

Format for Biennial Reports by UNESCO's Water-related Centres on activities related to the IHP in the period (June 2014 – May 2016)

1. Basic information on the centre

Name of the Centre		IRTCUD – International Research and Training Center on Urban Drainage
Name of Director		Prof.Dr. Jovan Despotovic
Name and title of contact person (for cooperation)		Ljiljana Jankovic, Dipl. Eng
E-mail		irtcud@hikom.grf.bg.ac.rs
Address		Bulevar Kralja Aleksandra 73 P.O.Box 35-42; 11120 Belgrade Serbia
Website		https://hikom.grf.bg.ac.rs/irtcud/
Location of centre		city/town <u>Belgrade</u> country <u>Serbia</u>
Geographic orientation *		<input checked="" type="checkbox"/> global <input type="checkbox"/> regional
Region(s) (for regional centres)		
Year of establishment		1986
Year of renewal assessment		In progress
Signature date of most recent Agreement		October 1989
Themes Of activities during reporting period	Focal Areas ·	<input checked="" type="checkbox"/> groundwater <input checked="" type="checkbox"/> urban water management <input checked="" type="checkbox"/> rural water management <input type="checkbox"/> arid / semi-arid zones <input type="checkbox"/> humid tropics <input type="checkbox"/> cryosphere (snow, ice, glaciers) <input checked="" type="checkbox"/> water related disasters (drought/floods) <input type="checkbox"/> Erosion/sedimentation, and landslides <input type="checkbox"/> ecohydrology/ecosystems <input type="checkbox"/> water law and policy <input type="checkbox"/> social/cultural/gender dimension of water <input type="checkbox"/> transboundary river basins/ aquifers <input checked="" type="checkbox"/> mathematical modelling <input checked="" type="checkbox"/> hydroinformatics <input type="checkbox"/> remote sensing/GIS <input checked="" type="checkbox"/> IWRM <input checked="" type="checkbox"/> Watershed processes/management <input type="checkbox"/> global and change and impact assessment <input checked="" type="checkbox"/> mathematical modelling <input checked="" type="checkbox"/> water education <input checked="" type="checkbox"/> water quality <input type="checkbox"/> nano-technology <input checked="" type="checkbox"/> waste water management/re-use <input type="checkbox"/> water/energy/food nexus <input checked="" type="checkbox"/> water systems and infrastructure <input type="checkbox"/> other: (please specify) <u>networking for water research</u>
	Scope of Activities ·	<input checked="" type="checkbox"/> vocational training <input checked="" type="checkbox"/> postgraduate education <input checked="" type="checkbox"/> continuing education <input type="checkbox"/> public outreach <input checked="" type="checkbox"/> research <input checked="" type="checkbox"/> institutional capacity-building <input checked="" type="checkbox"/> advising/ consulting

* check on appropriate box
· check all that apply

	<input checked="" type="checkbox"/> software development <input checked="" type="checkbox"/> data-sets/data-bases development <input type="checkbox"/> other: (please specify) _____
Support bodies ¹	Faculty of Civil Engineering, University of Belgrade
Hosting organization ²	
Sources of financial support ³	
Existing networks and cooperation ⁴	IRTCUD network of regional centres: <ul style="list-style-type: none"> • Centre for the Cold Climates (Trondheim, Norway) • Centre for Humid Tropics (Porto Alegre, Brazil) • Centre for Arid and Semiarid Climates (Cairo, Egypt) • RCUWM – Tehran, Iran • CUWs (Centres for Urban Water)
Governance	<input checked="" type="checkbox"/> director and governing board <input type="checkbox"/> other: (please specify) <u>Serbian Committee for UNESCO IHP</u> Link to election of board members to the IHP Intergovernmental Council (IGC) and hosting country IHP National Committee _____ Frequency of meetings: once every year <input checked="" type="checkbox"/> Existence of UNESCO presence at meetings
Institutional affiliation of director	
Number of staff and types of staff	total number of staff (full-time, or equivalent) : <u>30</u> (Host Institution – University of Belgrade-Faculty of Civil Engineering-Institute of Hydraulic and Environmental Engineering) number of staff who are water experts: <u>28</u> number of visiting scientists and postgraduate students: <u>40</u>
Annual turnover budget in USD	cca 70.000

2. Activities undertaken in the framework of IHP in the period June 2014 – May 2016

- 2.1 Educational activities (i.e., those with accreditation) that directly contributed to the IHP-VIII (Appendix 1) and WWAP
Please include here those activities which led to accreditation of degrees, or those held in formal school settings.

Continuation of Postgraduate studies in Water Resources and Environmental Management, in a framework of EDUCATE project, that started in December 2007. The EDUCATE! project (Building the Future of Transnational Cooperation in Water Resources in South East Europe) was implemented in a framework of the EU INTERREG CADSES programme.

The studies gathered high educational institutions from Balkan regions: two faculties from Greece (National Technical University of Athens, Greece – School of Civil Engineering and School of Chemical Engineering), one

¹ please specify bodies that cover the operational costs of the centre, and other essential costs such as salaries and utility bills, and that provide institutional support to ensure centre's sustainability

² if different from support bodies

³ please specify sources of main budgetary and extrabudgetary funds to implement projects

⁴ please write international networks, consortiums or projects that the centre is part of, or any other close links that the centre has with international organizations or programmes, which are not already mentioned above

from Slovenia (University of Ljubljana, Faculty of Civil and Geodetic Engineering), one from Romania (Technical University of Civil Engineering Bucharest) and two from Serbia (University of Belgrade, Faculty of Civil Engineering and IRTCUD).

This study aims at regional transnational cooperation through a long-term, continuous professional capacity building which will form the basis for long-term collaboration in the area and ultimately lead to a more integrated region.

The postgraduate course in Water Resources and Environmental Management is a flexible, distance learning programme based on both – e-learning and traditional way of lecturing. The students gather at their host university several times during the course: introductory week at the beginning of the course, examination for each thematic area, at a half of the course for definition of thesis and at the end of the course for presentation of thesis. Lectures and tutorials are developed in English. Duration of the course is two calendar years.

The first generation completed the studies in December 2009 when presentation of theses was organized in Belgrade, Serbia. Up to date six generations have been completed the studies.

- 2.2 Research activities that directly contributed to the IHP-VIII activities
Please include research/applied projects outputs such as publications that directly contributed to the IHP-VIII and WWAP objectives

A series of preparatory meetings held at the universities in Almaty, Baku and Moscow, in years 2014, 2015 and 2016, accounting for choosing the topics that are of common interests. At the last meeting in Moscow, October 2015, Theme 1 (Water-related disasters and hydrological change) was chosen, as the most interesting one. In addition, the meeting was held in Skocjan, organized by IHP Slovenia, together with representatives from other Group II countries' representatives.

Discussion with German IHP Center was organized in Belgrade, aiming at preparation for the VIII Phases, resulting in preparation of the draft program for implementation in the Danube river basin.

- 2.3 Training activities that directly contributed to the IHP-VIII and WWAP objectives

Invited lecturing at the Moscow State University Lomonosov aiming at discussion and preparation of the draft scheme for the First Topic of the VIII Phases IHP UNESCO, in 2014.

Invited lecturing at the Kazakh National Technical University named after K. Satpaev, in 2014 and 2016.

3. Collaboration and linkages

- 3.1 Participation in major international networks, programmes, partnerships with other UN or other International Agencies, media and professional bodies

Participation of IRTCUD at the international level has been seen since its establishment. The most important activities relate to cooperation with UNESCO and other UN organizations, such as UNEP, UDNP, UNIDO, and others. Cooperation with other UNESCO IHP centers has been fostered, especially with those which deal with water related issues, such as the regional IRTCUD Centres for the Cold Climates (Trondheim, Norway), Humid Tropics (Porto Alegre, Brazil) and Centre for Arid and Semiarid Climates established in the Regional Center of Research and Studies of Water Ethics (Cairo, Egypt).

Aiming at spreading transnational cooperation with neighboring countries, IRTCUD began the project EDUCATE that resulted in establishment of international postgraduate studies in water management, that include six

partner institutions from four countries (Greece, Romania, Slovenia and Serbia).

Spreading ideas on urban drainage modelling commenced in year 1986 when the first conference with this subject was organized by IRTCUD in Dubrovnik. Continuation of cooperation with numerous international institutions has been continued to date. IRTCUD members were the initiators and were either direct organisers or sponsors / book editors of all of the the UDM (Urban Drainage Modelling) series of 9 international conferences which are held every three years under auspices of the Joint Committee for Urban Drainage of IAHR (International Association for Hydraulic Research and IWA (international Water Association). Previous two conferences in the series were held at in Melbourne, Australia (2006) and in Tokyo, Japan (2009). The conference that was held in September 2012 in Belgrade was directly organised by IRTCUD. The last conference was held in Canada, in 2015.

Since that Director of IRTCUD, Prof. Jovan Despotovic, is also Chair of the Serbia National committee for UNESCO IHP, contribution of IRTCUD in activities related to cooperation of countries in Group II has been widely recognized.

- 3.2 Participation in meetings related to the IHP and UNESCO (e.g. the UNESCO General Conference, the UNESCO Executive Board, the IHP Intergovernmental Council and/or other meetings organized by IHP)
- 3.3 Collaboration and networking with other UNESCO category 1 or 2 institutes/ centres
 - 3.3.1 cross-appointment of directors of the category 1 or 2 institutes or centres on the governing board
 - 3.3.2 exchange of information on activities such as training/educational materials, and funding opportunities
 - 3.3.3 exchange of staff, most notably professionals and students
 - 3.3.4 implementation of joint activities, such as workshops, conferences, training programmes, joint projects, field visits, software and data sharing, knowledge exchange and publications

Invited lecturing at the Moscow State University Lomonosov aiming at discussion and preparation of the draft scheme for the First Topic of the VIII Phases IHP UNESCO, in 2014.

Invited lecturing at the Kaz NRU Almaty n.a. Satpayev, in 2014 and 2016.

- 3.4 Relationships with the UNESCO field and regional office whose jurisdiction covers the country of location
- 3.5 Relationship with the UNESCO National Commission and the IHP National Committee in the country of location and with other organizations of other countries

The cooperation with the National Commission for cooperation with UNESCO (which operates within the Ministry of Foreign Affairs was correct and fruitful. Although the Commission had not resources to provide financial support to the Centre, it provided a lot of logistic and administrative support to the Center especially in the phase of its re-establishment.

Cooperation with the Serbian National Committee for cooperation with IHP has established upon commencement of operation of the National Commission in May 2010 under the umbrella of the National Commission.

Prof. Despotovic is a member of the National Commission for Cooperation with UNESCO and is a Chief of the Serbian National Committee for cooperation with IHP..

Significant problem in realization of IRTCUD activities is lack of proper office space since the Institute of Hydraulic and Environmental Engineering provides the "basics" / share of space and staff for IRTCUD. The Faculty has made available about 250 m² of the space in a cellar which is the need for complete refurbishment. Several attempts to get funding from the relevant central (Republic of Serbia) and local government (Belgrade City Council) failed. It remains to be realized the recent promise of the Ministry of Science and Education. Additional efforts have been made toward realization of this initiative through preparation of main design for refurbishment of the office space and commencement of procedure for the project execution.

The meeting of National Committees' representatives of IHP UNESCO's Group II took place between 16 and 18 March 2016 at the premises of the Škocjan Caves Park, Slovenia. The meeting was attended by representatives of the following eleven countries: Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Montenegro, Romania, Russian Federation, Serbia, Slovakia, and Slovenia.

3.6 Relationship with other UNESCO-related networks, such as UNESCO Clubs, ASPnet, and UNESCO chairs

IRTCUD maintains close cooperation with Serbian National Committee for UNESCO IHP.

4. Communication

4.1 Communication and knowledge dissemination activities undertaken in the framework of IHP

IRTCUD participated in the meeting of National Committees of IHP UNESCO's group II in Russia, in 2015. Next meeting was held in Slovenia, in March 2016, when representatives from 11 states gathered. Both meetings supported the idea on preparation of long-term plans for water management and for providing funds for hydrological activities. Also, it is envisaged that intra-regional cooperation should be foster, as well as organised cooperation with the neighbouring Region I – Europe and North America, IHP Danube cooperation, and cooperation with Nordic countries.

The international cooperation between countries from UNESCO Group II has started through the realization of contracts signed between universities (Republic of Serbia, Republic of Kazakhstan and Republic of Azerbaijan). Cooperation is envisaged in teaching and research areas, especially in the water resources field.

Contribution to the celebration of 50 years of UNESCO IHP through participation in publication related to celebration of "Water People and Cooperation", chapter 4, IHP National Committees: Serbia – International Cooperation and Improved Water Governance".

4.2 Policy documents and advice

5. Update on Centre Operations

5.1 Membership of the Board of Governors between designated period

Director: Prof. Dr. Jovan Despotovic

Local Coordinators: Prof. Dr. Marko Ivetić, , Prof. Dr. Dusan Prodanovic, Dr. Jasna Plavsic, Dr. Milos Stanic

Programme Coordinator: Ljiljana Janković

Unfortunately the creation of the Board of Governors which was planned after the Centre's restart did not materialize, because of the tardiness (delay) in refurbishment of the office and research space which is still waiting for the formal approval and funding from the Ministry of Science and Technological Development.

5.2 Key decisions made (attach minutes of meetings)

- The decision made on March 20th, 2014, which was reported to the IHP UNESCO Secretariat, of acceptance the reviewing procedures for the category 2 centres according to the "Implementation of the guidelines and criteria for category 2 institutes and centres approved in 33 c/Resolution 90"
- The decision on the official "restart" of the Centre during the International Workshop on the Reactivation of the IRTCUD Network held in Belgrade from 14th to 16th of March 2002. By the decision IRTCUD reassumed its role as a global coordinator of the regional IRTCUD Centres for the Cold Climates (Trondheim, Norway), Humid Tropics (Porto Alegre, Brasil) and of the intended Arid and Semiarid Climates Regional Center.
- Official visit of the UNESCO DG (Mr Koichiro Matsura) on 4th May 2004. Representatives of IRTCUD presented organization of the IRTCUD Network, principal achievements, publications issued, current initiatives in IHP VI programme and others. Problem of inadequate office space and possibilities for refurbishment of celar space at the Faculty of Civil Engineering, University of Belgrade were presented.

6. Evidence of the Centre's Impacts

6.1 Science Impacts (Major contributions to the science, technology, education, and regional and/or international cooperation in the field of water)

- The Urban Pluvial Flood Modelling methodology originated in IRTCUD in 90-ies of the last century and recently developed by IRTCUD/CUW/Imperial College London team has made the major breakthrough at the international scene. The AOFD methodology officially tested and approved by UKWIR (UK Water Industry Research)
- Expertise in GIS support for hydroinformation systems and urban water systems developed in IRTCUD has been widely used in specific projects in Serbia and also in the region. As an example, it was used in the following projects:
 - GIS based improvement of distributed hydrological model of the Drina river: Development of GIS routines for automatic generation of SWAT input data files based on DEM, river, cover and network of meteorological stations (Ministry of Agriculture, Forestru and Water Management, Serbian Government)
 - Hydroinformation system "Vlasina" – hydrological simulation model: Development of hydrological simulation model for Vlasina hydro system using GIS tools based on 3DNet-Catch module (Hydro power plant Djerdap, Serbian Electropower Company)
- Modelling of urban groundwater systems originated in IRTCUD has been used in the project "Urban groundwater systems management UGROW-an advanced simulation and modeling tool" which resulted in a book published in a framework of IHP 6 programme. IRTCUD member (Dr. Milos Stanic) is a coauthor of the chapters "UGROW-the Urban GROundWater modelling system" and "UGROW applications – Case Studies"
- Analysis of the effects of the water transfer through the tunnel Fatnicko Polje-Bileca reservoir on the hydrological regime of Bregava River in Bosnia and Herzegovina (Electropower Company of Republic of Srpska)

- Establishment of three experimental urban catchments aiming at a research of quantity and quality of runoff from impermeable surfaces. Two experimental catchments have been established in Serbia - Belgrade and Subotica, and one in Croatia - Rijeka. Also, under preparation is establishment of the fourth experimental catchment in the City of Baya in Hungary at the Danube river. This is a beginning of a networking of urban experimental catchments in the Region.

6.2 Knowledge Transfer Impacts (Major achievements in the dissemination of knowledge and technology transfer)

- IRTCUD/CUW coordinated development of UWETTT is available to UNESCO
- Training of Trainers Workshop on Integrated Urban Water Management, Lahore, Pakistan, May 2007. Jointly organized by: PCRWR, RCUWM) – Tehran, UNESCO-IHP, UNESCO Tehran and UNICEF
- Short course on Urban GROundWater (UGROW) Modelling System held at UNESCO Paris, 11th September 2007: Analysis of Interaction of Urban Water Systems with Groundwater Aquifer: A case study of the Rastadt City in Germany.
- Cooperation with Hungarian Chamber of Engineers aiming at continual education of professionals from water field. Ongoing.
- Short training courses for professionals from ministries (Romania) and water industry and environmental services (Slovenia) in a framework of EDUCATE. Started in 2007, ongoing
- Short courses organized together with Association for Water Technology and Sanitary Engineering, aiming at continual education of professionals from water field. Ongoing.
- Series of training courses for professionals on contemporary methods for design of systems for protection of rain water, aiming at continual education of professionals from water field. Jointly with Serbian Chamber of Engineers. Organized in several regional centers of the Chamber in Serbia. Ongoing.
- Invited Lecture(s) at the Moscow State University Lomonosov on 24th December 2013, under the following titles:
 - Knowledge in the frame of the information, research and implementation of the IHP UNESCO, by Prof. Dr Jovan Despotovic,
 - Management of Rainfall runoff process including quality aspects in 7 steps - from cloudy, stochastic sky to safety of traffic, and rainfall harvesting, by the group of authors from the UB - FCE,
 - Networking for sustainable education aiming at integrated water resources management, by the group of authors from the UB - FCE, by the group of authors from the UB – FCE,
 - Optimal Management of complex water resources systems – An Introduction by Dr. Nesa Ilic
- Improved procedures and methodologies for design of the modern urban rainfall systems for highways and bridges such as Gazela bridge in Belgrade and bridges in a vicinity of Ostruznica and Obrenovac.

6.3 Policy Impacts (advice sought by government and other bodies and evidence of inputs into policy arena)

7. Future activities that will contribute directly to IHP and/or to WWAP

7.1 Operational Plan (attach if available)

Operational plan for period 2017-2018 is based on core IRTCUD activities, specifically with those linked with programme themes of the eight phase of IHP. The plan could be summarized as follows:

a) Attempt to finally resolve the problem of the lack of office / research space:

Finding of solution for financing of the space at the Faculty of Civil Engineering University of Belgrade that will be used for IRTCUD needs.

This issue is crucial for success of all planned activities and will enable expansion of current operations.

b) Legal aspects of the IRTCUD reassessment to be finished.

c) Cooperation with other UNESCO category 2 centres;
Cooperation with UNESCO category 2 centres will continue in the future through exchange of training/educational materials, joint application for projects, participation in workshops and conferences.

d) Cooperation with other UNESCO IHP groups ;
IRTCUD member (Prof. Jovan Despotovic), Vice-Chair of the IHP UNESCO Council Bureau, has been actively participated in activities related to preparation and improvement of the programme of IHP VIII. Future cooperation with IHP National committees of other countries from II Group is foreseen.

f) Exchange of students/teachers between University of Belgrade and universities from Azerbaijan and Kazakhstan;
Cooperation will be achieved through exchange of students/teachers and organization of training/courses covering hydraulic and environmental engineering, structural engineering and architecture engineering.

Partner Universities are as follows:

- University of Belgrade - Faculty of Civil Engineering
- University of Belgrade - Faculty of Architecture
- UNESCO Chair in Water for Ecologically Sustainable Developments
- IRTCUD - International Research and Training Centre for Urban Drainage, under UNESCO auspices

g) Education, research work incl. experimental polygon and measurements, in a joint Project with the Technical University at the Almaty.

h) Projects that will be implemented in the period in question:

- Scientific management of urban ground water based on GIS technique (National Scientific Funding of Serbia), Prodanovic, D.
- Assessment of environmental impacts of urban wetlands with using recycle water (National Scientific Funding of Serbia), Ivetic, M.
- MORE – Monitoring and Modelling of Rivers and Reservoirs - physical, chemical, biological and morpho-dynamic parameters, (Serbian Ministry of Science and Technological Development)

7.2 Strategic Plan linked with IHP-VIII (Appendix 1). Focal areas within IHP-VIII the centre plans to contribute to and specific actions the centre will undertake to align its activities with the strategic plan for IHP-VIII

The Center IRTCUD plan to contribute together within the Group II countries within the Theme 1 (Water-related Disasters and Hydrological Change), and also within the topic IV (Water and Human Settlements of the Future) with some other IHP Centers, but the discussions haven't completed yet.

8. Annexes

8.1 List of publications released by the centre (there can be overlap with those listed in 2.3 above)

- Despotović, J. (2015). Chapter 4, IHP National Committees: Serbia – International Cooperation and Improved Water Governance” in publication “Water People and Cooperation”, 50 years of water programme for sustainable development at UNESCO; ISBN 978-92-3-100128-4, pages 136-137
- Proceedings from 2nd Regional Rainfall Conference of the Balkans – Regional Rainfall and Climate Change, ISBN 978-86-7518-165-1, 2014

- Despotović, J., Janković, Lj. (2013). Application of water directives in small settlements, UNESCO publication "Free Flow – Reaching Water Security through cooperation", pages 123-125
- Nine books (four more to follow) published in the Urban Water Series initiated within the IHPVI, Series editors Č. Maksimović and J.A. Tejada-Guibert, starting with the book: "Data Requirements for Integrated Urban Water Management". T.D. Fletcher and A. Deletić, ed. Book Series, Series ed. C. Maksimovic and Tejada-Guibert, J.A., Taylor and Francis, ISSN 1749 0790,
- Maksimović, Č., Prodanović, D., Boonya-aroonnet, S., Leitão, J. P., Djordjević, S., and Allitt, R. (2009). Overland flow and pathway analysis for modelling of urban pluvial flooding. *Journal of Hydraulic Research*, 47(4):512-523.
- J. P. Leitao, S. Boonya-aroonnet, D. Prodanović and Č. Maksimović (2009) *The influence of digital elevation model resolution on overland flow networks for modelling urban pluvial flooding*, *Water Science & Technology—WST*, 60.12
- "Urban Water in Japan", Hooememeuer, F., ed. Urban Water Book Series, Series ed. Č. Maksimović, Taylor and Francis, June 2008,
- Despotovic, J. (2009), *Storm Water Channeling*. Faculty of Civil Engineering University of Belgrade,
- Editors: Kapor, R. and Ivetic, M. (2009), *Proceedings of 15th Council of Serbian Association for Hydraulics Research*. Faculty of Civil Engineering University of Belgrade
- Despotovic, J., Jovanovic, Z., Plavsic, J. (2009). Drainage of bridges in urban areas. *Gradjevinski calendar 2009*, Union of Engineers and Technicians of Serbia
- *Proceedings of the Ninth International Conference on Urban Drainage Modelling*, Belgrade, Serbia, 4-6 September 2012, Edited by Dusan Prodanovic and Jasna Plavsic
- Kapor, R. (2008), *Hydraulics*. Faculty of Civil Engineering University of Belgrade
- Prodanović D. (2007) *Fluid Mechanics for Civil Engineering Students*. Faculty of Civil Engineering University of Belgrade
- Jovanovic, M. (2007), *River Training Works – River Hydraulics and Morphology*, Faculty of Civil Engineering University of Belgrade

8.2 List of training courses conducted (there can be overlap with those listed in 2.1 above)

Postgraduate studies in Water Resources and Environmental Management, EDUCATE – Jointly with National Technical University of Athens, Greece, University of Ljubljana, Slovenia, Technical University of Civil Engineering Bucharest, Romania and University of Belgrade, Serbia. Started in 2007, ongoing

Short training courses for professionals from ministries (Romania) and water industry and environmental services (Slovenia) in a framework of EDUCATE. Started in 2007.

Short course on Urban GROundWater (UGROW) Modelling System , UNESCO Paris,

Joint training course on Urban Drainage with the University of Calabria, Italy, 15 June 2010

Training of Trainers Workshop on Integrated Urban Water Management, Lahore, Pakistan, May 2007. Jointly organized by: PCRWR, RCUWM) – Tehran, UNESCO-IHP, UNESCO Tehran and UNICEF

Several training courses on implementation of 3DNet software in Serbian companies

Short training courses on contemporary maintenance of water supply and sewerage systems. Jointly with Association for Water Technology and Sanitary Engineering

Series of training courses for professionals on contemporary methods for design of systems for protection of rain water. Jointly with Serbian Chamber of Engineers. Organized in several regional centers of the Chamber in Serbia.

Appendix 1

Overview of the Core Programme Themes of the Eighth Phase of the IHP (2014-2021) WATER SECURITY: ADDRESSING LOCAL, REGIONAL, AND GLOBAL CHALLENGES

THEME 1: WATER-RELATED DISASTERS AND HYDROLOGICAL CHANGE

- Focal area 1.1 - Risk management as adaptation to global changes
- Focal area 1.2 - Understanding coupled human and natural processes
- Focal area 1.3 - Benefiting from global and local Earth observation systems
- Focal area 1.4 - Addressing uncertainty and improving its communication
- Focal area 1.5 - Improve scientific basis for hydrology and water sciences for preparation and response to extreme hydrological events

THEME 2: GROUNDWATER IN A CHANGING ENVIRONMENT

- Focal area 2.1 - Enhancing sustainable groundwater resources management
- Focal area 2.2 - Addressing strategies for management of aquifers recharge
- Focal area 2.3 - Adapting to the impacts of climate change on aquifer systems
- Focal area 2.4 - Promoting groundwater quality protection
- Focal area 2.5 - Promoting management of transboundary aquifers

THEME 3: ADDRESSING WATER SCARCITY AND QUALITY

- Focal area 3.1 - Improving governance, planning, management, allocation, and efficient use of water resources
- Focal area 3.2 - Dealing with present water scarcity and developing foresight to prevent undesirable trends
- Focal area 3.3 - Promoting tools for stakeholders involvement and awareness and conflict resolution
- Focal area 3.4 - Addressing water quality and pollution issues within an IWRM framework - improving legal, policy, institutional, and human capacity
- Focal area 3.5 - Promoting innovative tools for safety of water supplies and controlling pollution

THEME 4: WATER AND HUMAN SETTLEMENTS OF THE FUTURE

- Focal area 4.1 - Game changing approaches and technologies
- Focal area 4.2 - System wide changes for integrated management approaches
- Focal area 4.3 - Institution and leadership for beneficitation and integration
- Focal area 4.4 - Opportunities in emerging cities in developing countries
- Focal area 4.5 - Integrated development in rural human settlement

THEME 5: ECOHYDROLOGY, ENGINEERING HARMONY FOR A SUSTAINABLE WORLD

- Focal area 5.1 - Hydrological dimension of a catchment– identification of potential threats and opportunities for a sustainable development
- Focal area 5.2 - Shaping of the catchment ecological structure for ecosystem potential enhancement – biological productivity and biodiversity
- Focal area 5.3 - Ecohydrology system solution and ecological engineering for the enhancement of water and ecosystem resilience and ecosystem services
- Focal area 5.4 - Urban Ecohydrology – storm water purification and retention in the city landscape, potential for improvement of health and quality of life
- Focal area 5.5 - Ecohydrological regulation for sustaining and restoring continental to coastal connectivity and ecosystem functioning

THEME 6: WATER EDUCATION, KEY FOR WATER SECURITY

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