

DEGREE CURRICULUM IN IWRM

1. The Need for Advanced Education and Training in IWRM

The underlying factor of many environmental issues relates partly to inadequately planned developments, which include exclusion of environmental considerations into physical development planning. This includes the fact that physical development planning has been based on administrative boundaries rather than ecosystem boundaries e.g. river basin boundary.

The idea of trans-media environmental management – management using ecosystem concept – is a relatively new one. Often water management efforts have been unsuccessful because they have focused on a single medium (i.e. water) without taking into account the impacts of those actions on the biophysical, economic and social elements of the environment.

Thus, specific to water resources, there is a need for a paradigm shift as well as concrete and effective measures to improve the governance of water. In this context, the most obvious areas to focus on are capacity building and human resource development through advanced education and training, and building partnership with and among the relevant institutions involved in the governance and management of water resources.

In general the need for advanced degree in IWRM is most pertinent amongst;

- the policy makers, including politicians at all administrative levels whose decisions will affect the overall planning and development of water resources in the country;
- those who are in the water and related business who require in-depth knowledge of the interactions of the elements of water resource development to perform their work more effectively;
- the future professionals who should be exposed to IWRM to be professionally relevant to the future needs in water resources management;
- those who are not necessarily in the water related fields but whose work would require good knowledge of IWRM in the course of their work, such as in urban and resources planning etc.
- stakeholders who are directly and indirectly affected by aspects of water such as floods and droughts and whose livelihood and existence will be better off if they are educated with the principles of IWRM.

In view of the aforementioned needs and relevance, MyCapNet and the Regional Humid Tropics Hydrology and Water Resources Centre for Southeast Asia and the Pacific (HTC

Kuala Lumpur) with the cooperation of invited experts from local public universities have developed a post-graduate level academic curriculum leading to M. Env. Sc. in IWRM. The programme is intended for local as well as regional students and mid-career professionals.

2. Programme Objectives

The main objectives of the Programme include the following:

- Strengthening of the human resource base with the capability to manage the water resources in an integrated manner, through education and research.
- Development and promotion of masters and post-graduate diploma level programmes in IWRM that are relevant to national and regional needs.
- Realising Malaysia as the regional centre of excellence in the area of IWRM training, education and research.
- Promoting an effective international networking in training, education and research related to IWRM.

Through careful development and implementation of academic curriculum and active collaboration between the participating institutions and agencies, the Programme should achieve the aforementioned objectives.

3. Demands for Graduates in IWRM

Generally, the market sectors and professions/career opportunities associated with water resource management can be categorised as in Table 1 noting the fact that the presently available positions and new job titles will continue to increase in number with time. Their potential employers will include:

- Public Sector – Federal, state and local governments.
- Private Sector – Service, equipment and resource based SMIs and local and multi-national companies/corporations.
- Non-Profit Organisations.
- Educational institutions.

4. Curriculum Development Process

The idea of developing and offering a post-graduate Programme in IWRM was mooted during the inception of MyCapNet in Oct 2001. The forum included senior academics and representatives from the industry (e.g. consulting firms), NGOs, government agencies and other water resource related practitioners. A Working Committee comprising representatives from the same groups was formed to develop the curriculum for the IWRM masters Programme. Since then, the Working Committee had successfully developed the programme specifications and curriculum structure. Drafts of course synopsis had also been prepared/contributed by selected experts from within and outside the committee.

In April 2002, a special workshop was organised for the purpose of getting comments from relevant experts, practitioners and stakeholders on the Programme specifications and draft

curriculum developed. The curriculum was then revised accordingly for submission to the academic authorities of the participating universities and eventually to the Department of Higher Education, Ministry of Education.

5. Participating Universities

The following eight participating universities have been involved in the curriculum development of the Programme. They are also keen to adopt the jointly developed curriculum and collaboratively offer the Programme based on this common curriculum. The participating universities are:

- Kolej Universiti Tun Hussein Onn (KUiTTHO)
- Universiti Kebangsaan Malaysia (UKM)
- Universiti Malaya (UM)
- Universiti Malaysia Sabah (UMS)
- Universiti Malaysia Sarawak (UNIMAS)
- Universiti Tenaga Nasional (UNITEN)
- Universiti Pertanian Malaysia (UPM)
- Universiti Teknologi Malaysia (UTM)

Table 1. Category of Market Sectors and Professional Opportunities

Planners, educators, researchers and communicators	<ul style="list-style-type: none"> • Limnologist • Watershed planner • Water resource planner • Water recreation planner • Teacher and lecturer • Researcher e.g. hydrologist, hydrogeologist, water pollution biologist, water quality analyst • Environmental interpreter/conservation educator • Technical writer
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<p>Water resource managers and specialists</p>	<ul style="list-style-type: none"> • Drainage and irrigation engineer • Environmental officer • Enforcement officer • Limnologist • Environmental and natural resource managers • Aquatic toxicologist • Water resource and environmental economist • Hydrogeologist • Hydrologist • Water quality inspector • Water resource risk analyst • River and coastal engineers • Civil engineer (dam, bridges etc) • Wastewater engineer • Water and wastewater treatment plant superintendent • Water resource rehabilitation specialist • Water resource modelling specialist • Water resource auditors • EIA consultant • Fishery resource manager • Aquaculturist • Aquatic toxicologist • River, lake, marine and wetland ecologist • Watershed and drainage managers • Water resource rehabilitation specialist • Water conservation consultant • Meteorologist
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6. Curriculum Structure

Through an exhaustive reference and consultation processes, a holistic IWRM Programme has been developed. The holistic feature of the Programme is reflected in the following curriculum elements:

- **Specialist subjects**, addressing the science and engineering principles of water resources, e.g. hydrology, hydraulics.
- **Experiential components**, providing hands-on exposure to real-life water resource related problems through field work and dissertation assignments.
- **Generic elements**, offering a collection of interdisciplinary courses relevant to water resources management, e.g. Land Use, Natural Resources and Integrated River Basin Management; and Human Dimension in Project Planning and Management.

The full list of identified courses for the Programme are given in Table 2 while the tentative scheduling by semester is shown in Table 3. The total number of credit hours is 40 and students will be required to pass all the 16 courses offered by the Programme.

Table 2. List of Courses for the IWRM Programme

Course Title	Credit Hours
1. Ecological Systems, Biodiversity and Env. Sensitive Areas	2
2. Landuse, Natural Resources and Integrated River Basin Mgt	3
3. Human Dimension in Project Planning and Management	2
4. Hydroinformatics	3
5. Hydrology for IWRM	2
6. IWRM Methodologies	2
7. Modelling in IWRM	2
8. Field Work	3
9. Sustainable Water Resource Utilization and Management	2
10. Environmental Management Instruments and Systems	3
11. Hydraulics for IWRM	2
12. Sustainable Urban Ecosystem	2
13. Water Resource Economics	2
14. Integrated Coastal Zone Management	2
15. Risk Analysis in Water Resources Management	1
16. Dissertation work	7

Table 3. Tentative Programme Schedule

Semester 1 (16 credits)		8. Field Work (3 credits)	Semester 2 (14 credits)		16. Dissertation (7 credits)
1.	Ecological Systems, Biodiversity and Env. Sensitive Areas (2 credits)		9.	Sustainable Water Resource Utilization and Management (2 credits)	
2.	Landuse, Natural Resources and Integrated River Basin Mgt (3 credits)		10.	Environmental Management Instruments and Systems (3 credits)	
3.	Human Dimension in Project Planning and Management (2 credits)		11.	Hydraulics for IWRM (2 credits)	
4.	Hydroinformatics (3 credits)		12.	Sustainable Urban Ecosystem (2 credit)	
5.	Hydrology for IWRM (2 credits)		13.	Water Resource Economics (2 credits)	
6.	IWRM Methodologies (2 credits)		14.	Integrated Coastal Zone Management (2 credits)	
7.	Modelling in IWRM (2 credits)		15.	Risk Analysis in Water Resources Management (1 credit)	

7. Study Duration and Mode of Offer

The Programme delivery is by coursework plus a dissertation. Depending on the number of students enrolled, the Programme can be offered through:

- full-time (average of 4 contact hours daily),
- flexi-time (e.g. 12 or more contact hours per weekend) or
- part-time (over 2 to 3 years).

Through the full time or flexi-time modes, the Programme can be completed in a period not exceeding 12 months or three 15-week semesters including 1 semester for dissertation work. The 12 months study period would comprise 9 months of coursework and 3 months of dissertation work.

8. Projection of Student Intake

Depending on the market demand, the projection of student intake during the first five years of Programme implementation will be as follows:

Year	2003	2004	2005	2006	2007
Enrolment	20	25	30	35	35
Graduated	-	20	25	30	35

9. Entry Requirement and Modus Operandi

9.1 Entry Qualification

Candidates applying to enroll in this Programme must have a good first degree in environmental or natural sciences, or in engineering from any institution of higher learning acknowledged by the Senates of the participating universities; or other qualifications which are equivalent to the first degree plus other qualifications or experience acknowledged by the said Senates. Special consideration shall be given to mid-carrier professionals.

Typically, candidates are expected to have obtained a CGPA of 2.75 and above, or CGPA of between 2.5 and 2.75 and not less than 3 years of working experience in the relevant fields, subject to the university Senate approval.

Eligible candidates shall be screened by the Joint Academic Board. Short listed candidates will then be requested to decide the university of their preference for carrying out the dissertation work, and thereon their applications will be formally processed and endorsed by the respective Boards of Post-graduate Studies and Senates of the university chosen.

9.2 Programme Management

It is proposed that the Programme be jointly managed by the participating academic institutions, HTC Kuala Lumpur, MyCapNet, AIT, IWMI and IHE. The other possible approach is by appointing the Malaysian Open University as implementer of the Programme.

10 Quality Assurance/Quality Control and Indicators of Success

The quality assurance of the proposed Programme shall be built into three operational mechanisms/approaches to be adopted in the implementation of IWRM masters Programme. These are:

- establishment of Programme-specific academic advisory panel and joint academic board whose duties include, *inter-alia* selection of adequately qualified students for enrolment, and planning and monitoring of academic curriculum, course delivery and quality assurance of the Programme;
- strict adherence to and meeting all the requirements of the participating universities' Post Graduate Studies Rules and Regulations in which quality assurance elements are intrinsically instituted;
- involvement of highly qualified and experienced/senior teaching staff sourced from among the participating universities, as well as others (external experts and practitioners) from local and international agencies and companies.

Indicators of success of the Programme would include:

- Number of graduating students
- Increase in enrolment
- Job market demand
- Annual/biennial reports
- Greater public awareness
- Effective and efficient management of water resources
- International recognition (international/regional student enrolment).

CONCLUDING REMARKS

MyCapNet a body entrusted to oversee and implement various capacity building programmes of which the Masters Degree described is its current focus. It is foreseen that a smaller module of courses will spring up from here. Such courses may take the form of a certificate level and even to incorporate water and related subjects into elementary and secondary school curricula. Undoubtedly education and increased awareness are paramount prerequisites to deal with water extremes and these can be achieved through an effective collaboration among the members of MyCapNet as well with other regional bodies. Apart from the Masters Degree Programme, two other programmes have been envisaged i.e. IWRM involving public organizations and the non governmental organizations both to tackle the training and awareness aspect respectively.

While operating mainly as a country network, MyCapNet is envisaged later to be part of the Southeast Asia regional network (currently under development) and would also be linked to the global CapNet and other similar regional or national networks.

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List of MyCapNet Members

No	Institution/ Agency	Name of Representatives
1	<i>MMS</i>	Mr Tan Lee Seng
2	<i>MACRES</i>	Mr Mansor Abd. Rahman
3	<i>UPM</i>	Assoc Prof Dr Mohd Amin Mohd Som
4	<i>UM</i>	(i) Ms Faridah Othman (ii) Assoc. Prof. Dr. Md. Ghazaly
5	<i>USM</i>	(i) Prof Dr Chan Ngai Wang (ii) Assoc. Prof Dr Wan Ruslan Ismail
6	<i>LESTARI</i>	Assoc. Prof Dr Mazlin Mokhtar
7	<i>DOE</i>	Ms Rahani Hussin
8	<i>UTM</i>	Assoc. Prof Dr Ahmad Khairi Abd. Wahab
9	<i>UM</i>	Assoc. Prof Nik Meriam Sulaiman
10	<i>UNIMAS</i>	Assoc. Prof Dr Murtedza Mohamed
11	<i>MINT</i>	Mr Md. Shahid Ayub
12	<i>ENSEARCH</i>	Dr Lee Jin
13	<i>WIAP</i>	Mr Murugadas T. Loganathan
14	<i>WWF</i>	Mr Marthan Lal Bangah
15	<i>DID</i>	Mr Ahmad Fuad Embi
16	<i>KUiTTHO</i>	Prof Dr Amir Hashim Mohd Kassim
17	<i>UNISEL</i>	Prof Ishak Abdul Rahman
18	<i>KUSTEM</i>	Assoc. Prof Ahmad Jusoh
19	<i>UPSI</i>	Prof Dr Abd. Hamid Abdullah
20	<i>UMCCED</i>	Dr O.P.Selvaraj
21	<i>UNITEM</i>	Prof Dr Ansary Ahmed

Note: *MMS* – Founder member

Appendix 2

Working Committee on M.Env.Sc. (IWRM) Curriculum

Name	Position
Dato' Ir Hj. Keizrul bin Abdullah	Chairman MyWP, Director General DID Malaysia (Advisor)
Dr Mohd Nor bin Mohd Desa	MyCapNet/Director HTC Kuala Lumpur (Chairman)
Prof Dr Murtedza Mohamed	Dean Faculty of Resources Science and Technology, UNIMAS (Technical Coordinator)
Mr Nishad M. Shaffy	HTC Kuala Lumpur (Secretary-October 2001-June 2002)
Mr Mohd Shahar Sharifuddin	HTC Kuala Lumpur (Secretary-July 2002-)
Dr Low Kwai Sim	GWP-SEATAC
Prof Dr Amir Hashim Mohd Kassim	Assistant Dean, Faculty of Engineering, KUiTTHO
Assoc. Prof Dr Ahamd Khairi Abdul Wahab	Head of Depart, Faculty of Civil Engineering, UTM
Prof Datin Dr Ann Anton	Director of Biotechnology Unit, UMS
Datin Zaharah Mahmud	ASPEC
Assoc. Prof Dr Mazlin Mokhtar	Director, Centre for Public and International Relation, UKM
Ms Lariyah Mohd Sidek	Lecturer, Department of Civil Engineering, Eng. College, UNITEN
Mr NazriJaafar	Lecturer, Department of Geography, UM
Ms Noriah Abu Bakar	MyCapNet HTC Kuala Lumpur
Mr Khairuddin Mohamed	MyCapNet HTC Kuala Lumpur