MEDFRIEND was also opened in February 2017 (https://www.researchgate.net/project/MEDFRIEND-The-FRIEND-IHP-VIII-program-for-the-Mediterranean). The FRIEND ResearchGate pages had a total of 3670 visits and 151 followers at the end of March 2018.

22. **Conclusion and way forward:** Tools and methodologies including flood and drought monitoring system deployed in Latin America and Southern Africa and human and institutional capacities were strengthened in Member States in the areas of water extremes (floods, droughts), glacier melting, sediment and river basin management including conditions under climate change by the provision of tools, trainings and platform for knowledge sharing and science-policy discussion. Various events (workshops, trainings, conferences and experts meetings) were organized with more than 600 people trained (30% women). IHP will build on the achievements so far and will further strengthen its networks and initiatives to continue reinforcing capacity of Member States in addressing the impacts of

water extremes and hydrological changes under global change with a focus on management under hydrological risk and related socio-economic losses.

**Theme 2: Groundwater in a changing environment**

23. The objective of Theme 2 is to contribute to water security by ensuring groundwater resources management and governance sustainability. The main results achieved in each of the Theme 2 Focal areas since the 22st IHP Council (June 2016) are set forth below, including references to the Groundwater Resources and Climate (GRAPHIC), Internationally Shared Aquifer Resources Management (ISARM), Managing Aquifer Recharge (MAR) and World Hydrogeological Map (WHYMAP) initiatives, along with concluding remarks and the way forward. The centres which contributed to the following achievements are the International Groundwater Resources Assessment Centre (IGRAC, Netherlands) and the Regional Centre for Groundwater Management (CeReGAS, Uruguay).

***Focal area 2.1 Enhancing sustainable groundwater resources management***

*New map produced on Karst Aquifers of the World. Member States' capacities on groundwater governance principles improved.*

24. UNESCO-IHP and its partners in the WHYMAP Programme, published in 2017 the World Map of Karst Aquifers. The map is a visual tool for decision-making and research (https://www.whymap.org/whymap/EN/Maps_Data/Wokam/wokam_node_en.html). The guidelines prepared during the implementation of the Groundwater Governance project, executed by UNESCO IHP together with FAO and World Bank, were considered in the preparation of project proposals for the application of the principles to specific aquifers in the LAC region (Montevideo, Uruguay, June 2017). The UNESCO Cairo Office organized a workshop in Bahrain in October 2017 to prepare a roadmap for capacity building on groundwater governance in the Arab Region. Thirteen Arab countries were represented (5 women and 27 men). A course on "Groundwater, Water Security and Governance" (April 2017) with emphasis on transboundary areas, organized with the CeReGAS was attended by 26 professionals (15 women and 14 men) from 10 countries.

**Focal area 2.2 Strategies for aquifers recharge**

*Increased knowledge and capacities*

25. Managed Aquifer Recharge (MAR) is a promising adaptation measure to reduce vulnerability to climate change and can contribute to the achievement of the SDGs. UNESCO-IHP and UNESCO IGRAC Centre have been continuously updating the MAR portal (http://marportal.un-igrac.org), which is the first global inventory of MAR schemes. The UNESCO IGRAC Centre has updated the MAR portal that is now presenting 1,200 case studies from over 50 countries.

**Focal area 2.3 Adapting to the impacts of climate change on aquifer systems**

*Series of Policy Papers*

26. The IHP GRAPHIC working group prepared a series of Policy Papers that was launched at COP21 that provides key recommendations and highlights the important role of groundwater in the context of adaptation to and mitigation of the impacts of climate change, and in particular on Small Island Developing States (SIDS). GRAPHIC-LAC prepared and

presented case studies from groundwater and climate experts involved in research and management activities in Bahamas, Brazil, Chile and Uruguay (September 2017).

27. The capacity of Arab climate change negotiators was enhanced on water governance and climate change with emphasis on the impact of climate change on groundwater following a training session held during the 9th Capacity Building Workshop for Arab Climate Change Negotiators Egypt, 9-12 September 2017.

**Focal area 2.4 Promoting groundwater quality protection**

*New maps and innovative methodologies for the characterization of the dependency of coastal wetlands on groundwater resources were released*

28. IHP is executing the preparation phase of a new project funded by the Global Environment Facility (GEF) aimed at applying the tools developed for the protection of coastal aquifers and groundwater-related ecosystems of the Mediterranean Sea. IHP contributed to and organized the consultations (Tivat, Montenegro, September 2017 and Rabat, Morocco, December 2017) needed to reach agreement in countries on the priority aquifers and related ecosystems where project activities will concentrate.

**Focal area 2.5 Promoting management of transboundary aquifers**

*Recognition of UNESCO-IHP work towards cooperation for the management of transboundary aquifers (TBA) by the UN General Assembly and establishment of the first TBA management mechanism in Southern Africa.*

29. As a result of the IHP work in the global assessment of transboundary aquifers (TBAs) and Small Island Development States (SIDS) groundwater systems, recommendations for the management of these resources are now available (http://unesdoc.unesco.org/images/0025/002592/259254e.pdf).

30. The recognition of IHP's efforts and successes was expressed in a Resolution (December 2016) by the United Nations General Assembly. IHP facilitated the establishment of the first cooperation mechanism for the governance of a transboundary aquifer in the Southern Africa Region (Stampriet Aquifer).

*UNESCO-IHP, as co-custodian agency*

31. IHP finalized the first cycle of monitoring the SDG6 indicator 6.5.2 on transboundary water cooperation, including groundwater. The results will be presented at the HLPF in New York in July 2018.

32. The IHP technical contribution to the topic of the management of transboundary aquifers has been fully acknowledged by the UN General Assembly at its 71st Session. The Assembly adopted on 13 December 2016 the resolution on "The law of transboundary aquifers" (A/RES/71/150, in reference documents), which encourages UNESCO-IHP to continue its contribution by providing further scientific and technical assistance to interested Member States.

33. As a follow up to A/RES/71/150, IHP continues its efforts in the setting up of multi-countries cooperation mechanisms and execution of joint plans for the governance and management of transboundary aquifers located in Central America, Central Asia, South Eastern Europe, North Africa, Southern Africa and the Sahel region. The related activities include the improvement of the knowledge on the aquifers characterization, the creation of enabling conditions for dialogues at different levels and the strengthening of local capacities

on groundwater governance, national and international water law, hydrodiplomacy and gender aspects.

34. **Conclusion and way forward:** In the current reporting period, IHP has increased the scientific knowledge base on the world's groundwater resources and facilitated the establishment of cooperative mechanism for the management and governance of transboundary aquifers (e.g. the Stampriet Aquifer – the first example in Southern Africa), and advanced on the mapping and assessment of groundwater in SIDS. Looking ahead, IHP will continue its work to collect data, expand inventories and assess global groundwater resources as well as to support countries in the establishment of cooperation mechanisms for the governance of groundwater resources management. Additionally, it will keep assisting member states for the monitoring of the indicator 6.5.2. In total, under Theme 2 more than 1000 persons were trained out of which around 300 were women.

**Theme 3: Addressing water scarcity and quality**

35. The theme contributes to addressing water scarcity and quality challenges. On water scarcity, the objective is to support member states to improve water governance by forecasting and planning for lack of water availability based on sound scientific information and appropriate tools and methodologies. For water quality, the objective is to support countries to improve water quality and wastewater management by strengthening knowledge and capacity on technical and policy approaches.

36. The IHP initiatives linked to the water quality theme are the International Initiative on Water Quality (IIWQ). The following UNESCO water-related C2Cs and Chairs have contributed to this theme: Regional Centre for Integrated River Basin Management (RC-IRBM) in Kaduna, Nigeria; International Centre for Water Resources and Global Change (ICWRGC) in Koblenz, Germany; the newly-established UNESCO Chair on Water, Energy and Disaster Management (WENDI) at Kyoto University, Japan; and UNESCO Chair in applied membrane sciences for environment at the European Institute of Membranes in Montpellier, France and I-WSSM C2C.

37. The IHP Initiatives linked to the water scarcity theme are Global Network on Water and Development Information for Arid Lands (G-WADI) and International Drought Initiative (IDI), the C2Cs and Chairs contributing to it are Water Centre for Arid and Semi-Arid Zones in Latin America and the Caribbean (CAZALAC, Chile), International Centre for Integrated Water Resources Management (ICIWaRM, USA), Water for Sustainable Development and Adaptation to Climate Change Centre (WSDAC, Serbia), Regional Centre on Urban Water Management (RCUWM, Iran).

38. In the area of water diplomacy, and in particular to the Potential Conflict to Cooperation Potential (PCCP), IHE Delft (Netherlands), the Chair on Hydropolitics (Geneva) and the International Centre for Water Cooperation (Stockholm) are the contributing Centres and Chairs.

**Focal Area 3.1 - Improving governance, planning, management, allocation, and efficient use of water resources**

39. A new strategy for G-WADI was developed and adopted during the international conference on "GWADI" (http://gwadi.org/article/new-strategic-plan-developed-g-wadi): More than a decade enhancing water and sustainable development for arid regions" held in Beijing (China) in October 2016 and attended by 36 experts from across the network (of which 8 women).

40. Capacities of 122 experts (38 women and 84 men) from Argentina, Aruba, Brazil,

Chile, Colombia, Cuba, Ecuador, Honduras, Mexico, Peru, USA and Uruguay were enhanced on Rainwater harvesting techniques as tool to deal with water scarcity during a workshop held in cooperation with the CAZALAC Center in March 2017 in Santiago, Chile.

41. Capacities of 324 experts (120 women and 204 men) from 26 countries (Brazil, Mexico, Colombia, Argentina, Peru, Venezuela, Chile, Guatemala, Ecuador, Cuba, Haiti, Bolivia, Dominican Republic, Honduras, Paraguay, Nicaragua, El Salvador, Costa Rica, Panama, Uruguay, Jamaica, Bahamas, Saint Lucia, Trinidad and Tobago, USA) were strengthened on tools and methodologies in addressing water related challenges in Arid and Semi-Arid lands within the framework of the project "Managing Water Resources in Arid and semi-Arid Regions of Latin America and the Caribbean (MWAR-LAC)" completed in December 2016 (http://www.cazalac.org/mwar_lac/).

42. Needs assessment on Climate Services for Improved Water Resources Management in Vulnerable Regions in Southern Africa were discussed during a regional workshop held from 30-31 January 2018 in Harare, Zimbabwe, involving 72 experts (19 women and 53 men) from Botswana, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe.

**Focal Area 3.2 - Dealing with present water scarcity and developing foresight to prevent undesirable trends**

43. IHP and the Centre of Hydrometeorology and Remote Sensing (CHRS) at UCIrvine jointly launched the iRain mobile application during COP22, providing global precipitation monitoring in near real-time based on satellite data. The free access to such data is especially relevant in countries where data availability is scarce. The Namibia Hydrological Services (NHS) continues using G-WADI's GeoServer data to prepare a daily flood/hydrological drought bulletin with up-to-date information on flood and drought conditions for local communities.

44. The Midsummer Drought Atlas to assess the 'Canicula' drought frequency in Central America and the Caribbean was developed and discussed during a regional workshop, held in Guatemala in July 2017 and attended by 25 participants from 11 countries, of which 7 women and 14 men.

**Focal Area 3.3 - Promoting tools for stakeholders involvement and awareness and conflict resolution**

45. Knowledge, experiences and best practices shared on water cooperation and water diplomacy during various events organized by IHP including: (a) a special session on innovative mechanism on water cooperation held in Tajikistan in August 2016 during the High Level Symposium on SDG 6; (b) a session at the IAHS Scientific Assembly in July 2017 in Port Elizabeth in South Africa which brought together 25 persons (7 women and 18 men); a panel of experts during the Knowledge Forum on Water Security on Climate Change in October 2017 in Paris; and (c) a panel session at the Water Security and Climate Change Conference in Cologne in September 2017, counting with 124 participants (of which 44 women and 80 men).

46. Twenty nine multi-disciplinary experts (of which 7 women and 22 men) from Afghanistan and Iran were capacitated on principles of transboundary water resource management with case studies and lessons learned from different regions in the world during a workshop held in January 2018 in collaboration with UNESCO Teheran and IHE Delft.

47. A position paper on UNESCO water diplomacy has been prepared in revamping PCCP and was discussed during a meeting of an expert advisory group on water diplomacy

in April 2018 at UNESCO HQ.

**Focal Area 3.4 - Addressing water quality and pollution issues within an IWRM framework - improving legal, policy, institutional, and human capacity**

*Water quality and climate change*

48. IIWQ facilitated science-policy discussions on the impact of climate change on water quality and adaptation responses through dedicated discussions at the COP22 (Morocco) and a technical meeting. Bringing together 6 policy-makers and experts (3 women and 3 men), the side-event provided a platform for a multi-stakeholder discussion on the topic within the international water and climate communities. IIWQ organized a major Technical Event on "Water quality and climate change: Connecting the dots" during the 2016 Stockholm World Water Week, attended by over 110 participants, including 5 women experts/speakers and 57 women attendees.

*Water quality in Africa and SIDS*

49. The IIWQ contributed to the 6th Africa Water Week in Dar Es Salaam in July 2016, by leading the Sub-Theme on Water Quality and wastewater management. IIWQ and other IHP programmes organized 5 thematic sessions on various water quality and wastewater issues, as well as on ecohydrology. The two IIWQ Thematic Session on Emerging Pollutants, were attended by approximately 60 and 100 participants respectively (about 30% women).

50. The IIWQ Regional Consultation on Water Quality in the Pacific SIDS was organized in Nadi, Fiji, in October 2017, to identify key water quality priorities and challenges faced by the Pacific SIDS for the implementation of water quality related SDGs. The meeting was attended by over 40 participants (13 women and 27 men), from 12 Pacific Island Countries and representatives of seven international and regional organizations such as UNICEF, WMO, among others. The recommendations of the meeting were presented at UNESCO day on Water at COP23.

*Capacity building on water quality*

51. Knowledge and capacities were enhanced on water quality of 12 decision-makers and technicians integrating Conference of Ibero-American Directors of Water (CODIA) via a training session (Colombia, June 2017). legal aspects and indicators of water quality were discussed, along experiences applied in the region. A regional working group on water quality was formed and met to share national perspectives (February 2018).

**Focal Area 3.5 - Promoting innovative tools for safety of water supplies and controlling pollution**

*Knowledge generation on emerging pollutants*

52. The extrabudgetary Project "Emerging Pollutants in Wastewater Reuse in Developing Countries" promoted the knowledge transfer and generation on emerging pollutants through the 16 IIWQ technical and policy case studies, which include 3 global, 2 regional and 11 national case studies covering 20 countries (Australia, Brazil, Canada, China, Ethiopia, India, Kenya, Kuwait, Mexico, Mongolia, Nigeria, Norway, Rwanda, Saint Lucia, Thailand, Tunisia, Ukraine and Vietnam). The case studies were presented at the IIWQ Technical Event on "Addressing emerging pollutants to achieve the SDGs" during the 2016 Stockholm World Water Week, attended by over 60 participants, including four women experts/speakers and 32 women attendees. The IIWQ convened a Technical Event on "Emerging pollutants in water reuse: Addressing knowledge and policy gaps" at the 2017

Stockholm World Water Week, and on “Opportunities and limits to water pollution regulations”. These technical meetings were attended by 70-100 participants (30-50% women participants).

53. A new UNESCO publication series entitled “Emerging Pollutants in Water Series” has been launched, presenting results of IIWQ case studies. In this series, the first case study report on Pharmaceuticals in the aquatic environment of the Baltic Sea region was published in March 2017 along with an awareness raising infographic brochure containing its key recommendations and data in four languages, including English, French, Spanish and Russian. Two new IIWQ publications in the series were presented at the 2017 Stockholm World Water Week.

*Microplastics in freshwater*

54. The IIWQ case study on Microplastics in freshwater Environments provided a preliminary assessment on the presence of microplastics in water resources and wastewater in 20 countries in all regions of the world, based on available research data. The report of this assessment is in preparation for publication. The case study was presented at Technical event on “Solving the plastic waste crisis in urban waterways” at the 2017 Stockholm World Water Week, attended by over 80 participants (40% women). IIWQ and the “International Centre on Water Resources and Global Change co-organized a Summer School on “Plastics in Marine and Freshwater Environments” in Koblenz, Germany from 16 to 21 July 2017, and was attended by 48 participants (20 women and 28 men ) from 20 countries (Austria, Bosnia and Herzegovina, Brazil, Egypt, France, Germany, India, Indonesia, Italy, Liberia, Mexico, Nigeria, Philippines, Romania, Russian Federation, Serbia, Slovenia, South Africa, UK, USA).

*Water quality monitoring*

55. To improve water quality information at the global level and support the implementation and monitoring of SDG 6 and other goals such as SDG 15 (ecosystems), the IIWQ launched a Project “Use of earth observation (EO) and satellite data for water quality monitoring”. The project’s demonstration phase completed with the development and launching of UNESCO World Water Quality Portal (www.worldwaterqualtiy.org), a pioneering innovative tool to monitor freshwater quality using satellite data. The portal, in its demonstration phase, includes 7 river basins and surface water resources in five different regions (Armenia; Argentina, Brazil and Paraguay; Germany; Egypt and Sudan; Vietnam; USA; and Zambia and Zimbabwe). It provides data on five key water quality indicators: turbidity and sedimentation distribution, *chlorophyll-a*, Harmful Algal Blooms (HAB), organic absorption and surface temperature. These indicators provide vital information on the impact of other sectors and land uses such as urban areas, fertilizer use in agriculture, climate change or dam and reservoir management on surface water resources. Hence, it helps better understand the impact of climate and anthropogenic changes on this type of water bodies. Opportunities for the further development of the Portal for the global coverage are being explored. On the launching of the Portal, IIWQ organized an Exhibition “Water Quality from the Space” at UNESCO in Paris in January 2018, with an inauguration event with the participation of Member States and international organizations such as ESA and JAXA.

56. **Conclusion and way forward**: Under Theme 3 through the development and provision of innovative tools, methodologies and knowledge sharing platforms IHP has supported Member States in addressing water scarcity and quality issues. Major achievements include the strengthening of initiatives including G-WADI and IIWQ, and improved water resources management in countries through the application of EO and satellite data for water resources monitoring and management, including the development of innovative tools such as iRain and IIWQ Portal for water quality monitoring. The MWAR-LAC

project was successfully completed with more than 324 people being capacitated in the LAC region. The new UNESCO publication "*Emerging Pollutants in Water Series*" provides a valuable knowledge source on emerging pollutants, presenting results of 16 IIWQ technical and policy case studies. IHP will expand the capacity development related to the provision of data, tools and methodologies to countries and will continue providing science-policy advices in addressing water quality and scarcity issues.

57. In total, Theme 3 trained 953 persons out of which around 30% were women, from the total 324 were on water scarcity, over 600 (among which, about 240 women; 40%) on water quality and 29 (7 women) on water diplomacy.

**Theme 4: Water and human settlements of the future**

58. The thematic area aims at supporting cities and rural settlements facing climate change, population growth, deterioration of urban infrastructure systems and other global challenges in understanding the issues and in adopting an approach based on the interdependence of the different water systems. The following paragraphs summarize achievements since the 22nd IHP Council session (June 2016) with focus on knowledge production and exchange, disseminating, the importance of Smart Water Systems and the exchange of good practices through conferences, workshops, and the establishment of new initiatives in line with 2013 IHP Nairobi meeting.

59. It is to be noted that three water related Category II Centres and three Chairs contribute to the work of the theme, these are: the UNESCO International Centre for Water Security & Sustainable Management (i-WSSM), Republic of Korea; the International Research and Training Centre on Urban Drainage (IRTCUD), Republic of Serbia; the Regional Centre on Urban Water Management (RCUWM), Islamic Republic of Iran; the UNESCO Chair on Water Access and Sustainability at the University of Cincinnati, USA; and the UNESCO Chair in Sustainable Water Services at Tampere University of Technology (TUT, Finland). As part of the activities for Theme 4, IHP is a member and provides the Secretariat of the Megacities Alliance for Water and Climate (MAWC).

60. A senior Programme Specialist at P5 level and three Programme Specialists have been generously seconded by the Government of the Republic of Korea to support Theme 4's activities.

**Focal area 4.1 Game-changing approaches and technologies**

61. Training was organized by IHP and the International Water Association's (IWA) Specialist Group on "Water Security and Safety Management" during the IWA World Congress in Brisbane (October 2016) on "Crisis Management at Water Utilities: Concept, Preparedness and Latest Technology Development in Decision Support System using Artificial Intelligence". 23 attendees from 14 countries (Australia, China, Iran, Japan, Kenya, Malaysia, New Zealand, Portugal, Saudi Arabia, Sierra Leone, South Africa, Swaziland, Sweden, and Vanuatu) have followed this training day, among which 8 women and 15 men.

62. IHP with W-Smart association and the city of Sydney delivered further training on "Eco-Resiliency & Crisis Management" in Sydney (October 2016). 51 participants, among them 13 women and 38 men, attended the workshop with 15 overseas experts, in particular from the water utilities of Tokyo, London, Paris, Singapore, Republic of Korea, Madrid, Liège (Belgium) and Noumea (New Caledonia). In total 74 experts were trained, 21 women and 53 men.

63. IHP through its Urban Water Management Programme (https://en.unesco.org/uwmp) is cooperating with the utilities of The Smart Water for Europe (SW4EU) consortium to share

experience, business model and lessons learnt in a book on “Smart Water Systems” to be co-published with UNESCO-IHP.

**Focal area 4.2 System-wide changes for integrated management approaches**

64. UNESCO-IHP organized a meeting in Paris (December 2017) with officials and key actors from Egypt, Israel, Jordan, Lebanon, and Palestine to promote coastal ecosystems preservation and monitoring measures for alleviating public health risks and environmental hazards due to the spilling of untreated wastewater along the East Mediterranean Coast. The meeting decided to pursue an extrabudgetary project that will facilitate the Member States actions towards environmental sustainability and health protection while supporting Member States in reporting on SDG 6. The meeting had 18 participants, of which 5 women.

65. The Workshop on Strengthening Science-Policy-Society Interface for Implementing Sustainability Science for Biodiversity Conservation in ASEAN and Asia Pacific Region, June 2017 capacitated 55 participants from 11 countries in Asia Pacific (Australia, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Philippines, Republic of Korea, Thailand, Vietnam), among them 20 women and 35 men. The workshop brought together results from sustainability science demonstration sites across the region, including a multi-dimensional Rehabilitation and Restoration Plan and an Urban Stormwater Management Plan for Langat River Basin, which were developed as part of the activities.

**Focal area 4.3 Institution and leadership for beneficiation and integration**

66. Closer cooperation with UN HABITAT and IWA has been pursued and an agreement for cooperation is being formalized within the framework of the Global Alliances for Water and Climate (GAWC; COP 22 http://climateaction.unfccc.int/media/1113/2-gca-water-report.pdf).

67. IHP is a Member and Secretariat of The Megacities Alliance for Water and Climate, which is now part of the Global Alliance for Water and Climate (GAfWAC), created during COP22 in Marrakech with the support of France and Morocco. Communication materials were developed to inform interested parties on the objectives and activities of the Megacities’ Alliance for Water and Climate (MAWaC), and explain the advances of joining the Megacities Alliance. A working group of experts identified by MS has been formed and have started working on the elements the cooperation platform will require.

68. The first edition of the Asian International Water Week (AIWW) was organized at the initiative of the Asian Water Council in Gyeongju, Republic of Korea, from 20 to 22 September 2017, in parallel with the 2nd Korean International Water Week as well as other related events, such as the Business Forum and the Asian Water Council’s meeting on the implementation roadmap to World Water Forum 8. IHP organized a session on “Efficient Water Management for Human Settlements of the future” and had a keynote speech on wastewater’s potential role on “Ensuring sustainable withdrawals of water resources” in a session co-organized with United Nations Environment (UNEP) and the United Nations University (UNU). 40 participants (10 women and 30 men) attended the sessions. Furthermore, the Secretariat was requested to provide the opening speech at the Business Forum and participated at the Asia to World Statement Session receiving high visibility.

69. IHP Secretariat co-organized during COP 23 (November 217) in Bonn, Germany, a UN side event on Human Settlements, promoting its work on its DANURBIS initiative and a parallel session on “Resilient cities” during the Water Action Day. More than 300 people attended the sessions around of which 20% of which women.

70. Within the reporting period, the Advisory Board of Theme 4, composed of 14 experts, of which 4 women, met twice, resulting in the proposal on four white papers to be developed by the Members of the Board (water engineer of the future; establishment of observatories on urban water management; science and technology in the service of urban water management; education in urban water management).

71. IHP in its efforts to eliminate the vague distrust on tap water and public water supply system is planning an international project to improve the ratio of citizens and tourists who are using tap water for drinking, by certifying the management of the water supply system of a city through appropriate tools and via a process of evaluation. In addition, UNESCO aims at developing and providing a platform, linked to WINS, that member cities can use to communicate with each other and to share their best practices and trouble-shooting cases.

**Focal area 4.4 Opportunities in emerging cities in developing countries**

72. IHP carried out demonstration site activities for drinking water supply issues and water resources management in Medan, the fourth largest city in Indonesia. It furthermore conducted studies on water provision for policy recommendations for future expansion on clean water supply in partnership with PDAM2 Tirtanadi and Universitas Sumatera Utara (USU). The policy proposals took into account the estimated population growth from 2019 to 2034, issues of water quality, quantity and a cost-benefit analysis. These activities were financially assisted by Indonesian Funds-in-Trust (FIT) and disseminated through several national and regional workshops.

73. A research project on Climate Change and water security was initiated, aiming to provide developing MS with engineering works that will fortify their defense from climate related effects. The project is funded by the Republic of Korea, and will support two countries per year, one in Asia and one in Africa, for 10 years.

74. In our efforts to provide the state of the art knowledge outlet on issues related to sanitation, UNESCO-IHP is revising the reference book “Sanitation and Disease: Health Aspects of Excreta and Wastewater Management.” published in 1983 (by R.G. Feachem, D.J. Bradley, H. Garelick and D.D. Mara). The project is funded by the Bill and Melinda Gates Foundation and supported by Abroknow, the Michigan State Unversity, and the American Chemistry Council and is mobilising 171 experts from 46 countries which constitutes the GWWP (Global Water Pathogens Project network http://www.waterpathogens.org/about). Several chapters have been published electronically and are available at http://www.waterpathogens.org/, which also include relevant communication material.

75. IHP established in cooperation with IWA, a group of experts on intermittent water supply with the participation of the Regional Centre for Urban Water Management (C2C) and two water related Chairs, the UNESCO Chair on Water Access and Sustainability (University of Cincinnati, USA) and the UNESCO Chair in Sustainable Water Services (Tampere University of Technology, Finland).

76. **Conclusion and way forward:** Overall, under theme 4 of IHP-VIII there were knowledge exchange and raising awareness sessions of UNESCO’s work on Urban Water management, covering events such as the World Water Forum, HABITAT III, COP22 and 23, and all International Weeks, benefiting more than 1000 people, in at least 60 countries, 25% of which female. Furthermore, 74 people were trained, 28% of which women.

77. The main focus of the Urban Water Management Programme is the development of new knowledge; to this extent, four new publications are being developed. New networking

opportunities with C40, Global Alliances for Water and Climate (GAfWaC) and IWA are being explored, while existing ones, like the Megacities Alliance, are being strengthened.

78. The activities undertaken thus far have been reflecting the Nairobi Implementation workplan but do not necessarily respond to all the identified deliverables; the short fall is due to the limited regular programme budget (that does not suffice to implement what was planned). To amend the situation and focus the work of the Secretariat a meeting was organized in May 2018 in Paris with all Theme 4 related Chairs and Category 2 Centres. The meeting resulted in an edited version of the Nairobi matrix, identifying the activities to be implemented until the end of IHP VIII and the contribution of the invited experts and Institutes to them, as well as issues and challenges to be addressed in IHP IX.

79. Furthermore, Theme 4 will continue its work within the Megacities Alliance, establishing their cooperation platform and produce three books related to Urban Water Management. Finally, Theme 4 with the financial and technical support of the Republic of Korea will be supporting 2 countries per year, one in Africa and one in Asia, for the next ten years, to enhance their resilience to Climate Change and strengthening their efforts in water security.

**Theme 5: Ecohydrology, engineering harmony for a sustainable world**

80. Ecohydrology creates green solutions for increasing challenges in the sustainable management of water ecosystems. It combines hydrology, biota and engineering for water security, to enhance both water quality and quantity. IHP-VIII encourages Member States to adopt ecohydrological, solution-oriented best practices in natural resources master plans as an important component of the integrated water resources management approach. With the inclusion of new Ecohydrology demonstration sites in Indonesia (Sagulin, 2017), Ecuador (Paltas, 2018) and France (Lyon, 2018), best practices and solutions are currently applied in 23 sites (http://ecohydrology-ihp.org/demosites/) in 18 countries around the globe, which form the growing Ecohydrology Demonstration Sites IHP Network. The activities carried out since the 22nd IHP Council (June 2016) addressed the issue of disseminating the ecohydrological concept in Member States, with particular reference to Africa, among other regions, through conferences, workshops, dedicated training courses and participation of the Water Family in international events. The programme benefits of a Scientific Advisory Committee also composed of representatives of Category 2 Centres under the auspices of UNESCO (C2C) and water-related UNESCO Chairs, namely the European Regional Centre for Ecohydrology (ERCE, Poland), the International Centre for Coastal Ecohydrology (ICCE, Portugal), the African Regional Centre for Ecohydrology (ARCE, Ethiopia) the Asia Pacific Centre for Ecohydrology (APCE, Indonesia), the International Centre for Integrated Water Resource Management (ICIWaRM, USA), the IHE-Delft Chair in Ecohydrology, the Netherlands, the UNESCO Water Chair in Ecohydrology and Hydroinformatics, China and the UNESCO Water Chair in Ecohydrology Water Ecosystem for Societies, in Portugal.

**Focal Area 5.1 – Hydrological dimension of a catchment**

81. Capacities of Member States on sustainable development related to environmental flows were improved through several national and international workshops and trainings in i) Santo Domingo (April 2017), ii) Costa Rica (May 2017), iii) Cuba (July 2017) and iv) Bolivia (August 2017). One hundred participants (30 women) from twenty countries (Dominican Republic, Cuba, Haiti, Aruba, El Salvador, Honduras, Nicaragua, Panama, Costa Rica, Argentina, Chile, Bolivia, Colombia, Ecuador, Venezuela, Peru, Paraguay, Uruguay, Mexico, Guatemala) attended the events.

**Focal Area 5.3 – Ecohydrology system solutions and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services**

82. With support from Indonesian Funds-in-Trust, a series of small-scale projects were undertaken by the UNESCO Office Jakarta to promote ecohydrology to address sustainable water management issues. Six ecohydrology-related activities based at selected sites across Indonesia were undertaken between June 2015 and March 2017, in collaboration with the Asia-Pacific Centre for Ecohydrology as well as a broad range of academic partners. Activities included the development of an ecohydrology demosite at the Saguling Reservoir in West Java, as well as interventions in areas including phytotechnology, rewetting of peatland, urban and peri-urban water management, and water education.

**Focal Area 5.4 – Urban Ecohydrology – storm water purification and retention in the city landscape, potential for improvement of health and quality of life**

83. A new demonstration site located in Lyon (France) joined the Ecohydrology Demonstration Sites IHP Network in March 2018. The site is located in the Yzeron river basin (147 $km^2$) in an area with a population of 144,000 (1,354,000 for Lyon metropolitan area). This project focuses on the enhancement of natural regulating services by increasing local biodegradation capacity of soils and stream sediments to trap and naturally process polluted waters delivered by urban sewage systems, through constructed porous riffles.

**Focal Area 5.5 – Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning**

84. A new demonstration site “Recovering the ancestral water system of Los Paltas with Ecohydrological approach to supply water to the city of Catacocha in southern Ecuador” joined the Ecohydrology Demonstration Sites IHP Network in March 2018. The restauration of the San Pedro Mártir micro basin, Paltas canton, with ancestral knowledge and watershed management, allowed to improve the water supply from 1 to 6 hours per day to the city of Catacocha. By constructing very small dams along the river course, major effect resulted in the reduction of the run-off for the infiltration into the underlying aquifer and the amount of water retained in the small reservoirs allows the ecosystem rehabilitation, inducing regulation of the hydrological cycle (hydrology – biota interplay) and proliferation of vegetation, which in turn reduces excessive evapotranspiration. The site is located in a MAB transboundary biosphere reserve, Bosque de Paz, between Ecuador and Peru.

**Other international events**

85. At the 5th Ecosummit 2016, August-September 2016 in Montpellier, France, IHP together with the C2Cs European Centre for Ecohydrology (ERCE, Poland), ICIWaRM, UNESCO-IHE Chair on Ecohydrology, the African Regional Centre for Ecohydrology (ARCE, Ethiopia), organized a session on “Ecohydrology, Biotechnology and Engineering for Sustainable Development Goals” (65 participants; 30 women and 35 men), a side event on “Integrating Sustainability Science around the hydrological cycle (15 participants; 8 women and 7 men) and a session on “Improving the urban water cycle through green infrastructures” (45 participants; 20 women and 25 men).

86. The Ministry of Water, Irrigation and Electricity of Ethiopia and IHP, together with ERCE, ICCE, UNESCO-IHE and ARCE organized the 2nd African International Symposium “Ecohydrology for Water, Biodiversity, Ecosystem Services and Resilience for Africa” (November 2016), Addis Ababa, Ethiopia, attended by 130 participants from 15 countries (20 women, 8 African countries Cameroon, Ethiopia, Kenya, Nigeria, South Africa, Sudan, Tanzania and Tunisia). The Symposium was followed by the Advanced Training Course in “Ecohydrology and Systemic Biotechnological Solutions for Implementation of Sustainability

in Africa", attended by 40 participants (10 women, 30 men) from eight (8) African countries (Cameroon, Ethiopia, Kenya Nigeria, South Africa, Sudan, Tanzania and Tunisia).

87. The Universidad Estadual do Norte Fluminense (UENF) in Brazil, together with the UNESCO Chair in Ecohydrology: water for ecosystems and societies" of the University of Algarve and the C2C International Centre for Coastal Ecohydrology (ICCE, Portugal) and IHP organised the international conference "Ecohydrology: water security for ecosystems and societies" held in in Campos de Goytacazes, Brazil in March 2017. The conference was attended by 82 participants (38 women, 44 men) from 22 countries, 14 of which from LAC (Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Mexico, Peru, Panama, Paraguay and Uruguay), 2 from Africa (Ethiopia and Nigeria) as well as from France, Greece, the Netherlands, Portugal, Tunisia and USA.

88. The International Symposium on Ecohydrology for the Circular Economy and Nature Based Solutions (Lodz, Poland, September 2017) brought together top experts from scientific institutions and international organizations, and provided an open floor for the discussion about integration of ecohydrological biotechnologies and systemic solutions with a circular economy development towards mitigation/adaptation to climate instability. One hundred and forty-seven participants (close to 50% women) from 20 countries (all continents including Africa) attended the symposium.

89. **Conclusion and way forward:** Overall, 1119 participants (425 women and 694 men) attended the events in the period 2016-2017. More than 100 men and 40 women were trained in ecohydrology, ecology and environmental flows. The events and the brochure "Ecohydrology as an integrative science from molecular to basin scale", distributed in 700 hardcopies from January 2016 to date, raised awareness and shared knowledge. The brochure, in English and Spanish, is available online: http://unesdoc.unesco.org/images/0024/002455/245512e.pdf (English). The Chinese version of the brochure will be available soon. The Ecohydrology Web Platform ecohydrology-ihp.org, contains a "Demosite Card" for each of the 23 sites, a harmonized/normalized and simplified visualization of the main characteristics, achievements and results obtained by each site, presented on a single page. As of March 2018, almost 5,000 demosite cards were downloaded from the web platform. Looking ahead, Theme 5 will continue its work to disseminate the ecohydrology concept and provide solution-oriented approaches for the enhancement of ecosystem services for the benefit of society in new demonstration sites. It will also provide the most appropriate and cost-effective ecohydrological engineering solutions for each ecosystem as management tools for Integrated Water Resources Management (IWRM) and will contribute to the achievement of the SDG 6 and other water related goals.

**Theme 6: Water education, key for Water Security**

90. Water Education at IHP is guiding and providing technical support through demonstration projects and development of prototype materials and tools at national, regional and global level. Activities have been focusing on Africa and Latin America where over half of the population is under the age of 19 and the need to create job combined with the great opportunity based on unprecedented potential economic and social development, enabled by a youthful population. Addressing youth unemployment, mismatch of skills and gender gap in the water sector can improve the Water Education contribution to achieving water security.

91. IHP trusts that promoting equal access to technologies can improve the quality of education in the water sector. This includes the use of Free and Open Source Software (FOSS) and E-Learning Open Solutions for Inclusive Knowledge Societies. The sound use of Information and Communication Technology (ICT) and water efficiency are key policy

issues with potential for new research areas, including decision support systems for the measurement of water quality and quantity, water recycling and reuse. Increased interoperability between water information systems and water resources management is crucial for enhanced efficiency.

92. IHP's work on water education under Theme 6 covers the following focal areas:

- 6.1 – Enhancing tertiary water education and professional capabilities ;
- 6.2 – Addressing vocational education and training of water technicians;
- 6.3 – Water education for children and youth ;
- 6.4 – Promoting awareness of water issues through informal water education;
- 6.5 – Education for transboundary water cooperation and governance

Below are the main activities implemented in line with the Focal areas.

**Focal areas 6.1 – Enhancing tertiary water education and professional capabilities and 6.2 – Addressing vocational education and training of water technicians**

93. **HOPE-Initiative:** Since its launch in 2013, the Hydro free and/or Open-source software Platform for Experts (HOPE) initiative brings together experts from several fields of water resources to engage in capacity development and training based on the use of FOSS. Indeed, FOSS provide a sustainable basis for scientific decision-making, essential for the sound governance of water resources. With decreased software costs, FOSS contribute to improve access to technologies, especially in the developing world. HOPE also intends to stimulate cooperation in research and development and to enhance FOSS' dissemination. Since education continues to be ever more linked to technologies, it is essential to promote and foster equal access to ICTs in order to improve the quality of education in the water sector. HOPE contributes to this by providing trainings on FOSS and e-Learning open solutions Towards Inclusive Knowledge Societies and by reinforcing the capacities of youth and young professionals in the water sector: https://en.unesco.org/hope.

94. **FREEWAT**: In partnership with 18 universities, centres and other organizations, IHP is part of the project FREE and open source tools for WATer resource management (FREEWAT), a HORIZON 2020 project financed by the European Commission (EC). FREEWAT is an innovative participatory approach gathering technical staff and relevant stakeholders, including policy and decision makers, to design scenarios for the proper application of conjunctive water policies. The consortium organized also capacity development workshops and seminars and provided training to 700 participants. FREEWAT is part of ICT4WATER cluster, which is a cluster of ICT and water management projects, all EC co-funded. Their common goal is to increase efficiency in water management and enable greater cooperation among water regulators, operators and users by deploying solutions provided by Information and Communication. The FREEWAT platform is based on groundwater and solute transport numerical models (from the MODFLOW USGS family). It includes also modules for solute transport in the unsaturated zone; water management and planning; Observations Analysis Tools (OAT); calibration, uncertainty and sensitivity analysis; management of water in agriculture; tools for groundwater quality issues; tools for the analysis, interpretation and visualization of hydrogeological data. The FREEWAT project is being applied to 14 case studies within the EU, 3 case studies in neighboring countries (Switzerland, Turkey and Ukraine) and to a large transboundary aquifer in Africa (UNESCO GGRETA project) The FREEWAT project is being applied to 14 case studies within the EU, 3 case studies in neighbouring countries (Switzerland, Turkey and Ukraine) and to a large transboundary aquifer in Africa (UNESCO GGRETA project). A total of 890 individuals were trained on the tools. About 650 people needed to be directly trained to the use of the

platform within the EU, 60 in Switzerland, 100 in neighboring countries (Ukraine and Turkey) and another 80 in Africa (in South Africa, Namibia and Botswana). At the national level (national trainings), 1.076 participants attended 44 national courses and 2 remote courses. These courses were performed in 53 countries spread out over the 5 continents (see http://www.freewat.eu/).

**Focal area 6.3 – Water education for children and youth**

95. **Survey on water supply and sanitation in schools**: IHP will be launching an online survey on "*Water supply and sanitation in schools*" (https://www.surveymonkey.com/r/schoolwaterandsanitation), in order to update information and gather new data related to this topic. Data shall help to inform policy recommendations and dedicated IHP activities. Results will be shared on the online knowledge-sharing IHP-WINS, with the aim of supplementing the existing data existing on the platform.

96. **Survey on Youth Employment and Unemployment in the Water Sector:** IHP is also continuing its online survey on *"Youth employment and unemployment in the water sector"*. The results shall help formulating policy recommendations and dedicated IHP activities. The survey, in English and French, is open to anyone aged 15 to 40 in the water sector. Up to now, we received 855 responses (49,5% female) from 124 countries: https://fr.surveymonkey.com/r/waterandjobs; https://fr.surveymonkey.com/r/eauetemploi. Results will be shared on the online knowledge-sharing IHP-WINS, with the aim of supplementing the existing data existing on the platform.

97. The "**Water Education Training for Teachers**" promotes responsible water use, culture of water conservation, best management and practices, improving awareness and understanding of water challenges in the Arab region. The program activities comprise the development of general guidelines for teachers, development of supportive illustrative water educational tools (8-12 years students) and development of interactive educational activities (13-18 years students). Regional and national training workshops for more than 50 teachers' trainers (26 women, 24 men) were organized in Sharm El Shiekh, Egypt and Luxor, Egypt. Currently, the developed UCO water educational tools, mainly the illustrative booklet and Cartoons, are being disseminated to the main stakeholders in Egypt, Oman, Jordan, Lebanon and Sudan. More than 80 schools are involved and 250 teachers (half of them are women) are using UCO WET tools and implementing the program. Large number of school students are being involved in the program. The number of involved schools is increasing.

**Focal area 6.4 – Promoting awareness of water issues through informal water education**

98. **Workshop for journalist educators on climate change and water management**: in December 2016, a three-day international workshop was organized jointly organized by the UNESCO Tehran Cluster Office, the Regional Centre on Urban Water Management under the auspices of UNESCO (RCUWM), the International Centre of Qantas and Hydraulic Structures under the auspices of UNESCO (ICQHS), the Iran Water Resources Management Company, the Iranian National Committee on Irrigation and Drainage and the Iranian National Commission of UNESCO. It gathered participants and trainers from Canada, Iran, Malaysia, Oman, Pakistan, Turkmenistan and the United States.

**Focal area 6.5 – Education for transboundary water cooperation and governance**

99. Activities related to education for transboundary water cooperation and governance are undertaken in the framework of Theme 2 and Theme 3.

100. **Conclusion and way forward:** IHP through its Theme 6 on Water Education will improve synergies and communications strategies between all members of the UNESCO Water Family, in order to join forces on the development of projects and activities for water education at all levels, also favouring bottom-up approaches rather than be only initiated at the global level. Water education at IHP will continue its progresses towards a clear priority: enhancing capacity-building at all levels, in order to train water experts and technicians able to handle and manage water resources in Member States, but also to provide basic water education to all citizen and sensibilize them to water issues. This can only be done by seeking support from Member States, and with important challenges in mind: the need to tackle youth unemployment, to address skills and competencies gaps, and to promote gender equality.

### 6.2 Regional Perspectives (agenda item 6.2)

101. In **Africa**, access to safe drinking water and sanitation, recurrent water-related disasters both floods and droughts and lack of human capacity are the main key challenges. IHP activities related to all the 6 Themes of IHP-VIII have been implemented by the different offices in Africa in partnership with national IHP committees, UNESCO Chairs, centres and scientific networks and regional organizations in the region. Partnership with main key water regional stakeholders has been strengthened. The Category 2 centres and Chairs actively involved in the implementation are the Regional Centre for Integrated River Basin Management (RC-IRBM, Nigeria) and the Chair on hydrogeology of Western Cape in South Africa.

102. The 6th IHP regional meeting of the IHP national committees and focal points in sub-Saharan Africa took place from 12-13 July 2017 in Port Elizabeth, South Africa. The meeting gathered over 50 representatives (20% women) from 25 countries from Benin, Botswana, Burkina Faso, Burundi, Cabo-Verde, Chad, Côte d'Ivoire, Gambia, Ethiopia, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Senegal, South Africa, Swaziland, Togo, Uganda, Zambia and Zimbabwe. Five UNESCO Regional Offices from Africa jointly with the IHP Secretariat supported this meeting, hosted by the Department of Water and Sanitation (DWS), Government of South Africa. The regional platform provides local IHP National Committees the opportunity to discuss and share the progress achieved by countries in addressing Africa's water challenges. At this 6th African IHP meeting, participants emphasized the importance of having UNESCO-IHP National Committees and requested UNESCO to help African Member States to formally establish IHP committees where it is not done and to make the existing ones functional, create awareness among Member States on several existing platforms under IHP to share knowledge and capacity among countries in Africa. The main results of the meeting included an agreement to establish a communication and information exchange e-platform within African Member States with a focus on knowledge sharing, resource materials dissemination, capacity development and partnerships including, among others, civil society organizations, African economic communities, higher education institutions, UNESCO institutes, Chairs and Centres, sister UN agencies and other partners and a communiqué addressed to Member States and UNESCO.

103. The communiqué issued and signed by all the participants, called upon UNESCO to reinstate "Freshwater Security through IHP" as a Main Line of Action in its programming so as to retain the strategic focus on freshwater for mobilizing the necessary resources to develop the capacity of IHP especially in Africa and Small Island States for the attainment of the crucial SDG 6 and other SDGs that are reliant on achieving freshwater security.

104. IHP has been implementing the project dedicated to human capacity development in the water sector in Africa through the New Partnerships for Africa's Development (NEPAD) African Network of Centres of Excellence (CoE) in Water Sciences and Technology to

address sustainably lack of water professionals. The project is funded by the European Union Joint Research Centre (JRC) and implemented in partnership with Stellenbosch University for the SADC CoE network and with the University of Dakar for the Western Africa network. National frameworks on human capacity development have been prepared in nine countries (Botswana, Burkina, Ghana, Malawi, Mozambique, Nigeria, Senegal, South Africa and Zambia). The implementation of the project has expanded to the countries hosting the new selected NEPAD centres in Kenya, Uganda, Ethiopia and Sudan.

105. Other activities include the regional programme on transboundary water management in Sahel region; the programme on the review of hydrological norms in West and Central Africa; the SADC Integrated Water Resources Management Initiative (SADC-WIN) project which was launched at the World Water Day Summit and Expo in Durban, South Africa in March 2017. Mobilization of partners and donors have been ongoing for these set of regional projects.

106. A Regional experts' meeting on Water Quality in the SDG framework was organized in December 2016 through Abuja office, in cooperation with Category 2 Regional Centre for Integrated River Basin Management (RC-IRBM, Nigeria). A total of 50 experts, 15 women and 35 men, from 8 West African countries participated. The output of the event was the preparation of a needs assessment of the countries in terms of water quality. Nigeria national capacities and institutional frameworks were reinforced to strengthen water governance and to address water quality and pollution in West Africa.

107. In January 2017, UNESCO offices in Jakarta and Abuja, RC-IRBM and National Water Resources Institute (NWRI) organized an Inter-Regional Workshop on South-South Cooperation for Upscaling IWRM and Ecohydrology as Tools for Achieving Water Security in Africa. A total of 62 people attended (of which 22 women and 40 men), from 15 countries in the West African Sub region (Benin, Burkina Faso, Ghana, Guinea, Ivory Coast, Liberia, Mali Mauritania, Nigeria, Niger, Senegal, Sierra Leone and Togo); Asia and the Pacific; the five (5) Regional River Basin Organizations in Africa; UNESCO Water Family; the Economic Community of West African States' (ECOWAS) Commission Water Resources Coordination Centre and other water-related Institutions. The main outcome of the event was the development of a tool to assess IWRM in the region.

108. In the **Arab States**, UNESCO Cairo office (UCO) continues to implement IHP-VIII with focus on the priorities of the Arab Region. These priorities are managing and coping with water scarcity, climate change, capacity development of the water sector, non-conventional water resources, and awareness raising of critical water resources challenges, The Centres in the region are the Regional Centre for Training and Water Studies of Arid and Semi-Arid Zones (link is external) (RCTWS), and the Regional Centre on Capacity Development and Research in Water Harvesting (RCWH) and the Chairs: UNESCO Chair for Water Resources at the Islamic University of Um Darman, Sudan and UNESCO Chair on groundwater resources at Al Ein University, UAE, UNESCO Chair on Gender in water resources management in Morocco, and UNESCO chair on Wadi hydrology in Jordan.

109. Due to continuing engagement with regional partners including the secretariat of Arab Ministerial Council on Water at the League of Arab States, UNESCO Cairo has actively engaged in the implementation of the Arab Water Security Strategy. UCO is also a member of the UN-LAS coordination group on water and has participated in the drafting of the terms of reference for the regional coordination mechanism on water, intending to support the UN regional coordination mechanism in the Arab region. IHP had a high presence at COP22 (Marrakech, Morocco, November 2016) with more than 17 events organized (sub-item 6.4).

110. During the 4$^{th}$ Arab Water Week, "Managing Water Systems within Fragile Environments in the Arab Region" (19-21 March 2017), two sessions were organized and Chaired by IHP on (a) groundwater governance and (b) managing groundwater aquifers towards sustainability. Each session was attended by a total of nearly 40 participants (eight

and ten women, respectively), UNESCO Cairo Office (UCO) also supported, fully and partially ten speakers (two women) from Jordan, Tunisia, and Egypt to provide technical presentation of their work on groundwater during the conference. Five keynote speakers from Egypt, Jordan, Morocco and Sudan were supported to provide technical presentations during the 12th Water Science and Technology Association Conference (Manama, Bahrain, March 2017). In addition, an IHP special session on groundwater governance was held during the conference with 50 participants (14 women and 36 men) representing Gulf Cooperation Council (GCC) countries in addition to Egypt, Lebanon, Morocco and Sudan, were informed about the Groundwater Governance project and discussed related challenges affecting the Arab Region.

111. A regional workshop of teacher trainers organized in Sharm El Shiekh (Egypt, September 2016) trained more than 20 participants (12 women and 8 men) representing UNESCO associated schools in 5 Arab countries, namely: Lebanon, Sudan, Oman, Jordan and Egypt. Currently, more than 120 teachers (60 women and 60 men) are trained and involved in the water education programme.

112. UCO, in cooperation with the Ministry of Regional Municipalities and Water Resources of Oman, organized the 16th Session of the regional meeting of Arab IHP national committees (Muscat, Oman, 17-18 September, 2017). The thematic focus of the session was “towards empowerment of the national committees of IHP in the Arab Region. Representatives of 15 Arab countries attended the meeting, namely Algeria, Egypt, Iraq, Jordan, Kuwait, Lebanon, United Arab Emirates, Oman, Yemen, Syria, Tunisia, Morocco, Mauritania, Palestine and Sudan. The meeting issued a resolution calling on Member States to support the establishment of national committees/focal points for IHP. The resolution also invites on the National Commission for UNESCO in the Arab Region to utilize the participation programme to support activities of national IHP committees. The participants invited the IHP Secretariat with support from UCO to extend technical and advisory support to Member States concerning the establishment of IHP Committees. The participants also presented the national water strategies and highlighted areas of intersection with IHP strategic plan in those strategies. Observers representing the Arab G-WADI network also attended the meeting and the network of water related Chairs and centres in the Arab region. The third (3rd) General Assembly of the Arab G-WADI on September 19, 2017 in Muscat, Oman with the attendance of representatives of 17 Arab countries, namely: Algeria, Bahrain, Egypt, Iraq, Jordan, Palestine, Kuwait, Mauritania, Morocco, Sudan, Syria, Tunisia, UAE, Lebanon, KSA, Oman and Yemen. The main objective of the meeting was to address the activation of the Arab G-WADI network and to identify capacity building priorities for the 2nd half of IHP-VIII (2018-2021).

113. UCO presented a proposed new vision of a major science/water diplomacy programme in the Arab region and neighbouring countries during a special session on “Science Diplomacy: Lessons Learnt and Future Prospects for Management of Shared/Transboundary Water Resources in the Arab Region”, during the World Science Forum (7-11 November 2017, Dead Sea, Jordan). The proposal builds on previous experiences and envisages a “developmental bottom-up science diplomacy approach” with achievement of the globally endorsed SDGs providing the overall umbrella. The panelist included the President of the Arab Council of Ministers on Water (Iraq), the Chair of the IHP Bureau of the Council and UNESCO Chair for Water Resources at the Islamic University of Um Darman, Sudan. More than 100 forum participants attended the session and deliberated over the proposed **activities**

114. In **Asia and the Pacific** activities within the region have been implemented through the involvement and contribution of the following centres and Chairs: the Asia Pacific Centre for Ecohydrology (APCE), the Humid Tropics Centre Kuala Lumpur (HTCKL), International Centre for Water Hazard and Risk Management (ICHARM), the International Centre for

Water Security and Sustainable Management (i-WSSM) and the UNESCO Chair in Water, Energy and Disaster Management for Sustainable Development (WENDI), Kyoto University.

115. In an effort to enhance hydrogeological information and promote regional cooperation for shared aquifer management in Greater Mekong Subregion (GMS), a regional workshop on “Shared Aquifer Management for Greater Mekong Subregion (GMS)”was organized in July 2017 in Cambodia with 25 participants (8 women and 17 men) from six countries (Cambodia, Malaysia, Lao PDR, Republic of Korea, Thailand, Vietnam). The participants exchanged information and best practices among Mekong countries for shared aquifer resources management and discussed how to enhance sub-regional collaboration. Consensus was made among the regional experts to establish shared aquifer monitoring network; as a result, the first monitoring well was installed in the downstream area of Mekong (Leuk Daek District of Cambodia). The households in this village collect drinking water directly from polluted surface water sources. Given the low quality of the surface water, groundwater can be considered as an alternative freshwater source. The first pumping test of the well confirmed and girls with a particular need for improved access to clean water for hygiene, childcare, etc.

116. Sediment: Under IHP’s ISI, Bangkok office jointly with the Stockholm Environment Institute (SEI) has commenced regional activity for identifying key issues on sustainable sediment management for the Mekong River Basin. It is expected that this information will be useful to policy-makers in the region and beyond as well as external donors in better targeting their support towards sediment management efforts in the Mekong Basin.

117. UNESCO’s IHP Regional Steering Committee for Southeast Asia and the Pacific (RSC) made historical decisions at its 25th inaugural session held in Manila, the Philippines, on 13 November 2017. Reflecting the increasing interconnectedness of the Asia and the Pacific as well as the shared water-related challenges faced by countries across the region, the 25th session of the RSC decided unanimously to welcome as a member any country in Asia and Pacific with a desire to participate in its work. In order to better reflect its expanded geographical coverage, the RSC also decided to rename itself the “IHP Regional Steering Committee for Asia and the Pacific”, removing the word “Southeast” from the its name. Attended by 43 delegates (11 women and 32 men) from RSC member states, observers from India and Pakistan, representatives of water-related UNESCO Category 2 Centres as well as a representative of Fiji delivering a message from the Pacific island countries, the 25th inaugural session of the RSC further decided to pursue a more active engagement between annual sessions. Plans were made for the active exchange of hydrological data as well as the organization of several training and research exchange activities over the coming year. The RSC met in conjunction with the UNESCO-JASTIP (Japan-ASEAN Science, Technology and Innovation Platform) Joint Symposium on Intra-Regional Water Security and Disaster Management, organized by the Philippines’ Water Partnership and the UNESCO Office Jakarta, in partnership with the JASTIP on ”Promotion of Sustainable Development Research”. Held during 15-16 November, the Symposium featured more than 50 technical presentations[2].

118. Kyoto University in collaboration with UNESCO Office Jakarta conducted the 27th IHP training course under the theme Integrated Basin Management under Changing Climate. The event took place from 4 to 15 December 2017 in Kyoto, Japan, bringing together water managers and researchers from Asia and the Pacific as well as the Arab States and Europe. The training course was participated by 17 trainees (8 women) from 12 countries within four regions: Africa (Egypt), Arab States (Oman), Asia and the Pacific (Cambodia, China, Indonesia, Japan, Mongolia, Myanmar, Pakistan, Solomon Islands,

[2] See also: a) http://www.unesco.org/new/en/jakarta/about-this-office/single-view/news/regional_unesco_water_science_network_welcomes_all_of_asia_a/; b) http://jfit-for-science.asia/25th-rsc-meeting-and-unesco-jastip-symposium/

Vietnam), and Europe (Bulgaria). UNESCO provided direct support for the participation of one female participant from Mongolia and one male participant from the Solomon Islands.

119. In **Eastern and Central Europe**, addressing water security, water-related hazards and climate change impacts are the main priorities, in line with the IHP-VIII and the 2030 Development agenda and Paris agreement. The Centres contributing to the thematic activities in the region are the European Regional Centre for Ecohydrology (ERCE, Poland), the International Research and Training Centre on Urban Drainage (IRTCUD, Serbia) and the Centre for Water for Sustainable Development and Adaption to Climate Change (WSDAC, Serbia).

120. The main regional actions include the continuous cooperation with the International Sava River Basin Commission (ISRBC) involving Bosnia and Herzegovina, Croatia, Montenegro, Serbia and Slovenia. From 13 to 15 June 2017, Slovenia hosted the meeting on "Improvement of joint Actions in Flood Management in the Sava River", during which UNESCO-IHP, *Istituto Superiore Mario Boella* (I-REACT[3] project leader) and ISRBC discussed how to join forces in the new Early Warning system for floods funded by the World Bank, and build a transboundary platform for the harmonization of hydrological models, data and forecasting methods. This could include the integration of modular solutions of I-REACT, in particular geo-localised crowdsourcing services. The total number of participants was 30 (10 women and 20 men).

121. A joint Transboundary Training Workshop on the "Governance and Technology for Flood Risk Reduction: Linking early warning to emergency management in the Sava River Basin" was held in Zagreb (Croatia) 5-7 December 2017, aimed at linking early warning alerts triggered by the responsible national hydro-meteorological services and/or water agencies, with monitoring, response and flood protection actions performed by all responsible institution (emergency responders), using historical flood event cases as a simulating scenarios. 60 experts and managers participated (20 women and 40 men).

122. In the **Latin America and the Caribbean** (LAC) region, ensuring universal access to water services and water security remains a key priority, in line with IHP-VIII and the SDGs. The following members of UNESCO Water Family in LAC participate in trimestral coordination meetings (virtual) and have contributed to the implementation of IHP: Regional Centre for Groundwater Management for Latin America and the Caribbean (CEREGAS), Water Centre for Arid and Semi-Arid Zones of Latin America and the Caribbean (CAZALAC), International Centre for Hydroinformatics (CIH), Centre for the Sustainable Management of Water Resources in the Caribbean Island States (CEHICA), UNESCO Chair in Water and Education for Sustainable Development (Santa Fe), UNESCO Chair on Water Resources Management and Culture (UDELAR), UNESCO Chair in Hydrometeorological Risks (Americas Puebla), UNESCO Chair in Sustainable Water Technology and Management (Curaçao), UNESCO Chair in Water in the Knowledge Society (IMTA), UNESCO Chair on Water, Women and Governance (IGLOBAL), UNESCO Chair on Water, Women and Development (Ouro Preto), and the UNESCO Chair on Water Resources Sustainability (San Carlos).

123. In coordination with UNESCO Montevideo Regional Office for Science, UNESCO Offices in the region (Brasilia, Havana, Kingston, Lima, Quito and San José), IHP-VIII implementation advanced across all themes. The terms of reference of the following IHP-LAC working groups were prepared: G-WADI, IFI, ISI, FRIEND/AMIGO, Snow and Ice, Water Education and Cultures, GRAPHIC, ISARM AMERICAS, Urban Waters, Water and Forest Systems and Ecohydrology. Quarterly distance meetings of the UNESCO water centres and Chairs are in place, resulting in strengthening the IHP network and in the

[3] "Improving Resilience to Emergencies through Advanced Cyber Technologies"

preparation of an online course on water security for the region and in combined communication efforts. The IHP-LAC webpages are currently under review and translated into English.

124. IHP governance in LAC strengthened at the XIIth Meeting of the National Committees and Focal Points of IHP-LAC (Nassau, Bahamas, September 2017), which adopted various decisions concerning the implementation of the programme in the region, support to disaster affected SIDS, work on water quality, and the strengthening of IHP National Committees in LAC. The meeting attracted record participation (a total of 27 LAC Member States and Associate Members with the presence of focal points from Aruba and Guyana, the first time in the case of the first and the first time in 20 years in the case of the latter), as well as the presence of the coordinators of the 11 IHP-LAC Working Groups, 12 directors of water-related centres and UNESCO Chairs in the region, and numerous observers.

125. UNESCO Water Family activities and events in LAC counted with the participation of over 10,000 people (the number of women estimated on around 4,400) from over 23 Member States and Associated Members for the 2016-2017 period. Enhanced coordination and cooperation of UNESCO Water Family in LAC, through trimestral virtual meetings organized by UNESCO Montevideo with the water-related UNESCO Chairs in July and November 2016 and in February, May, June and August 2017 and with water-related Centers under the auspices of UNESCO in August and November 2016 and in February, May and August 2017. Among the different interchanges, chairs and Centers prepared issues of AQUA-LAC (2018) and a joint virtual course on water security. Water-related research and scientific knowledge promoted via the publishing of 4 numbers of AQUA-LAC, IHP's scientific journal, comprising over 30 papers. An estimate of 25 professional participated in the AQUA-LAC seminar (Port-au-Price, Haiti, August 2017), in which the special issue on Haiti was presented. The Executive Board of AQUA-LAC met in 2016 and decided several measures to enhance the visibility and impact of the journal; the process of indexation DOI of the journal is advancing, with several changes implemented.

126. The IHP LAC webpages, hosted by UNESCO Montevideo were restructured and updated, including featured events, news, publications and reference materials. Contacts details of IHP National Committees and Focal Points were revised; the information on Centres and Chairs was incorporated. Over one hundred documents were uploaded to UNESDOC and made available on-line, including the reports of all previous sessions of the regional meetings of the LAC IHP national committees (CoNaPHIs), as part of a communications strategy that also included the production of updated IHP LAC brochures and USB cards with information about the programme.

127. Three water-related sessions were organized in the framework of the LAC Open Science Forum CILAC 2016 (September 2016). Support was provided to the establishment of a Regional Youth Parliament for Water for LAC, in an event with over 40 young people (Cartagena, August 2016). Capacities of teachers and educators were enhanced at the symposium on "Water is Life. Let's Protect it!" (Uruguay, October 2016); and through the workshop on "The Water Cycle in Terrestrial Ecosystems", with the Spanish Agency for International Development Cooperation (AECID) and the Embassy of Israel (September 2016). Support was provided to the inter-sector workshop for the prevention and management of extreme hydrometeorological phenomena and measures to adapt to climate change (Guatemala, December, 2016) and the work on the hydrological risk management in relation to sustainable development in the Caribbean (Aruba, December 2016), with 23 participants (6 and 17 women).

128. Groundwater governance capacities and cooperation were enhanced in collaboration with CeReGAS - Regional Center for Groundwater Management. A workshop on "The

General Principles of Transboundary Water Cooperation" was organized in the context of SDG 6 - Sustainable Development Goal 6, together with CODIA, CEPAL - Economic Commission for Latin America and the Caribbean (Comisión Económica para América Latina y el Caribe), and UNECE - Economic Commission for Europe (Mexico, October 2016), for 16 participants (25% women) from Brazil, Chile, Costa, Dominican Republic, Ecuador, Honduras, Nicaragua, Panamá, Paraguay, Peru and Rica.

129. The IHP Water Information Network System (WINS) was presented to the Mexico 2030 Forum (April 2017). A Seminar on Economical instruments for Water Management was held before the annual CODIA meeting with 40 participants from 19 countries (September 2017).

130. IHP was coordinator of the South America regional process for the 2018 World Water Forum. It conducted five preparatory meetings (Chile, Brazil and Bahamas) prior to the Forum and coordinated eight sessions at the Forum (March 2018).

131. Aruba's needs on water resources management and water security and sustainability were identified for the development of the UNESCO Country Strategy.

132. In **Western Europe and North America** water security and climate change are the main priorities, in line with IHP-VIII and the 2030 Development agenda and Paris agreement. The Centres supporting the implementation in the region are the Centre for Water Law, Policy and Science (University of Dundee), the International Groundwater Resources Assessment Centre (IGRAC), the International Centre for Integrated Water Resources Management (ICIWaRM), the International Centre for Coastal Ecohydrology (ICCE), the International Centre for Water Cooperation (ICWC) and the International Centre for Water Resources and Global Change (ICWRGC).

133. At the "XXVII$^{th}$ Conference of the Danubian Countries on Hydrological Forecasting and Hydrological Bases of Water Management" was held 26-28 September 2017, Golden Sands, Bulgaria. Continuing the tradition of cooperation of the Danube Countries under the IHP, 68 scientists (35 women and 33 men) in the broad field of hydrology were involved in presentations and discussions on 8 main topics: Basis of hydrology; Hydrological data management; Hydrological modelling and forecasting; Disaster events; Administrative structures for water management; River Basin and Water Management; Water quality and pollutants and Eco-hydrology. The conference brings together 187 authors (86 women and 101 men) from 19 countries from the Danube River Basin. In plenary session, the colleagues from National Committees for IHP addressed topics that could strengthen the cooperation of Danube countries. The scientists participating at the recent XXVII$^{th}$ conference have agreed to adopt a common statement in respect on the urgent needs for further systematic and broadly integrated research in the Danube River Basin with the aim of comprehensive further water management research including climate change and anthropogenic impacts that have been emerging for the last centuries.

### 6.4 Cooperation with other UNESCO programmes (Agenda item 6.4)

134. IHP maximizes synergies by cooperating with other existing UNESCO programmes, including the International Geosciences and Geoparks Programme (IGGP), the Man and the Biosphere (MAB) Programme, the Earth and Ecological Sciences Division, and the Communication and Information (CI) Sector. Furthermore, IHP provided technical contribution from water prospective to the UNESCO Task Force on Climate Change. The IHP-MAB joint publication "Mountain Ecosystem Services and Climate Change. A Global Overview of Potential Threats and Strategies for Adaptation" was launched in October 2017 during the Knowledge Forum on Water Security and Climate Change held in UNESCO

Headquarters. MAB, IHP and Culture sector are jointly implementing the project on the Lake Chad basin.

135. Networking and cooperation between IHP and MAB in both Arab region and Africa has been further enhanced during the 2nd Arab/African IHP/MAB meeting, Aghadir, Morocco (17-19 October, 2017). The UNESCO Office in Rabat organized the meeting, in cooperation with UNESCO Cairo, Islamic Educational, Scientific and Cultural Organization (ISESCO), and the Government of Morocco. The second Joint IHP-MAB meeting focused on the implementation of the recommendation of the first joint meeting (Tanger, Morocco 18-20 October, 2016) concerning the establishment Arab African Biosphere Reserve Initiative (AABRI) addressing the deployment of biosphere reserves as laboratories for monitoring climate change and SDG with water being a primary focus. The Aghadir meeting identified a framework for the initiative and developed a proposal for its governing structure.

136. IHP is cooperating with the Social and Human Sciences (SHS) Sector and the programme Management of Social Transformation (MOST) of UNESCO. IHP contributed through a rolling review and a case study to the report World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) on "Water Ethics: Ocean, Freshwater, Coastal Areas", due in September 2018 and also reviewed and advertised the *Declaration of Ethical Principles in relation to Climate Change*[4].

137. IHP regularly provided technical input to the UNESCO Climate Change task team including contribution to UNESCO Strategy for Action on Climate Change (2018-2021), which was adopted by 39th GC of UNESCO in November 2017.

138. IHP also participated in the mobilization and selection of youth for the 10th UNESCO Youth Forum, which took place at UNESCO's Headquarters in Paris, from 25 to 26 October 2017. IHP also mobilized the participation of youth networks for the Knowledge Forum on Water Security and Climate Change that as organized at UNESCO's Headquarters in October in 2017.

139. Several UNESCO Natural Sciences Programmes have already contributed with their data to the IHP-WINS database since the opening of the platform in January 2017, including MAB with the World Network of Biosphere Reserves (WNBR), (669 biosphere reserves in 120 countries, including 16 transboundary sites). Further to that, the IHP demonstration site on "Water and environmental sustainability education linked with ecotourism in Langkawi Geopark", in Malaysia, is carried out in a UNESCO Global Geopark. The UNESCO World Heritage Sites list was also added to the platform (1052 sites: 814 cultural, 203 natural, and 35 mixed properties, in 165 countries).

140. The first joint Arab/African MAB/IHP meeting was held in Tangier, Morocco (18-20, October 2016). Nearly 80 participants attended the meeting representing both MAB and IHP in the Arab Region and Sub-Saharan Africa. As a major outcome of the meeting, the participants proposed the establishment of an inter-regional initiative on biosphere reserves as laboratories for monitoring climate change and sustainable development with water as a fundamental linkage.

141. Within the framework of UNESCO's work on DRR, IHP collaborated with the Section on Earth Sciences and Geo-Hazards Risk Reduction for the international conference on multi-hazard early warning systems held in May 2017 in Cancun, Mexico.

142. The Hydro Open-source software Platform of Experts (HOPE) Initiative, brings

[4] http://portal.unesco.org/en/ev.php-URL_ID=49457&URL_DO=DO_TOPIC&URL_SECTION=201.html

together Science, Education and CI sectors in steering its direction having UNESCO-UNEVOC, the specialized Centre for Technical and Vocational Education and Training (TVET), and CI Sector in its Advisory Committee.

143. IHP cooperated with the Culture, Social and Human Sciences and Education sectors in a unified presence at HABITAT III and all sectors are working together in establishing a UNESCO Urban Hub/Platform.