International Hydrological Programme

50th session of the IHP Bureau
(Paris, 31 March – 1 April 2014)

PROPOSAL FOR THE ESTABLISHMENT OF A REGIONAL WATER RESEARCH CENTRE AT THE COMSATS INSTITUTE OF INFORMATION TECHNOLOGY, ABBOTTABAD, PAKISTAN AS A CATEGORY 2 CENTRE UNDER THE AUSPICES OF UNESCO

Item 6.1 of the provisional agenda

Summary

On 15 April, 2014, the Permanent Delegation of Pakistan to UNESCO Submitted a full proposal for the establishment of a Regional Water Research Centre at the COMSATS Institute of Information Technology in Abbottabad, Pakistan as a category 2 centre under the auspices of UNESCO. This document contains the Original letter of intent as submitted by the Permanent Delegation of the Islamic Republic of Pakistan for consideration by the 50th Session of the IHP Bureau and the and full proposal as submitted to the out of session teleconference of the Bureau, which was held on 29 April, 2014.

Action Expected of the Bureau:
Please refer to document IHP/Bur-L/9
Subject: UNESCO Category-II, Water Research Centre at COMSATS Institute of Information Technology, Abbottabad, Pakistan

Excellency,

I have the honour to enclose herewith a Letter of Intent from the Ministry of Science & Technology, Government of Pakistan along with a Proposal for Water Research Centre (UNESCO Category-2) to be established at the COMSATS Institute of Information Technology, Abbottabad, Pakistan as UNESCO Category-II Centre. The objectives of this Centre are:

a) To conduct research on fresh water resources of upstream region situated in the high altitude mountainous region in northern Pakistan;

b) Capacity building in water resources management related fields in the national as well as regional institutions; and,

c) To produce highly qualified manpower that can play a significant role in various aspects of water research, e.g. surface water, groundwater, water resources management, snow and glacier, water resources engineering, etc.

d) The Centre will undertake research and promote its applications in the above stated areas. It will also act as an institutional resource to carry out water quality testing in formulating recommendation for its improvement according to the prescribed international standards.

2. It is requested that IHP Secretariat may please be advised to present the letter of intent to the upcoming 50th session of the IHP Bureau for seeking the Bureau’s agreement to review the full proposal prior to 21st session of the IHP Intergovernmental Council.

Please accept, Excellency, the assurances of our highest consideration.

(Handwritten signature)
Humaira Zia Mufti
Deputy Permanent Delegate

Ms Irina Bokova
Director General
UNESCO Headquarters
Paris

CC:
1) Ms Wendy Watson-Wright, Assistant, Assistant Director (Sc).
2) Ms Blanca Jimenez-Cisneros, Secretary, International Hydrological Programme.
Subject: Proposal for UNESCO Category-II, Water Research Center at COMSATS Institute of Information Technology, Abbottabad

Dear Ms. Mufti,

Please find enclosed the “Letter of Intent” from the Government of Pakistan regarding establishment of UNESCO Category-II Centre on Water Research at COMSATS Institute of Information Technology, Abbottabad. This letter may please be forwarded to the office of DG UNESCO, with a copy to Mr. Bisher Imam Deputy Secretary IHP, UNESCO.

Best regards,

(Dr. I. E. Qureshi)

Ms. Humaira Zia Mufti  
Deputy Permanent Delegate of Pakistan to UNESCO  
Paris, France
Letter of Intent
Concerning
UNESCO Category-II, Water Research Center at COMSATS Institute of Information Technology, Abbottabad

The Ministry of Science & Technology, Government of Pakistan, hereby endorses the proposal of establishing a UNESCO Category-II Centre entitled, “Water Research Center” at COMSATS Institute of Information Technology (CIIT), Abbottabad, under its “Department of Environmental Sciences”. The CIIT is a ranking public sector degree awarding institution working under the administrative control of the Ministry of Science & Technology.

2. The objectives set forth for the proposed Center are:
   a) To conduct research on fresh water resources of upstream region situated in the high altitude mountainous region in northern Pakistan;
   b) Capacity building in water resources management related fields in the national as well as regional institutions; and,
   c) To produce highly qualified manpower that can play a significant role in various aspects of water research, e.g. surface water, groundwater, water resources management, snow and glacier, water resources engineering, etc.

3. The Center will undertake research and promote its applications in the above stated areas. It will also act as an institutional resource to carry out water quality testing in formulating recommendations for its improvement according to the prescribed international standards.

4. A detailed proposal of the centre prepared according to UNESCO’s Guidelines was earlier submitted by the Ministry of Science and Technology to Pakistan National Commission for UNESCO for onward transmission to UNESCO, Paris. This document will be dispatched shortly.

Please assurances of my highest considerations and regards,

[Signature]
Amjad Hussain
Joint Scientific Adviser (IL)

➤ The Secretary General,
United Nations Educational, Scientific and Cultural Organization,
Paris, France.

cc: (1) Mr. Bisher Imam, Deputy Secretary IHP, UNESCO, Paris.
No.PDU-1/COMSATS/14

24 April, 2014

Subject: **UNESCO Category-II, Regional Water Research Centre at COMSATS Institute of Information Technology, Abbottabad, Pakistan**

Excellency,

In continuation of our letter of even number dated 11 March, 2014, I have the honour to enclose herewith the Proposal for establishment of Regional Water Research Centre at the COMSATS Institute of Information Technology, Abbottabad, Pakistan as UNESCO Category-II Centre. The proposed objectives of this Centre are:

i) To conduct research on fresh water resources upstream region situated in the high altitude mountainous HKH region in northern Pakistan.

ii) Capacity building in water resources management related fields from the national institutes.

iii) To produce highly qualified manpower that can play a significant role in various aspects of water research, e.g. surface water, groundwater, water resources management, snow and glacier, water resources engineering.

2. In close collaboration with, and by building on the advances of knowledge by, the IHP and other key partners the centre will move the research front and thereby improve our understanding of the surface and ground water research. The Centre will therefore contribute to the objectives of UNESCO. In close collaboration with IHP programs, especially those focusing on Water Related Disasters and Hydrological Change, Ground Water in A Changing Environment, Addressing Water Scarcity and Quality, and Water for Human Settlements of the Future themes of the eighth phase of IHP, the proposed centre will facilitate and embark the research on the sustainable food security and water resources management (quantitatively and qualitatively).

3. I am pleased to inform that the 50th Session of the IHP Bureau has approved
the Proposal for submission to the out of session meeting of the IHP Bureau scheduled on 30th April, 2014. It is now requested that the IHP Secretariat may please be advised to present the Proposal to the IHP Bureau meeting for consideration and for final submission to the 21st session of the IHP Intergovernmental Council scheduled in June this year.

Please accept, Excellency, the assurances of our highest consideration.

(Humaira Zia Mufti)
Deputy Permanent Delegate

Ms Irina Bokova
Director General
UNESCO Headquarters
Paris

CC:


ii) Ms Blanca Elena Jimenez-Cisneros, Director of Division, Secretary of the International Hydrological Programme, UNESCO Hqs. Paris.
Proposal for the Establishment of
UNESCO Category-II Centre in Pakistan

Regional
Water Research Center (RWRC)
CIIT, Abbottabad, Pakistan

COMSATS Institute of Information Technology (CIIT),
Pakistan
I. Regional Water Research Centre (RWRC), COMSATS Institute of Information Technology (CIIT) Abbottabad, Pakistan

It is proposed that a centre focusing on water research should be established as a category II Centre under the auspices of UNESCO in Abbottabad, Pakistan. The proposed name of the centre is “Regional Water Research Centre”. The centre is envisaged to have close links with UNESCO-IHP. COMSATS Institute of Information Technology (CIIT) will host RWRC. The COMSATS Institute of Information Technology is a federally chartered degree awarding institution working under the administrative control of the Government of Pakistan with eight campuses in different part of the country including Abbottabad.

II. Background and Motivation

Pakistan, a country with sixth largest population (more than 185 million) in the world (United Nations, 2010), is dependent highly on agricultural based economy. Approximately, more than 60 percent of country's population living in rural areas is directly or indirectly dependent on agriculture for their livelihood. Moreover, this sector provides raw material to domestic agro-based industries, such as sugar, leather, and textiles. Hence, the importance of agriculture to the economic growth of Pakistan and the well being of its people cannot be overstated. Pakistan is an arid to semi arid country and the rainfall contribution is very little in the irrigation of agricultural lands. Throughout history, people have adapted to the low and poorly distributed rainfall by either living along river banks or by careful management of local water resources. One of the greatest of human civilizations—the Indus Valley Civilization (3300–1300 BCE; mature period 2600–1900 BCE) – flourished along the banks of the Indus River (http://en.wikipedia.org/wiki/Indus_Valley_Civilization). The low level balance of man and water was dramatically shifted with the advent of large-scale irrigation technology, in the nineteenth century. The Indus Basin Irrigation System, IBIS became the largest contiguous irrigation system in the world. The Indus River and its two eastern tributaries—Jhelum and Chenab contribute a major proportion of the water supply to this irrigation system.

The catchment area of the River Indus is located in 4 countries (Pakistan, India, China and Afghanistan) with the largest part in Pakistan. The Indus Water Treaty was signed between Pakistan and India in 1960 to share river waters. According to this treaty, Pakistan has the rights to the waters of Indus, Jhelum and Chenab rivers, whereas India retained the rights on Ravi, Beas
and Sutlej rivers. To cater for water needs in the eastern irrigated region of Pakistan, in the year 1974, the world’s largest earth-fill dam, the Tarbela dam was constructed on the River Indus. Tarbela is the first controlling storage on the River Indus and most of the annual Upper Indus River influx stored at Tarbela is derived from the snow and glacier melt in Hindukush-Karakoram-Himalaya (HKH) ranges. This stored water is then supplied to the downstream irrigated-lands through a network of barrages, canals and small watercourses.

The Indus Basin depends heavily on the glaciers of the western Himalayas which act as a reservoir, capturing snow and rain, holding the water and releasing it into the rivers which feed the plain. Rapidly changing demographics and climatic conditions are seriously disturbing the natural eco-hydro system in the upper Indus Basin. Snow and glaciers are sensitive climate indicators and it is now clear that climate change is already affecting these glaciers in a dramatic fashion. Baseline studies and reliable estimates of the precipitation, snow/glacier area extent, snow water equivalent and snowmelt runoff are lacking in this largely inaccessible and data sparse region. However, the literature and future projection of the existing scenario indicates that there will be glacial retreat, during which the river flows will increase. This especially in combination with the predicted flashier rainfall is likely to exacerbate the already serious problems of flooding and draining, especially in the lower parts of the Indus basin, in the next few decades. But then the glacial reservoirs will be reduced and there are likely to be dramatic decreases in river flows, conceivably by a terrifying 30 to 40 percent in the Indus Basin in one hundred years time.

In other words, the sustainability of Pakistan’s economy and food security is dependent on these water resources (snow and glaciers) of HKH region and the water management in the downstream. Any change in these available water resources through climate variability, socio-economic factors or international policies will have a serious impact on food security and the environment in Pakistan (Fowler and Archer, 2006; Tahir et al., 2011). There are very few institutes within Pakistan which are conducting specialized water research.

Given the lack of research and data on the upper Indus basin and water regime in the downstream CIIT propose to establish a regional water research center that should be devoted for the research on every aspect of the water resources e.g. hydrologic regime of the HKH (region under snow and glaciers cover) under climate variability to manage the available water resources, irrigation and
drainage, groundwater management, water quality, water demand and supply, water resources engineering (for flood control and reservoir operation) and hydrological modeling.

This centre will address water related problems (quantitative and qualitative) in its broadest sense with a primary focus on high-altitude water resources of Hindukush-Karakoram-Himalaya for the regional development. It should be stressed that the centre is dependent on the support of UNESCO and its wide ranging network of partner institutions. In close collaboration with, and by building on the advances of knowledge by, the IHP and other key partners the centre will move the research front and thereby improve our understanding of the surface and groundwater research. The Centre will therefore contribute to the objectives of UNESCO.

The centre will be based at the COMSATS Institute of Information Technology (CIIT), Abbottabad, Northern Pakistan. CIIT is a science and technology institute with diverse regional and internationally-oriented programs and activities having 8 campuses in Pakistan. This location of CIIT Abbottabad is proposed because of its geographical importance around the main water resources, catchments/watersheds and reservoirs. CIIT Abbottabad is situated in the north of Pakistan at southern foothills of western Himalaya. Main glacierized area (HKH) which generates the bulk of water for the Indus River Irrigation System of Pakistan is situated at about 300-400 km in the north of Abbottabad. The major water reservoir of Pakistan i.e. Tarbela Dam, is situated at about 90 km in the south-west. Therefore, the access to all the principle water bodies is easier from this site than any other urban areas of the country.

III. Program, Objectives, and Functions

This proposed Center would be oriented towards the following important aspects of the water research:
1) **Snow and glacier hydrology:**
   i. Study of the snow cover and glacier dynamics in Hindukush-Karakoram-Himalaya (HKH) region using field data and satellite based Remote Sensing data
   ii. Studying the impact of climate change on the cryosphere (snow and ice) of HKH
   iii. Analysing the hydrological regime in the high-altitude catchment areas of HKH like Upper Indus River Basin (UIB)
   iv. Measuring climate variables in the glacierized regions of HKH to analyse the climate variation trends

2) **Hydrological modeling:**
   i. Modeling Snowmelt-Runoff for simulation, forecasting and to study the impact of climate variability on the mountainous river discharges
   ii. Rainfall-Runoff modeling
   iii. Groundwater modeling
   iv. Climate modeling to generate/simulate the future climate scenarios

3) **Water resources Engineering:**
   i. Operational hydrology like flood estimation and control (suggesting the need and design of the water conservation structures) and hydropower generation
   ii. Analysis of the reservoir sedimentation and its remediation
4) Water resources management:
   i. Groundwater resources management (recharge) under future climate change scenarios
   ii. Sustainable management of future water demand and supply for irrigation, domestic and industrial use by applying different modeling techniques (WEAP model)
   iii. Application of the improved irrigation techniques (sprinkler and drip irrigation etc.) in the local environment to increase the irrigation efficiency with more agricultural production

5) Water quality:
   i. Analysis and treatment of the drinking water to bring it to the international standard
   ii. Waste water treatment using different chemical and biological techniques

The main objectives of the proposed center at CIIT, Abbottabad are:

   i) To conduct research on fresh water resources upstream region situated in the high altitude mountainous HKH region in northern Pakistan
   ii) Capacity building in water resources management related fields from the national institutes
   iii) To produce the highly qualified manpower that can play a significant role in various aspects of the water research, e.g. surface water, groundwater, water resources management, snow and glacier, water resources engineering.

In close collaboration with the IHP programs, especially those focusing on Water Related Disasters and Hydrological Change, Ground Water in A Changing Environment, Addressing Water Scarcity and Quality, and Water for Human Settlements of the Future themes of the eighth phase of IHP, the proposed centre will facilitate and embark the research on the sustainable food security and water resources management (quantitatively and qualitatively).

In tandem with the development of new research, significant efforts will be put into how the results can be put into concrete use by policy and decision-makers. Thus the research that will be developed will be “research for application”. The network of partners will encircle other regional and global water research oriented Universities and Institutes/Centres. The Centre would usefully complement and support other UNESCO centers’ on water, in particular:

   i. International Center for Water Security & Sustainable Management, Daejeon, Republic of Korea
   ii. Regional Humid Tropics Hydrology and Water Resources Centre for South-East Asia and the Pacific (HTC Kuala Lumpur, Malaysia)
iii. Regional Centre for Training and Water Studies of Arid and Semi-arid Zones (RCTWS), Egypt
iv. International Centre for Water Hazard and Risk Management (ICHARM), Japan
v. Asia-Pacific Centre for Ecohydrology (APCE), Indonesia

The centre will perform research; publish results; build capacity through dedicated training programs. The intended beneficiaries of the results are primarily policy and decision-makers but the outputs will also in broader terms build the scientific knowledge within the realm of water and cooperation. Further downstream effects of benefit for the society (especially agricultural community) will be improved water quantity and quality and thereby positive effects for economic development and growth both at national as well as regional level.

IV. Facilities and Expertise

CIIT has the potential to run this center with a least effort because of its existing facilities to conduct the research on the above mentioned subject areas. Some of these existing facilities are explained below:

**Faculty/Researchers:**

There are 15 faculty members/researchers (Annex A) holding Ph.D. degrees with specialization in the above areas of water research working currently at COMSATS IIT, Abbottabad:

- Professors (3)
- Associate Professors (2)
- Assistant Professors (10)

**International Collaborations:**

i. **Germany – Geographical Institute of University of Bonn (GIUB), Germany and CIIT, Abbottabad** are already working together for the monitoring of high-altitude water resources. In this context, we already have a field excursion of 10-days to some of the important glaciers (e.g. Batura, Gulkian, Gulmit, Passu etc.) in May 2013. Almost 8 high-altitude weather stations were observed and managed on these glaciers at different locations. A team of 10 researchers (faculty members and students) from
CIIT, Abbottabad and 2 scientists from GIUB, Germany participated in this field excursion. Another field visit is intended to be in May 2014. An **Automatic Weather Station** is also installed at CIIT, Abbottabad Campus (donated by GIUB, Germany) to give the operational knowledge to the researchers of the Institute about the climate variables measurement.

CIIT has already signed MoU with Karlsruhe Institute of Technology (KIT), Germany to join their forces on Meteorological research and education. These two are running a joint project on the sedimentation mapping of Tarbela reservoir. This collaboration may further be expanded for the research on water.

ii. **Italy** – A MoU is signed with the “Institute of Atmospheric Sciences and Climate (ISAC) of the Italian National Research Council (CNR)” to collaborate within a running project (Ev-K2-CNR) on the climate data measurements in the glacierized region of Central Karakoram National Park (CKNP), Northern Pakistan. CIIT, Abbottabad is actively participating in the operational meetings of this organization and presenting the scientific findings on this area.

iii. **Norway** – CIIT and Norwegian University of Life Sciences (NMBU) has long term collaboration in research and education. Currently five research and education programs on different aspects of climate change, water and sanitation, livelihoods and development are in progress between the two institutes.

**Laboratories/instrumentation:**

a. One Automatic Weather Station (fully functional) for demonstration is installed at CIIT

b. **Analytical Lab**
   - Biology
   - Chemistry

c. **Microbiology Lab**

d. **Earth Sciences**

e. **Engineering Resource Lab.**

f. **Advance Computing Lab (Research)**
Need of a knowledge base for an efficient water research:

The sustainable management of a huge, interlinked, and very complex natural resource base is the single most challenging long-term task for water managers in Pakistan, and requires the development of world-class capacity in three related areas: **the natural sciences, engineering sciences and the social sciences**.

There is a need to build a strong natural, engineering, and social scientific cadre in Pakistan capable of working with all users in defining the problem, developing solutions, monitoring, assessing and adjusting.

It will require an expansive and long-term human resource strategy which will update the skills of the formidable capacity which exists in Pakistan, but will also strengthen the capacity of universities and other scientific and training institutions to produce high quality applied research and to train the next generation of water policymakers and managers. **Fortunately, CIIT Abbottabad has most of above knowledge base already existing within the institute in the form of the Departments of Engineering, Sciences and Development studies.**

V. Governance and Administration

The **RWRC** will be designed to function under the umbrella of CIIT that can provide water security strategies for adaption to climate change and sustainable water resource management through integrated research, practical education and information networking and achieve its ultimate goal of contributing to the fair use of water resources and the improvement of quality of life. It will consist of Advisory Board headed by the Additional Director to be appointed by the CIIT. The Advisory Board will function as a body to make overall decisions on the operation of the **RWRC**, and the Secretariat will take charge of operating and managing the **RWRC**. The Advisory Board of the **RWRC** will include UNESCO, government agencies, public institutions, universities, private sectors, communities, water associations and agencies, etc. The Additional Director of the Advisory Board will build a cooperative system with UNESCO and other international organizations.
The following shows details about the organizational structure of the RWRC:

1. **The Advisory Board**

The major functions of the Advisory Board, as a body to make overall decisions on the operation of the RWRC, will include:

- Approving medium-/long-term programs;
- Approving a budgetary plan, an annual operation plan, personnel, etc.;
- Screening and evaluating annual reports submitted by the Additional Director of the RWRC;
- Monitoring compliance with relevant laws and regulations, and making decisions on financial requirements.

The Advisory Board will consist of not more than 10 members, including:

- Two representatives of the Government of Pakistan
- Two representatives of CIIT - one being Additional Director
- One representative of Director-General of UNESCO
- Three representatives of relevant research institutes and universities
- Two representatives of member countries that makes significant contributions to the activities of the RWRC

The Additional Director of the Board shall be appointed by the CIIT. The Advisory Board shall be operated in accordance with regulations initially to be developed separately by the CIIT and endorsed by the board for the center. The term of a board Additional Director shall be 3 years.

2. **Secretariat**

The major functions of the Secretariat will include:

- Engaging in activities consistent with programs and policies as decided by the Advisory Board
- Proposing an operation and budgetary plan as decided by the Advisory Board;
- Preparing an operation report submitted to the Advisory Board;
Proposing to the Advisory Board new ideas about the development of the RWRC.

The RWRC personnel will include a Additional Director, and heads of the sub-programs and administration. The Additional Director will be elected by the CIIT. He/she will bear overall responsibilities for the operation and management of the RWRC. At the early stage of its operation, the RWRC will consist of three sections including snow and glacier hydrology and modeling, water and wastewater and energy and water quality and management (with at least 24 full-time employees): However, it may expand its organizational scale by installing additional sections, if necessary. Each section will define their and execute their own projects and programs on research, institutional collaboration under the overall supervision of the director of the center.

The staffs include:

- Staff(s) seconded in accordance with the relevant regulations of the UNESCO
- Experts with the recommendation of the Additional Director and the Advisory Board
- Government officials or any other employees with relevant agencies who are used in accordance with governmental regulations, etc.

For its efficient operation, the proposed center will be established within CIIT that is well equipped with research and education infrastructure facilities. The center will have operation framework under the auspices of CIIT.

VI. Legal Status

There will be a prompt effort by the CIIT in coordination with relevant Government Agency to secure the legal status of the proposed Center in manner consistent with UNESCO’s comprehensive strategy for Category-II Centers.

VII. Financial Aspects

Estimated annual budget:

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Item/Activities</th>
<th>Estimated cost (USD) per annum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Per annum estimated costs to run the centre (Running cost)</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Office and financial support</td>
<td>30,000/-</td>
</tr>
<tr>
<td>2</td>
<td>Projects and publications</td>
<td>20,000/-</td>
</tr>
<tr>
<td>3</td>
<td>Seminars and workshops</td>
<td>10,000/-</td>
</tr>
<tr>
<td>4</td>
<td>Meeting of governing board</td>
<td>20,000/-</td>
</tr>
<tr>
<td>5</td>
<td>Salaries a</td>
<td>100,000/-</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1,80,000/- per annum</strong></td>
</tr>
</tbody>
</table>

**Capital (one-time cost) estimated costs to run the centre**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Office space (one time cost)</td>
<td>30,000/-</td>
</tr>
<tr>
<td>2</td>
<td>Laboratory equipment (one time cost)</td>
<td>40,000/-</td>
</tr>
<tr>
<td>3</td>
<td>GIS and RS lab (with installed GIS, hydrological modelling softwares etc.) – one time cost</td>
<td>30,000/-</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1,00,000/-</strong></td>
</tr>
</tbody>
</table>

**Gross total to establish the RWRC**

|   | **2,80,000/- USD** |

**Funding contributions (by Government and by CIIT and/or by other organizations):**

**VIII. Cooperation with UNESCO Water Family**

IHP Phase VIII “Water Security: Addressing Local, Regional, and Global Challenges”(2014-2021) consisting of 6 main themes has started earlier this year. To contribute to the successful achievement of IHP-VIII, key tasks, the **RWRC** will closely work with international and local agencies and the UNESCO IHP.

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* Salaries are calculated at 25% of present salaries of faculty members, and for 10 persons of administrative staff
More specifically, through these partnerships, the snow and glacier hydrology and hydrologic modeling aspects of the center’s research, education, and capacity building activities will actively support the implementation of Theme I (Water Related Disasters and Hydrological Changes) of IHP-VIII. Similarly, the Center’s water resources engineering aspects will strive to provide cross cutting support to the water scarcity component of Theme 3 (Addressing Water scarcity and Quality) and to Theme 4 (water for human settlement of the Future). Our activities on water resources management will support the implementation of theme 4 (Water and human settlements of the future) both in urban and rural areas, and our water quality activities will strive to support the water quality component of theme 3 (Addressing water scarcity and quality) including the international water quality initiative.

The RWRC will maintain cooperative partnership with FRIEND (Flow Regimes from International Experimental and Network Data), HELP (Hydrology for the Environment, Life and Policy), IFI (International Flood Initiative), ISI (International Sediment Initiative), PCCP (From Potential Conflict to Cooperation Potential), and UWMP (Urban Water Management Program). This will contribute to the solution of global water problems. Also, the RWRC will try to identify how to secure a successful adaptation to the global impacts of climate change on river basins, build up a governance system for securing sustainability, develop eco-hydrological capacity and transfer water knowledge to developing countries.

We believe that, based on its cooperative partnership with the RWRC, the UNESCO can:

- Give advice about, or cooperation on, short-/medium-/long-term programs provided in the future by the RWRC, or technically assist with, or give administrative advice about, the establishment of the RWRC;
- Encourage not only member states but also international organizations and non-governmental financial stakeholders to propose feasible projects and give financial and technical advice to the RWRC, and facilitate communication with other international organizations whose functions have something to do with those of the RWRC;
- Provide the RWRC with IHP publications and any other information, and post information about the activities of the RWRC at the IHP website;
- Enter into any research contract with the RWRC as per policies relating to the IHP
Intergovernmental Council, provide any kinds of helps for the **RWRC** within the rules governing budgets and regular programs, and partner with **RWRC** on relevant research and education programs depending on its own program priority.

**IX. Responsibilities of Member State and UNESCO**

The proposed duration of the Centre is for a six-year period, with possibility of renewal into a second-phase after an evaluation is performed as envisaged in the UNESCO guidelines for category 2 centres. The Pakistan Government will fund the core activities of the centre, including facilities, staff and key activities.

According to the strategic priorities and objectives of UNESCO, it is expected that UNESCO will provide technical assistance and intellectual contributions to the activities of the Center, in line with UNESCO strategy for category 2 centres as adopted by the General Conference.

The UNESCO contribution could result in:

- a) Providing the collaboration of experts in the thematic areas and activities of the Center;
- b) Temporary assignment of staff members;
- c) Associating the Center to various programs in which its participation is considered necessary;
- d) Providing the center with scientific material such as publications of interest;

UNESCO’s support may be requested, under contract, for specific activities in line with UNESCO program priorities, particularly for networking, organization of courses, workshops and conferences in different regions, edition of education materials and student exchange.

UNESCO will not be legally responsible for the Category 2 Centre and it shall bear neither responsibility nor liabilities of any kind, be it managerial, financial or otherwise.
X. Annexes and Supplemental Documents

Annex A: Key Scientific Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Specialization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Adnan Ahmad Tahir (Assistant Professor)</td>
<td>Snow and glacier hydrology, Snowmelt-runoff modeling, Water resources management, Climate Change, GIS &amp; Remote Sensing</td>
</tr>
<tr>
<td>View Profile at: <a href="http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=342&amp;Department=5">link</a></td>
<td></td>
</tr>
<tr>
<td>Dr. Muhammad Atiq Ur Rehman Tariq (Assistant Professor)</td>
<td>Water Resources Engineering, Flood risk management</td>
</tr>
<tr>
<td>View profile at: <a href="http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=391&amp;Department=11">link</a></td>
<td></td>
</tr>
<tr>
<td>Dr. Muhammad Irshad (Professor)</td>
<td>Soil and Water Resources Management</td>
</tr>
<tr>
<td>View Profile at: <a href="http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=94&amp;Department=5">link</a></td>
<td></td>
</tr>
<tr>
<td>Dr. Tayyab Ashfaq (Assistant Professor)</td>
<td>Civil and Environmental Engineering</td>
</tr>
<tr>
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</tr>
<tr>
<td>Dr. Muhammad Bilal (Assistant Professor)</td>
<td>Waste water treatment, Organic waste detection in potable drinking water supplies</td>
</tr>
<tr>
<td>View profile at: <a href="http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=128&amp;Department=5">link</a></td>
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<tr>
<td>Dr. Arif Alam (Assistant Professor)</td>
<td>Rural Development, Water Resources Management</td>
</tr>
<tr>
<td>View profile at: <a href="http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=474&amp;Department=6">link</a></td>
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</tr>
<tr>
<td>Dr. Zulfikar Ahmad Bhatti (Assistant Professor)</td>
<td></td>
</tr>
<tr>
<td>Dr. Naim Rashid (Assistant Professor)</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Specialization</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mr. Asim Jahangir (Assistant Professor) – On study leave for doctoral Degree in Germany</td>
<td>Industrial and municipal waste-water treatment, Hazards analysis of critical control points</td>
</tr>
<tr>
<td>Specialization:</td>
<td>Renewable energy production, Water and wastewater treatment</td>
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<tr>
<td>Specialization:</td>
<td>Hydrology and Hydrological Modeling</td>
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<td>Specialization:</td>
<td>Wetlands management, Waste water treatment</td>
</tr>
<tr>
<td>Dr. Muhammad Amjad Sabir (Assistant Professor)</td>
<td></td>
</tr>
<tr>
<td>Specialization:</td>
<td>Groundwater Hydrology</td>
</tr>
<tr>
<td>Dr. Arshid Pervez (Professor/HoD)</td>
<td></td>
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</tbody>
</table>
Proposal for the Establishment of
UNESCO Category-II Centre in Pakistan

Regional
Water Research Center (RWRC)
CIIT, Abbottabad, Pakistan

COMSATS Institute of Information Technology (CIIT),
Pakistan
I. Regional Water Research Centre (RWRC), COMSATS Institute of Information Technology (CIIT) Abbottabad, Pakistan

It is proposed that a centre focusing on water research should be established as a category II Centre under the auspices of UNESCO in Abbottabad, Pakistan. The proposed name of the centre is “Regional Water Research Centre”. The centre is envisaged to have close links with UNESCO-IHP. COMSATS Institute of Information Technology (CIIT) will host RWRC. The COMSATS Institute of Information Technology is a federally chartered degree awarding institution working under the administrative control of the Government of Pakistan with eight campuses in different part of the country including Abbottabad.

II. Background and Motivation

Pakistan, a country with sixth largest population (more than 185 million) in the world (United Nations, 2010), is dependent highly on agricultural based economy. Approximately, more than 60 percent of country's population living in rural areas is directly or indirectly dependent on agriculture for their livelihood. Moreover, this sector provides raw material to domestic agro-based industries, such as sugar, leather, and textiles. Hence, the importance of agriculture to the economic growth of Pakistan and the well being of its people cannot be overstated. Pakistan is an arid to semi arid country and the rainfall contribution is very little in the irrigation of agricultural lands. Throughout history, people have adapted to the low and poorly distributed rainfall by either living along river banks or by careful management of local water resources. One of the greatest of human civilizations—the Indus Valley Civilization (3300–1300 BCE; mature period 2600–1900 BCE) – flourished along the banks of the Indus River (http://en.wikipedia.org/wiki/Indus_Valley_Civilization). The low level balance of man and water was dramatically shifted with the advent of large-scale irrigation technology, in the nineteenth century. The Indus Basin Irrigation System, IBIS became the largest contiguous irrigation system in the world. The Indus River and its two eastern tributaries—Jhelum and Chenab contribute a major proportion of the water supply to this irrigation system.

The catchment area of the River Indus is located in 4 countries (Pakistan, India, China and Afghanistan) with the largest part in Pakistan. The Indus Water Treaty was signed between Pakistan and India in 1960 to share river waters. According to this treaty, Pakistan has the rights to the waters of Indus, Jhelum and Chenab rivers, whereas India retained the rights on Ravi, Beas
and Sutlej rivers. To cater for water needs in the eastern irrigated region of Pakistan, in the year 1974, the world’s largest earth-fill dam, the Tarbela dam was constructed on the River Indus. Tarbela is the first controlling storage on the River Indus and most of the annual Upper Indus River influx stored at Tarbela is derived from the snow and glacier melt in Hindukush-Karakoram-Himalaya (HKH) ranges. This stored water is then supplied to the downstream irrigated-lands through a network of barrages, canals and small watercourses.

The Indus Basin depends heavily on the glaciers of the western Himalayas which act as a reservoir, capturing snow and rain, holding the water and releasing it into the rivers which feed the plain. Rapidly changing demographics and climatic conditions are seriously disturbing the natural eco-hydro system in the upper Indus Basin. Snow and glaciers are sensitive climate indicators and it is now clear that **climate change** is already affecting these glaciers in a dramatic fashion. Baseline studies and reliable estimates of the precipitation, snow/glacier area extent, snow water equivalent and snowmelt runoff are lacking in this largely inaccessible and data sparse region. However, the literature and future projection of the existing scenario indicates that there will be glacial retreat, during which the river flows will increase. This especially in combination with the predicted flashier rainfall is likely to exacerbate the already serious problems of flooding and draining, especially in the lower parts of the Indus basin, in the next few decades. But then the glacial reservoirs will be reduced and there are likely to be dramatic decreases in river flows, conceivably by a terrifying 30 to 40 percent in the Indus Basin in one hundred years time.

In other words, the **sustainability of Pakistan’s economy and food security** is dependent on these water resources (snow and glaciers) of HKH region and the water management in the downstream. Any change in these available water resources through climate variability, socio-economic factors or international policies will have a serious impact on food security and the environment in Pakistan (Fowler and Archer, 2006; Tahir et al., 2011). There are very few institutes within Pakistan which are conducting specialized water research.

Given the lack of research and data on the upper Indus basin and water regime in the downstream CIIT propose to **establish a regional water research center** that should be devoted for the research on every aspect of the water resources e.g. hydrologic regime of the HKH (region under snow and glaciers cover) under climate variability to manage the available water resources, irrigation and
drainage, groundwater management, water quality, water demand and supply, water resources engineering (for flood control and reservoir operation) and hydrological modeling.

This centre will address water related problems (quantitative and qualitative) in its broadest sense with a primary focus on high-altitude water resources of Hindukush-Karakoram-Himalaya for the regional development. It should be stressed that the centre is dependent on the support of UNESCO and its wide ranging network of partner institutions. In close collaboration with, and by building on the advances of knowledge by, the IHP and other key partners the centre will move the research front and thereby improve our understanding of the surface and groundwater research. The Centre will therefore contribute to the objectives of UNESCO.

The centre will be based at the COMSATS Institute of Information Technology (CIIT), Abbottabad, Northern Pakistan. CIIT is a science and technology institute with diverse regional and internationally-oriented programs and activities having 8 campuses in Pakistan. This location of CIIT Abbottabad is proposed because of its geographical importance around the main water resources, catchments/watersheds and reservoirs. CIIT Abbottabad is situated in the north of Pakistan at southern foothills of western Himalaya. Main glacierized area (HKH) which generates the bulk of water for the Indus River Irrigation System of Pakistan is situated at about 300-400 km in the north of Abbottabad. The major water reservoir of Pakistan i.e. Tarbela Dam, is situated at about 90 km in the south-west. Therefore, the access to all the principle water bodies is easier from this site than any other urban areas of the country.

**III. Program, Objectives, and Functions**

This proposed Center would be oriented towards the following important aspects of the water research:
1) **Snow and glacier hydrology:**
   i. Study of the snow cover and glacier dynamics in Hindukush-Karakoram-Himalaya (HKH) region using field data and satellite based Remote Sensing data
   ii. Studying the impact of climate change on the cryosphere (snow and ice) of HKH
   iii. Analysing the hydrological regime in the high-altitude catchment areas of HKH like Upper Indus River Basin (UIB)
   iv. Measuring climate variables in the glacierized regions of HKH to analyse the climate variation trends

2) **Hydrological modeling:**
   i. Modeling Snowmelt-Runoff for simulation, forecasting and to study the impact of climate variability on the mountainous river discharges
   ii. Rainfall-Runoff modeling
   iii. Groundwater modeling
   iv. Climate modeling to generate/simulate the future climate scenarios

3) **Water resources Engineering:**
   i. Operational hydrology like flood estimation and control (suggesting the need and design of the water conservation structures) and hydropower generation
   ii. Analysis of the reservoir sedimentation and its remediation
4) Water resources management:
   i. Groundwater resources management (recharge) under future climate change scenarios
   ii. Sustainable management of future water demand and supply for irrigation, domestic and industrial use by applying different modeling techniques (WEAP model)
   iii. Application of the improved irrigation techniques (sprinkler and drip irrigation etc.) in the local environment to increase the irrigation efficiency with more agricultural production

5) Water quality:
   i. Analysis and treatment of the drinking water to bring it to the international standard
   ii. Waste water treatment using different chemical and biological techniques

The main objectives of the proposed center at CIIT, Abbottabad are:
   i) To conduct research on fresh water resources upstream region situated in the high altitude mountainous HKH region in northern Pakistan
   ii) Capacity building in water resources management related fields from the national institutes
   iii) To produce the highly qualified manpower that can play a significant role in various aspects of the water research, e.g. surface water, groundwater, water resources management, snow and glacier, water resources engineering.

In close collaboration with the IHP programs, especially those focusing on Water Related Disasters and Hydrological Change, Ground Water in A Changing Environment, Addressing Water Scarcity and Quality, and Water for Human Settlements of the Future themes of the eighth phase of IHP, the proposed centre will facilitate and embark the research on the sustainable food security and water resources management (quantitatively and qualitatively).

In tandem with the development of new research, significant efforts will be put into how the results can be put into concrete use by policy and decision-makers. Thus the research that will be developed will be “research for application”. The network of partners will encircle other regional and global water research oriented Universities and Institutes/Centres. The Centre would usefully complement and support other UNESCO centers’ on water, in particular:
   i. International Center for Water Security & Sustainable Management, Daejeon, Republic of Korea
   ii. Regional Humid Tropics Hydrology and Water Resources Centre for South-East Asia and the Pacific (HTC Kuala Lumpur, Malaysia)
The centre will perform research; publish results; build capacity through dedicated training programs. The intended beneficiaries of the results are primarily policy and decision-makers but the outputs will also in broader terms build the scientific knowledge within the realm of water and cooperation. Further downstream effects of benefit for the society (especially agricultural community) will be improved water quantity and quality and thereby positive effects for economic development and growth both at national as well as regional level.

IV. Facilities and Expertise

CIIT has the potential to run this center with a least effort because of its existing facilities to conduct the research on the above mentioned subject areas. Some of these existing facilities are explained below:

Faculty/Researchers:

There are 15 faculty members/researchers (Annex A) holding Ph.D. degrees with specialization in the above areas of water research working currently at COMSATS IIT, Abbottabad:

- Professors (3)
- Associate Professors (2)
- Assistant Professors (10)

International Collaborations:

i. Germany – Geographical Institute of University of Bonn (GIUB), Germany and CIIT, Abbottabad are already working together for the monitoring of high-altitude water resources. In this context, we already have a field excursion of 10-days to some of the important glaciers (e.g. Batura, Gulkin, Gulmit, Passu etc.) in May 2013. Almost 8 high-altitude weather stations were observed and managed on these glaciers at different locations. A team of 10 researchers (faculty members and students) from
CIIT, Abbottabad and 2 scientists from GIUB, Germany participated in this field excursion. Another field visit is intended to be in May 2014. An **Automatic Weather Station** is also installed at CIIT, Abbottabad Campus (donated by GIUB, Germany) to give the operational knowledge to the researchers of the Institute about the climate variables measurement.

CIIT has already signed MoU with Karlsruhe Institute of Technology (KIT), Germany to join their forces on Meteorological research and education. These two are running a joint project on the sedimentation mapping of Tarbela reservoir. This collaboration may further be expanded for the research on water.

ii. **Italy** – A MoU is signed with the “Institute of Atmospheric Sciences and Climate (ISAC) of the Italian National Research Council (CNR)” to collaborate within a running project (Ev-K2-CNCR) on the climate data measurements in the glacierized region of Central Karakoram National Park (CKNP), Northern Pakistan. CIIT, Abbottabad is actively participating in the operational meetings of this organization and presenting the scientific findings on this area.

iii. **Norway** – CIIT and Norwegian University of Life Sciences (NMBU) has long term collaboration in research and education. Currently five research and education programs on different aspects of climate change, water and sanitation, livelihoods and development are in progress between the two institutes.

**Laboratories/instrumentation:**

a. One Automatic Weather Station (fully functional) for demonstration is installed at CIIT
b. Analytical Lab
   - Biology
   - Chemistry
c. Microbiology Lab
d. Earth Sciences
e. Engineering Resource Lab.
f. Advance Computing Lab (Research)
g. Computer Simulation Lab

Need of a knowledge base for an efficient water research:

The sustainable management of a huge, interlinked, and very complex natural resource base is the single most challenging long-term task for water managers in Pakistan, and requires the development of world-class capacity in three related areas: the natural sciences, engineering sciences and the social sciences.

There is a need to build a strong natural, engineering, and social scientific cadre in Pakistan capable of working with all users in defining the problem, developing solutions, monitoring, assessing and adjusting.

It will require an expansive and long-term human resource strategy which will update the skills of the formidable capacity which exists in Pakistan, but will also strengthen the capacity of universities and other scientific and training institutions to produce high quality applied research and to train the next generation of water policymakers and managers. Fortunately, CIIT Abbottabad has most of above knowledge base already existing within the institute in the form of the Departments of Engineering, Sciences and Development studies.

V. Governance and Administration

The RWRC will be designed to function under the umbrella of CIIT that can provide water security strategies for adaption to climate change and sustainable water resource management through integrated research, practical education and information networking and achieve its ultimate goal of contributing to the fair use of water resources and the improvement of quality of life. It will consist of Advisory Board headed by the Additional Director to be appointed by the CIIT. The Advisory Board will function as a body to make overall decisions on the operation of the RWRC, and the Secretariat will take charge of operating and managing the RWRC. The Advisory Board of the RWRC will include UNESCO, government agencies, public institutions, universities, private sectors, communities, water associations and agencies, etc. The Additional Director of the Advisory Board will build a cooperative system with UNESCO and other international organizations.
The following shows details about the organizational structure of the RWRC:

1. **The Advisory Board**

The major functions of the Advisory Board, as a body to make overall decisions on the operation of the RWRC, will include:

- Approving medium-/long-term programs;
- Approving a budgetary plan, an annual operation plan, personnel, etc.;
- Screening and evaluating annual reports submitted by the Additional Director of the RWRC;
- Monitoring compliance with relevant laws and regulations, and making decisions on financial requirements.

The Advisory Board will consist of not more than 10 members, including:

- Two representatives of the Government of Pakistan
- Two representatives of CIIT - one being Additional Director
- One representative of Director-General of UNESCO
- Three representatives of relevant research institutes and universities
- Two representatives of member countries that makes significant contributions to the activities of the RWRC

The Additional Director of the Board shall be appointed by the CIIT. The Advisory Board shall be operated in accordance with regulations initially to be developed separately by the CIIT and endorsed by the board for the center. The term of a board Additional Director shall be 3 years.

2. **Secretariat**

The major functions of the Secretariat will include:

- Engaging in activities consistent with programs and policies as decided by the Advisory Board
- Proposing an operation and budgetary plan as decided by the Advisory Board;
- Preparing an operation report submitted to the Advisory Board;
Proposing to the Advisory Board new ideas about the development of the RWRC.

The RWRC personnel will include a Additional Director, and heads of the sub-programs and administration. The Additional Director will be elected by the CIIT. He/she will bear overall responsibilities for the operation and management of the RWRC. At the early stage of its operation, the RWRC will consist of three sections including snow and glacier hydrology and modeling, water and wastewater and energy and water quality and management (with at least 24 full-time employees): However, it may expand its organizational scale by installing additional sections, if necessary. Each section will define their and execute their own projects and programs on research, institutional collaboration under the overall supervision of the director of the center.

The staffs include:

- Staff(s) seconded in accordance with the relevant regulations of the UNESCO
- Experts with the recommendation of the Additional Director and the Advisory Board
- Government officials or any other employees with relevant agencies who are used in accordance with governmental regulations, etc.

For its efficient operation, the proposed center will be established within CIIT that is well equipped with research and education infrastructure facilities. The center will have operation framework under the auspices of CIIT.

VI. Legal Status

There will be a prompt effort by the CIIT in coordination with relevant Government Agency to secure the legal status of the proposed Center in manner consistent with UNESCO’s comprehensive strategy for Category-II Centers.

VII. Financial Aspects

Estimated annual budget:

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Item/Activities</th>
<th>Estimated cost (USD) per annum</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Per annum estimated costs to run the centre (Running cost)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Amount</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>Office and financial support</td>
<td>30,000/-</td>
</tr>
<tr>
<td>2</td>
<td>Projects and publications</td>
<td>20,000/-</td>
</tr>
<tr>
<td>3</td>
<td>Seminars and workshops</td>
<td>10,000/-</td>
</tr>
<tr>
<td>4</td>
<td>Meeting of governing board</td>
<td>20,000/-</td>
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<td>5</td>
<td>Salaries&lt;sup&gt;a&lt;/sup&gt;</td>
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<td></td>
<td><strong>Total</strong></td>
<td><strong>1,80,000/- per annum</strong></td>
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</tbody>
</table>

**Capital (one-time cost) estimated costs to run the centre**

<table>
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<tr>
<th></th>
<th>Description</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Office space (one time cost)</td>
<td>30,000/-</td>
</tr>
<tr>
<td>2</td>
<td>Laboratory equipment (one time cost)</td>
<td>40,000/-</td>
</tr>
<tr>
<td>3</td>
<td>GIS and RS lab (with installed GIS, hydrological modelling softwares etc.) – one time cost</td>
<td>30,000/-</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1,00,000/-</strong></td>
</tr>
</tbody>
</table>

**Gross total to establish the RWRC**

|   | **2,80,000/- USD** |

**Funding contributions (by Government and by CIIT and/or by other organizations):**

**VIII. Cooperation with UNESCO Water Family**

IHP Phase VIII “Water Security: Addressing Local, Regional, and Global Challenges”(2014-2021) consisting of 6 main themes has started earlier this year. To contribute to the successful achievement of IHP-VIII, key tasks, the RWRC will closely work with international and local agencies and the UNESCO IHP.

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<sup>a</sup> Salaries are calculated at 25% of present salaries of faculty members, and for 10 persons of administrative staff
More specifically, through these partnerships, the snow and glacier hydrology and hydrologic modeling aspects of the center’s research, education, and capacity building activities will actively support the implementation of Theme I (Water Related Disasters and Hydrological Changes) of IHP-VIII. Similarly, the Center’s water resources engineering aspects will strive to provide cross cutting support to the water scarcity component of Theme 3 (Addressing Water scarcity and Quality) and to Theme 4 (water for human settlement of the Future). Our activities on water resources management will support the implementation of theme 4 (Water and human settlements of the future) both in urban and rural areas, and our water quality activities will strive to support the water quality component of theme 3 (Addressing water scarcity and quality) including the international water quality initiative.

The RWRC will maintain cooperative partnership with FRIEND (Flow Regimes from International Experimental and Network Data), HELP (Hydrology for the Environment, Life and Policy), IFI (International Flood Initiative), ISI (International Sediment Initiative), PCCP (From Potential Conflict to Cooperation Potential), and UWMP (Urban Water Management Program). This will contribute to the solution of global water problems. Also, the RWRC will try to identify how to secure a successful adaptation to the global impacts of climate change on river basins, build up a governance system for securing sustainability, develop eco-hydrological capacity and transfer water knowledge to developing countries.

We believe that, based on its cooperative partnership with the RWRC, the UNESCO can:

- Give advice about, or cooperation on, short-/medium-/long-term programs provided in the future by the RWRC, or technically assist with, or give administrative advice about, the establishment of the RWRC;

- Encourage not only member states but also international organizations and non-governmental financial stakeholders to propose feasible projects and give financial and technical advice to the RWRC, and facilitate communication with other international organizations whose functions have something to do with those of the RWRC;

- Provide the RWRC with IHP publications and any other information, and post information about the activities of the RWRC at the IHP website;

- Enter into any research contract with the RWRC as per policies relating to the IHP
Intergovernmental Council, provide any kinds of helps for the RWRC within the rules governing budgets and regular programs, and partner with RWRC on relevant research and education programs depending on its own program priority.

IX. Responsibilities of Member State and UNESCO

The proposed duration of the Centre is for a six-year period, with possibility of renewal into a second-phase after an evaluation is performed as envisaged in the UNESCO guidelines for category 2 centres. The Pakistan Government will fund the core activities of the centre, including facilities, staff and key activities.

According to the strategic priorities and objectives of UNESCO, it is expected that UNESCO will provide technical assistance and intellectual contributions to the activities of the Center, in line with UNESCO strategy for category 2 centres as adopted by the General Conference.

The UNESCO contribution could result in:

a) Providing the collaboration of experts in the thematic areas and activities of the Center;

b) Temporary assignment of staff members;

c) Associating the Center to various programs in which its participation is considered necessary;

d) Providing the center with scientific material such as publications of interest;

UNESCO’s support may be requested, under contract, for specific activities in line with UNESCO program priorities, particularly for networking, organization of courses, workshops and conferences in different regions, edition of education materials and student exchange.

UNESCO will not be legally responsible for the Category 2 Centre and it shall bear neither responsibility nor liabilities of any kind, be it managerial, financial or otherwise.
### X. Annexes and Supplemental Documents

#### Annex A: Key Scientific Staff

<table>
<thead>
<tr>
<th>Name</th>
<th>Specialization</th>
<th>View Profile at</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Adnan Ahmad Tahir (Assistant Professor)</td>
<td>Snow and glacier hydrology, Snowmelt-runoff modeling, Water resources management, Climate Change, GIS &amp; Remote Sensing</td>
<td><a href="http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=342&amp;Department=5">http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=342&amp;Department=5</a></td>
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<tr>
<td>Dr. Muhammad Atiq Ur Rehman Tariq (Assistant Professor)</td>
<td>Water Resources Engineering, Flood risk management</td>
<td><a href="http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=391&amp;Department=11">http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=391&amp;Department=11</a></td>
</tr>
<tr>
<td>Dr. Muhammad Irshad (Professor)</td>
<td>Soil and Water Resources Management</td>
<td><a href="http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=94&amp;Department=5">http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=94&amp;Department=5</a></td>
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<tr>
<td>Dr Tayyab Ashfaq (Assistant Professor)</td>
<td>Civil and Environmental Engineering</td>
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<td>Dr. Muhammad Bilal (Assistant Professor)</td>
<td>Waste water treatment, Organic waste detection in potable drinking water supplies</td>
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<td>Dr. Arif Alam (Assistant Professor)</td>
<td>Rural Development, Water Resources Management</td>
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<tr>
<td>Dr. Zulfiqar Ahmad Bhatti (Assistant Professor)</td>
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<td>Dr. Naim Rashid (Assistant Professor)</td>
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<td>Specialization</td>
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<tr>
<td>Mr. Asim Jahangir (Assistant Professor) – On study leave for doctoral Degree in Germany</td>
<td>Specialization: Renewable energy production, Water and wastewater treatment</td>
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<td>Specialization: Hydrology and Hydrological Modeling</td>
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<td>Dr. Arshid Pervez (Professor/HoD)</td>
<td>Specialization: Groundwater Hydrology</td>
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<td>Specialization: Wetlands management, Waste water treatment</td>
<td>View profile at: <a href="http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=93&amp;Department=5">http://ciit-atd.edu.pk/departments/FacultyProfile.aspx?FacultyID=93&amp;Department=5</a></td>
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<td>Dr. Muhammad Amjad Sabir (Assistant Professor)</td>
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