Masters | Graduate Diploma | Graduate Certificate

Integrated Water Management

Full-time and part-time/distance

CRICOS 096488K
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Program at a glance

Program overview

Program level: Postgraduate coursework

Program options: Masters, Graduate Diploma or Graduate Certificate

Institution coordinating the program: International WaterCentre (IWC)

University hosting the program: Griffith University (GU), Nathan Campus, Brisbane (Faculty of Engineering, Architecture & Information Technology)

Co-taught degree delivered by IWC founding member universities:
The program is enrolled through Griffith University and delivered at Griffith’s Nathan Campus by lecturers from International WaterCentre (IWC), from all founding member universities including Griffith, UQ, Monash and UWA, along with leading practitioners from private consulting and selected University partners internationally.

Students graduate with a Griffith University degree co-badged by the University of Queensland.

Delivery modes: full-time (internal, on-campus) or part-time (external, distance)

Start trimester: Trimester 1 intake (February) each year - no mid-year intake

Entry requirements

• A completed undergraduate degree in a related field of study from an internationally-recognised institution;

• English language skills as demonstrated by an officially recognised test of English language proficiency (see Griffith University’s specific requirements)

• Professional experience in a water related field is preferred but not essential to enrol in the program

Program outline

The program aims to build integrated water management professionals able to collaborate, create and deliver innovative approaches to complex water management challenges.

The program draws on the expertise of international leaders in teaching, research and practice across a wide breadth of disciplines, taking a transdisciplinary ‘whole-of-water-cycle’ approach that equips participants with practical tools and skills for developing and delivering effective water management solutions. Through this program you’ll develop effective leadership capacity as well as the strategic, managerial and technical skills you need to advance in the water sector.

Program participants learn to (a) use and integrate social and natural science with engineering skills and knowledge to diagnose water management problems from whole of watercycle and systems perspectives; (b) apply the principles and methods of integrated water management to achieve sustainable development outcomes; (c) provide leadership, managerial and technical input into the planning and implementation of water policies, projects, programs and infrastructure; (d) integrate relevant social, economic and environmental factors to more effectively plan and manage water management projects and programs, and; (e) collaborate and communicate for better cross-sectoral, transdisciplinary and multi-stakeholder outcomes. The program focuses on building the skills of participants in critical thinking, systems thinking and team work.

Teaching staff

The International WaterCentre adopts a collaborative teaching approach, bringing together lecturers from leading Australian universities, industry, government and NGOs. They are all highly regarded experts (academics and professionals) in a range of disciplines which combine biophysical sciences and socio-economic disciplines for sustainable water management outcomes.

About Griffith University

Griffith University is ranked in the top 3% of Universities worldwide and is Australia’s top University in terms of:

• Freshwater ecology research output (11th globally);

• Estuarine research output (top 30 globally):
  • Civil engineering (top 50-100);
  • Water resources research (top 50-100).

Griffith University is also home to the globally leading Australian Rivers Institute, Australia’s largest group of university-based scientists specialising in river, catchment and coastal research and education.
Program structure

Full-time

Domestic and international students come to Brisbane to study the program full-time (1.5 years). Exit points exist at the Graduate Certificate and Graduate Diploma levels. The program commences in trimester 1 (February) each year. Full-time students undertake four courses per trimester.

<table>
<thead>
<tr>
<th>Foundation courses</th>
<th>Year 1 Trimester 1</th>
<th>Graduate Certificate</th>
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<tbody>
<tr>
<td>New perspectives on project management</td>
<td>Science of water</td>
<td>PBL1 (Group) – Situation analysis and critique of an existing water management project or program</td>
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<tr>
<td>Science of water</td>
<td>Water, sustainability and development</td>
<td>PBL2 (Individual) – Design an integrated water management project</td>
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<td>Water, sustainability and development</td>
<td>Water governance and policy</td>
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**Integration courses & elective streams (choose one*)**

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<tr>
<td>Water supply, sanitation and hygiene (WASH)</td>
<td>Urban Futures: delivering water sensitive cities</td>
<td>Collaborative planning</td>
<td>PBL 3 (Individual) – Integrated catchment management: developing strategies for change</td>
</tr>
<tr>
<td>Community, livelihoods development and water (trimester 3 in Thailand)</td>
<td>Urban Metabolism: resource and energy recovery systems</td>
<td>Water, agricultural landscapes and food security (trimester 3 in Perth)</td>
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<tr>
<td><strong>PBL 1 (Group)</strong> – Situation analysis and critique of an existing water management project or program</td>
<td><strong>PBL 2 (Individual)</strong> – Design an integrated water management project</td>
<td><strong>PBL 4 (Individual)</strong> – Learning lessons from integrated water management in practice</td>
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*Choose your specialisation stream:

<table>
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<tr>
<th>Year 2 Trimester 1</th>
<th>Masters</th>
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<tr>
<td>Professional placement or research project (in Australia or overseas)</td>
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Program structure

Part-time/distance

Domestic students can study the program either full-time or part-time/distance (3 years). With the part-time option, they undertake two courses per trimester. At the beginning of each trimester, they join the full-time cohort for a short period of field trips and on-campus workshops. The rest of the courses are taught online, using the best principles of flexible delivery.

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<tr>
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<tr>
<td>Year 1 Trimester 1</td>
<td>New perspectives on project management</td>
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<td>Science of water</td>
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<td>Trimester 2</td>
<td>Catchment and aquatic ecosystem health</td>
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<td>First course of chosen stream*</td>
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<tr>
<th>Integration courses &amp; elective streams (choose one*)</th>
<th>Graduate Diploma</th>
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<tr>
<td>Year 2 Trimester 1</td>
<td>Water, sustainability and development</td>
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<td>Water governance and policy</td>
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<tr>
<td>Trimester 2</td>
<td>Economics for water resources management</td>
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<td>Second course of chosen stream*</td>
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<th>Final project</th>
<th>Masters</th>
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<tr>
<td>Year 2 Trimester 1</td>
<td>Professional placement or research project (in Australia or overseas)</td>
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<td>Trimester 2</td>
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*Choose your specialisation stream:

- **Stream 1: WASH and Development**
  - Community, livelihoods, development and water (trimester 3 in Thailand)
  - Water supply, sanitation and hygiene (WASH)

- **Stream 2: Urban Water**
  - Urban Futures: delivering water sensitive cities
  - Urban Metabolism: resource and energy recovery systems

- **Stream 3: Water, Land and People**
  - Water, Agricultural Landscapes and Food Security (trimester 3 in Perth)
  - Collaborative planning

Note: if you choose ‘WASH and Development’ or ‘Water, Land and People’ you will take the first course of your chosen stream as trimester 3. This means that the study load for trimester 2 will be reduced to 1 course (Catchment and aquatic ecosystem health).
Specialisation streams

At the end of trimester 1, students select one of three available specialisation streams.

1. WASH and development

This specialisation stream aims at developing skills for effective community engagement and sustainable development, as well as the technological knowledge needed to alleviate poverty and improve access to water and sanitation services in developing countries.

Participants learn to work with communities to establish effective and sustainable water and sanitation services and to improve lives and livelihoods. They gain the skills to develop and implement behaviour change strategies for improved hygiene, and to develop sustainable livelihood strategies for overcoming poverty. They learn about the strengths and weaknesses of alternative governance models for development. They also come to understand the financing mechanisms and institutional capacity required to ensure lasting impact.

Participants within this stream take two specialist courses:
- 7940ESC - Community, livelihoods, development and water (summer trimester in Thailand)
- 7941ESC - WASH: Water supply, sanitation and hygiene (WASH)

Graduates of this stream are well-equipped with the skills to join the many NGOs, governments, aid agencies and consultancies working to improve access to safe water and sanitation globally, and to alleviate poverty through empowerment and capacity building.

2. Urban water

This specialisation stream develops design, planning and engagement skills and prepares students to play a significant role in delivering 21st century urban sustainability.

Participants learn a range of conceptual frameworks and methods to better integrate water into urban planning and design, to improve aquatic ecosystem function in and around cities, to promote the use of a range of alternative water supplies, to manage water-related energy use, and to enhance the liveability of urban places. They gain skills in water sensitive urban design and resource efficient urban development to make our cities more resilient to climate change.

Participants within this stream take two specialist courses:
- 7950ESC - Urban futures: delivering water sensitive cities
- 7951ESC - Urban metabolism: resource and energy recovery systems

Both courses involve a range of classroom based learning and field trips around innovative and key infrastructure, urban development and building scale sites.

Graduates of this stream are well-equipped with the skills to work in government agencies, water utilities, urban development, landscape architecture and consultancies organisations.

3. Water, land and people

This specialisation stream develops the knowledge necessary to integrate assessment and planning of water resources with effective stakeholder engagement to enable change, promote sustainable water management and achieve water and food security at catchment scale and beyond.

Participants learn to characterise and assess the trade-offs involved in allocating increasingly scarce water resources across competing uses, including urban areas, agriculture, industry and the environment. They learn how to design, implement and evaluate strategic and collaborative planning skills to navigate the potential tensions between competing interests across agriculture, mining, industry, cities and the environment.

Participants within this stream take two specialist courses:
- 7960ESC - Water, Agricultural Landscapes and Food Security (in Perth)
- 7961ESC - Collaborative planning

Graduates of this stream are well-equipped with the skills to work in government, catchment planning agencies, not-for-profit organisations, agriculture, mining, water utilities and environmental regulators.
Field trips

Cost of field trips (including travel from campus, accommodation and meals) are included in tuition fees (except for Thailand and Perth where costs are only partially subsidised by the IWC).

Foundation trimester

- Three days on North Stradbroke Island
- One-day Brisbane River field trip
- Half-day field trip to an Advanced Wastewater Treatment Plant
- Half-day water sampling field trip (Griffith University, Brisbane)

Integration trimester

For all students

- Ten days in Cairns, Queensland, as part of the course ‘Catchment and aquatic ecosystem health.’ Students learn about how to measure, monitor and manage land-based, tourism and climate change impacts on the Great Barrier Reef.

For students who take the ‘WASH and development’ specialisation:

- Ten days in Thailand, as part of the summer-trimester course ‘Community, livelihoods development and water’
- 1 day of community environmental health assessment work on North Stradbroke Island

For students who take the ‘Urban water’ specialisation:

- The ‘Urban futures’ course includes four half-day field trips looking at aspects of urban waterways and water sensitive urban design
- The ‘Urban metabolism’ course includes three half-day visits to an advanced reclamation plant, a permaculture site and a range of houses in Brisbane with sustainable water, food and energy design features

For students who take the ‘Water, land and people’ specialisation:

- Seven days in Perth, as part of the summer-trimester course ‘Water and agricultural landscapes’

Final project experience

Participants design and undertake self-directed project work aimed at consolidating and applying concepts and methodologies learned in the Foundation, Integration and Specialisation trimesters. Scholarship and visa conditions permitting, projects can be undertaken in Australia or overseas. Visit IWC website for more details regarding the final project.

Water Leadership Masterclass

Participants are offered a one-day ‘Water Leadership Masterclass’ at the beginning of trimester 1. They are trained in transformational leadership, team leadership, power, influence tactics and social networking. They also meet and learn from inspiring professionals in the water sector, and work through a water leadership case study.

Problem-Based Learning (PBL) Projects

Problem-Based Learning (PBL) projects comprise roughly 50% of the assessment weight for both the Foundation and Integration trimesters.

Full-time students complete two PBL projects per trimester while part-time students complete one PBL per trimester.

Foundation trimester

- PBL1: Situation analysis and critique of an existing water management project or program (Group project)
- PBL2: Design a project proposal to address a real-world water management issue from an integrated water management perspective (Individual project)

Integration trimester

- PBL3: Integrated catchment management: developing strategies for change (Individual project)
- PBL4: Learning lessons from integrated water management in practice (Individual project)
7900ENV - New perspectives on project management

Foundation course

Course description
This course provides participants with an overview of issues relating to integrated water project management.

This foundation course’s aim is for participants to understand, critique and engage creative thinking in relation to project management and to learn the skills necessary to professionally design and manage water projects in international development and Australian contexts.

Key topics include: critical, creative and ethical approaches to project design and management; stakeholder and rights-holder identification and analysis; project management skills and tools; impact assessment; and the design of relevant monitoring and evaluation techniques.

Course introduction
Participants are equipped with the skills, tools and techniques necessary to manage a range of project activities. Participants learn the principles of project management through each stage of the project cycle. These include:

- Initial problem analysis, scoping and project design;
- Identification and inclusion of stakeholders and communities in the design and implementation of projects;
- Management of administrative, logistical and financial aspects of project implementation;
- Social, environmental and gender impact assessment processes;
- Ongoing monitoring and evaluation, and
- Grievance procedures.

Focusing on project management for the water sector, the course emphasises participatory project management and frameworks for cross-sectoral collaboration.

Course delivery

- **Full-time** (on-campus) students, including international students, are required to enrol in the internal offering in trimester 1. Trimester 1 begins with a three-day field trip to North Stradbroke Island.
- **Part-time** (external) students are required to attend a three-day field trip to North Stradbroke Island followed immediately by an intensive three-day block of classes (9am-5pm). The remainder of the course is taught externally online.

Assumed background
This course is one of four foundation courses for the Master of Integrated Water Management. Participants are expected to have the requisite undergraduate and/or workplace knowledge to enable them to conduct postgraduate study.

Learning objectives

After successfully completing this course participants are able to:

- Understand the project management cycle and use it in specific project activities
- Apply the essential tools of project management relating to project planning and resourcing
- Identify the elements required in project design
- Define a project’s scope using a range of participatory and analytical tools
- Develop a project logical framework and critically analyse the logical framework approach
- Recognise the need and plan for social, environmental, and gender impact assessments in project design and rollout
- Participate in and lead a project team
- Understand and apply monitoring and evaluation in the project cycle
- Demonstrate the use of personal reflection and social learning to improve their own ability, and their ability as part of a team, to analyse and explore integrated solutions to practical water planning and management problems exemplified in case studies presented in this course
- Show how relevant theories, integration tools and decision support systems presented in this course can inform the research and analysis of case studies and help to identify practical, integrated solutions to water planning and management problems.
Teaching staff

Lead Lecturer: Dr Helen Johnson (University of Sassari, Italy)
Lecturer: Mr Peter Wegener (International WaterCentre)

Problem-Based Learning (PBL) projects

PBL projects and field trips run through the trimester, comprising roughly 50% of the assessment weight. These enable participants to develop skills that complement the content delivered in the four Foundation courses.

Full-time students complete two PBL projects per trimester while part-time students complete one PBL per trimester:

- **PBL1:** Situation analysis and critique of an existing water management project or program (*Group project*)
- **PBL2:** Design of a project proposal to address a real-world water management issue from an integrated water management perspective (*Individual project*)

A significant amount of project time is spent exploring the case study material with respect to the topic content of the ‘New perspectives on project management’ course. Participants are able to apply project management tools to their group project tasks. They consider the design, planning, management, monitoring and evaluation of the water projects presented in the case studies. As their skills and knowledge progress, participants are asked to undertake the comprehensive design of a water project situated in a designated case study catchment. In addition to generic project management skills such as the use of the logical framework approach participants apply particular tools, for example the household survey, risk analysis framework and tools for stakeholder analysis. Linking with material taught in the other courses, participants consider how management actions are affected by the social and policy context, as well as the bio-physical characteristics of the case study catchments.

Field trips

Participants begin the Foundation trimester with a three-day field trip to North Stradbroke Island. The cost of the trip (including transport from Brisbane, accommodation and meals) is included in the tuition fees.

For a complete list of field trips that participants undertake during the Foundation trimester, please refer back to “Field trips” on page 6 of this syllabus.

“When we graduate we will be one of the new ‘breeds’ of water managers who are able to interact with professionals from a number of disciplines – from engineering to community development. This is a skill that is desperately needed if we are to effectively manage water in Australia and globally.”

– Masters student
7901ENV - Science of water

Foundation course

Course description
This course introduces participants to some of the fundamental science which underpins the understanding of the whole of catchment water cycle, including aspects of water quality and water treatment for human consumption. The course introduces the physical, chemical and biological properties of water (physical and chemical), microbial and biogeochemical processes as well as concepts relating to the natural hydrological cycle and groundwater systems. The course also addresses the human uses of water including water quality and water treatment and highlights the dynamic relationship between human and natural aquatic systems.

Key issues include: concepts and practice of integrated water resource management; principles of water science; and, whole-of-water-cycle approaches.

Course introduction
This course covers key knowledge that is critical for a rigorous understanding of integrated water management problems. There is an emphasis on the physical, chemical and biological aspects of water and how an understanding of these disciplines is necessary when developing whole-of-water-cycle and adaptive management approaches to ensure the sustainable use of water. Participants will be exposed to both the theoretical and practical components of the course content (case study material, etc). The course content will also be reflected against material presented through case-study exploration.

Course delivery
- Full-time (on-campus) students, including international students, are required to enrol in the internal offering in trimester 1. Trimester 1 begins with a three-day field trip to North Stradbroke Island. Full-time students also participate in a one-day field trip on the Brisbane River from the catchment to the coast. Other field trips include a visit to a wastewater treatment plant, and a water sampling day at Griffith University.

- Part-time (external) students are required to attend a three-day field trip to North Stradbroke Island followed immediately by an intensive three-day block of classes (9am-5pm). The remainder of the course is taught externally on-line.

Assumed background
This is a postgraduate course in general water science offered as part of the IWC Master of Integrated Water Management. Participants are expected to have basic background knowledge through undergraduate science or engineering programs. For this particular course, it is assumed that participants have a basic understanding of chemical equations and stoichiometry.

Learning objectives
After successfully completing this course participants are able to:

- Describe the physical and chemical properties of water. These are the basic properties of water that underpin its role in the environment, and contribute to an understanding of water quality and water treatment for human consumption;

- Describe the processes that affect these physical and chemical properties with respect to water quality. This includes human influences in the environment, such as increased nutrient and organic loads on waterways, land use changes, hydrological changes and urbanisation;

- Analyse, interpret and write about water quality data. Analyse given water quality data using correct analysis methods and statistics; present water quality data using correct tables and figures; interpret the outcomes of this analysis; write a meaningful report about the data and its implications for water quality, ecosystem health, or human use;

- Describe basic hydrology of catchments, and physical processes within catchments. An understanding of basic catchment hydrology is important in understanding water quality, linkages between the terrestrial and aquatic environment, the influence of land-use change on aquatic systems, reservoir function and water treatment needs and environmental flows;

- Describe basic ecological processes in aquatic systems and measure key water quality and biologic indicators for ecological health in an aquatic system. In understanding the whole of catchment water cycle it is important to also have an understanding of the functioning of natural aquatic systems and the trajectories of change imposed on these systems by human development and modification. Monitoring and assessing the health of aquatic systems is an integral part of water resource management;

"I am a very practical person. I love the hands-on approach that the Masters Program has offered us in the teaching and learning process."

— Masters participant

www.watercentre.org/education
• Understand the principles of water storage and treatment. Most of the world’s freshwater systems have been modified for human use with water storage for human consumption a major use. Understanding the principles of water storage and its subsequent treatment for human use is a major component of integrated water management, particularly with respect to sustainable water use;

• Be aware of larger issues of water security, such as climate change. In the current context of climate change it is important to understand issues relating to water security. Climate change models can be used to assess water supply changes and also model changes in water quality;

• Have improved (1) their ability to manage their own study and (2) their ability to work effectively in an engineering team, and should particularly be able to:
  - reflect on own learning and improve study approaches on basis of this learning;
  - work in a team to solve a large complex problem and communicate the solution effectively;
  - identify and overcome issues/problems in a team to make the team result better than the sum of the individuals;
  - have participated in an integrated group project exploring detailed aspects of integrated water management.

Teaching staff

Lead Lecturer: Dr Wade Hadwen (School of Environment and Australian Rivers Institute, Griffith University)

Lecturer: Dr Steven Pratt (School of Chemical Engineering, The University of Queensland)

Problem-Based Learning (PBL) projects

PBL projects and field trips run through the trimester, comprising roughly 50% of the assessment weight. These enable students to develop skills that complement the content delivered in the four Foundation courses.

Full-time students complete two PBL projects per trimester while part-time students complete one PBL per trimester:

• PBL1: Situation analysis and critique of an existing water management project or program (Group project)

• PBL2: Design of a project proposal to address a real-world water management issue from an integrated water management perspective (Individual project)

Field trips

Students begin the Foundation trimester with a three-day field trip to North Stradbroke Island. The cost of the trip (including transport from Brisbane, accommodation and meals) is included in the tuition fees.

As part of this course (Science of water) students also participate in the following activities:

• One-day trip on the Brisbane River

• Half-day field trip to an Advanced Wastewater Treatment Plant (Queensland)

• Half-day water sampling field trip (Griffith University, Nathan Campus, Brisbane)

For a complete list of field trips that students undertake during the program, please refer back to "Field trips" on page 6 of this syllabus.
Course description

This course introduces students to the current theory and practice of international development and poverty reduction, and its application to Integrated Water Management (IWM) in developing contexts. The course also presents some critical perspectives and current debates in the development field towards improved conceptualisation and practice of IWM. Issues such as poverty, livelihoods, power and participation, gender, and collaboration are analysed and explored in terms of their contributions to sustainable development. We also explore emerging frameworks such as adaptive practice and collective impact. Although the focus is on rural development in both international and Indigenous development settings, the skills and theory taught in this course can also be applied to more urban and developed contexts involving sustainability and communities.

Course delivery

- **Full-time** (on-campus) students, including international students, are required to enrol in the internal offering in trimester 1. Trimester 1 begins with a three-day field trip to North Stradbroke Island.
- **Part-time** (external) students are required to enrol in this course in trimester 3. They are required to attend a six-day intensive workshop at the beginning of the trimester, where two and a half days of the course are taught face-to-face and the remainder is taught externally online.

Assumed background

This is a postgraduate course in general water science offered as part of the IWC Master of Integrated Water Management. Participants are expected to have basic background knowledge through undergraduate science or engineering programs, however this is not essential.

Learning objectives

On completing this course participants are able to apply a range of analytical and critical perspectives on water and sustainable development in developing countries, and understand and be able to implement a range of methods for community participation.

After successfully completing this course participants are able to:

- Explain the theoretical underpinnings and key principles of sustainable development and its application to water resource management.
- Employ a range of analytical frameworks to understand different contexts, including a critical appreciation of the links between poverty, gender, power and capability.
- Build governance capability in community-based organisations and broker complex collaborations across a range of stakeholders in different institutional positions.
- Utilise a range of methods for facilitating community participation and stakeholder collaboration, including community planning, mobilisation, networking, advocacy and conflict management.
- Critically analyse and respond innovatively to sustainable development challenges in different water resource contexts.
- Plan and facilitate a participatory workshop on IWM and community participation.
Teaching staff

Lead Lecturer: Mr Akhter Hamid

Problem-Based Learning (PBL) projects

PBL projects and field trips run through the trimester, comprising roughly 50% of the assessment weight. These enable participants to develop skills that complement the content delivered in the four Foundation courses.

Full-time students complete two PBL projects per trimester while part-time students complete one PBL per trimester:

- **PBL1:** Situation analysis and critique of an existing water management project or program *(Group project)*
- **PBL2:** Design of a project proposal to address a real-world water management issue from an integrated water management perspective *(Individual project)*

A significant amount of project time is spent exploring the case study material with respect to the topic content of the 'Water, sustainability and development' course. Participants are provided with an introduction to the case study river-basin catchments from the sustainable development perspective.

Field trips

Participants begin the Foundation trimester with a three-day field trip to North Stradbroke Island. The cost of the trip (including transport from Brisbane, accommodation and meals) is included in the tuition fees.

For a complete list of field trips that participants undertake during the Foundation trimester, please refer back to "Field trips" on page 6 of this syllabus.

Florent Vetillart – France

When I go back to Europe, I want to apply my new understanding of the multi-dimensional nature of water challenges to the human and environmental crises that water issues are shaping.
Course description

In this Foundation course, participants are introduced to governance frameworks at the global/international, national, regional/basin, transboundary and local levels. Across five components of the course, participants consider current themes influencing water governance and policy including that of sustainable development, collaborative management, water rights and access, and equity for marginal groups. Water planning as a key governance mechanism at regional and basin levels form one of the components, with comparisons drawn between Australia and other countries.

Course introduction

Water governance refers to the range of legal, policy and administrative arrangements in place to: develop, allocate and manage water resources and deliver water services at different levels of society. Understanding governance requires awareness of the historical, cultural and socio-political contexts in which it operates, and of the complexities of multi-level, multi-institutional processes and methods. This course provides an introduction to the basic elements of good water governance in developed countries and those seeking industrialisation and sustainable development. Throughout the course, participants are encouraged to develop an interdisciplinary perspective.

Course delivery

• **Full-time** (on-campus) students, including international students, are required to enrol in the internal offering in trimester 1. Trimester 1 begins with a three day field trip to North Stradbroke Island.

• **Part-time** (external) students are required to enrol in this course in trimester 3. They are required to attend a six-day intensive workshop in Brisbane, at the beginning of the trimester, where two days of the course are taught face-to-face and the remainder of the course is taught externally on-line.

Assumed background

This is a postgraduate course in general water science offered as part of the IWC Master of Integrated Water Management. Participants are expected to have basic background knowledge through undergraduate science or engineering programs, however this is not essential.

Learning objectives

After successfully completing this course participants are able to:

- Grasp the concepts underpinning water governance initiatives at different scales i.e. global/international, national, regional/catchment, and local levels
- Acquire an interdisciplinary perspective to governance, policies and practices related to integrated water management in developing and developed country contexts
- Be aware of water planning as a key governance mechanism in developed and developing country contexts
- Discuss, critique and evaluate transboundary governance arrangements, particularly how they implement international norms for sharing water and their methods of resolving conflict
- Communicate an understanding of basic governance policies and challenges as identified above in a systematic and contextually appropriate way, either orally or in written form or through multimedia, with attention to the diverse needs of governments, the private sector and civil society
- Undertake individual research on governance issues, critically evaluate materials accessed from a variety of standpoints and communicate essential points of such materials in an accurate, engaging and contextually appropriate way
- Demonstrate the use of personal reflection to improve their own ability, and their ability as part of a team, to analyse, explore and evaluate governance initiatives to practical water planning and management problems exemplified in case studies presented in this course
- Show, through the associated project work component, how relevant theories, integration tools and decision support systems presented in this course can inform the analysis of case studies and help to identify practical, integrated solutions to water planning and management problems.
Teaching staff

Lead Lecturer: Prof Poh-Ling Tan (Griffith Law School, Griffith University)

Problem-Based Learning (PBL) projects

PBL projects run throughout the trimester, comprising roughly 50% of the assessment weight. These enable participants to develop skills that complement the content delivered in the four Foundation courses.

Full-time students complete two PBL projects per trimester while part-time students complete one PBL per trimester:

- **PBL1**: Situation analysis and critique of an existing water management project or program (Group project)
- **PBL2**: Design of a project proposal to address a real-world water management issue from an integrated water management perspective (Individual project)

A significant amount of project time is spent exploring the case study material with respect to the topic content of the Water governance and policy course. Participants are provided with an introduction to the case study catchments from the governance and policy perspective. They examine governance initiatives in the different catchments, including relevant policy and legislative documents. Participants are asked to critically evaluate governance arrangements in the case study catchments based on good governance principles. Participants take a comparative approach to analysing case study catchments which allows them to consider the case studies against other catchments explored in lecture and workshop sessions. Participants consider the policy implications of different management actions, and also look at governance and policy issues as they sit within the broader ‘sustainability and development’ discourse.

Field trips

Participants begin the Foundation trimester with a three-day field trip to North Stradbroke Island. The cost of the trip (including transport from Brisbane, accommodation and meals) is included in the tuition fees.

For a complete list of field trips that participants undertake during the Foundation trimester, please refer back to “Field trips” on page 6 of this syllabus.

Photos: students on a field trip to Maroochy Catchment and North Stradbroke Island.
7920ENV - Catchment and aquatic ecosystem health
Integration course

Course description
This course provides participants with an in-depth understanding of the issues and challenges relating to the sustainable management of aquatic ecosystems. The study of aquatic ecosystem health is a relatively new field that brings together biophysical understandings of how natural systems function with societal goals and human values. A major challenge for society is to satisfy the growing demands for water without degrading aquatic ecosystems and the ecological goods and services they provide. The course focuses on three key components:

• An understanding of hydrological regimes and the basic principles relating to hydrology to aquatic ecosystems and the condition of aquatic environments.

• Theory and methodology behind the assessment of aquatic ecosystem health, including the development and validation of cost-effective techniques for the ecological assessment of river health.

• Principles and practical tools for implementing riparian restoration projects across a range of aquatic ecosystems.

Course introduction
The aim of this course is to take a whole-of-water-cycle approach to ecosystem health and catchment management. Participants gain an understanding of catchment management including hydrology, riparian restoration and ecosystem health through the lens of a real-world case study in Cairns. Throughout the course there is an emphasis on the whole-of-water-cycle and adaptive management approaches. Participants are exposed to both the theoretical and practical components of the course content, they participate in a field trip which includes a hands-on discussion of management issues with stakeholders, along with the measurement of ecosystem health and an exploration of the outcomes of management actions like riparian restoration.

Course delivery
• Full-time (on-campus) students, including international students, are required to enrol in the internal offering in trimester 2. The majority of this course takes place during an intensive 10-day field trip to Cairns, Queensland at the beginning of trimester 2.

• Part-time (external) students are required to enrol in this course in trimester 2. They are also required to attend the 10-day field trip to Cairns, Queensland where the majority of this course is delivered.

Assumed background
The following courses are pre-requisites for this course: ‘New perspectives on project management’ and ‘Science of water’.

Learning objectives
After successfully completing this course participants are able to:

• Describe basic hydrology of catchments, and physical processes within catchments. An understanding of basic catchment hydrology is important in understanding water quality, linkages between the terrestrial and aquatic environment, the influence of land-use change on aquatic systems, reservoir function and water treatment needs and environmental flows;

• Have a basic understanding of the concepts and practices of ecosystem health;

• Have an improved understanding of stakeholder concerns in a complex, real-world setting, including understanding different perspectives and attaining balance in decision-making;

• Understand the concepts behind riparian restoration in relation to whole of catchment management;

• Have improved (1) their ability to manage their own study and (2) their ability to work effectively in teams including the ability of the student to: reflect on own learning and improve study approaches on the basis of this learning; work in a team to solve a large complex problem and communicate the solution effectively; and identify and overcome issues/problems in a team to make the team result better than the sum of the individuals;
• Participate successfully in an integrated group project exploring detailed aspects of integrated water management;
• Participate successfully in an individual project that integrates the knowledge obtained from the core classes;
• Demonstrate the use of personal reflection and social learning to improve their own ability, and their ability as part of a team, to analyse and explore integrated solutions to practical water planning and management problems exemplified in case studies presented in this course;
• Show how relevant theories, integration tools and decision support systems presented in this course can inform the analysis of case studies and help to identify practical, integrated solutions to water planning and management problems.

**Teaching staff**

**Lead Lecturer:** Dr Wade Hadwen (Australian Rivers Institute, Griffith University)

**Problem-Based Learning (PBL) projects**

The majority of this course takes place during an intensive 10-day field trip to Cairns, Queensland at the beginning of trimester 2.

Parallel PBL projects and field trips run through the trimester, comprising roughly 50% of the assessment weight. Full-time students complete two PBL projects per trimester, while part-time students complete one PBL per trimester.

PBL projects for the Integration trimester comprise:

- **PBL3:** Integrated catchment management – developing strategies for change (Individual project)
- **PBL4:** Learning lessons from integrated water management in practice (Individual project)

**Field trips**

Participants begin the Integration trimester with a 10-day field trip to Cairns, Queensland. The cost of the trip is covered in course fees.

For a complete list of field trips that participants undertake during the Integration trimester, please refer back to “Field trips” on page 6 of this syllabus.
Course description
This course has twin aims. Firstly, it aims to introduce participants to some of the goals, objectives and principles of water planning and second, to water resource economics and economic concepts pertinent to water management and planning. It explores principles of water planning and current issues, using Australia as a learning model with references to different social and economic contexts. Participants are introduced to economic and social impact analyses which are key aspects of water planning and management. There is an emphasis on foundational concepts and methodologies. Risk assessment including adaptation for climate change impact is examined. As one of the outcomes of plans is security for consumptive water users, this is discussed in the context of Australia and contrasted with developing countries. Environmental allocations are also discussed. Thus participants are encouraged to develop awareness of the need to integrate economic, social, legal and environmental perspectives in planning against a background of uncertainty and change.

Course introduction
This course provides an introduction to the inter-related areas of water resources planning and economics. It introduces participants to the goals, objectives and principles of water planning and the challenges of integrating social, economic and environmental perspectives in water planning. The course provides a broad introduction to water resource economics and participants gain familiarity with economic concepts pertinent to water management and planning.

Course delivery
- **Full-time** (on-campus) students, including international students, are required to enrol in the internal offering in trimester 2.
- **Part-time** (external) students are required to enrol in this course in trimester 1. Three days of the trimester 1 intensive workshop is held at the beginning of the trimester will focus on this course. The remainder of the course is taught externally on-line.

Assumed background
The following courses are pre-requisites for this course: ‘New perspectives on project management’, ‘Science of water’, ‘Water, sustainability and development’, Water governance and policy’.

Learning objectives
After successfully completing this course participants are able to:
- Develop a sound understanding of the key principles and issues relating to water planning and economics in developing and developed country contexts
- In relation to water planning, have a basic understanding of social and cultural values in water and how to identify these values, and incorporate them in social impact assessments
- Understand how economic principles can inform planning and allocation of water resources
- Discuss ecosystem services and economic values of water, and the different methodologies used to identify these values
- Apply principles of risk assessment in relation to water planning
- Have a basic understanding of water entitlements in developed and developing countries and the extent that they provide security for users and protect ecosystem health
- Apply the essential elements of water resource planning and economics in developed and developing countries in appropriate oral and written formats
- Show how relevant theories and assessments presented in this course can inform the analysis of case studies and help to identify practical, integrated solutions to problems of water planning and management
- Participate successfully in an integrated group project exploring detailed aspects of integrated water management.
Kristal Burry – Australia
The exciting thing about integrated water management is the new breed of water managers it is creating, who can interact with professionals from a number of disciplines. That’s a skill which is desperately needed to manage water effectively.

Teaching staff

Lead Lecturer: Dr Jim Smart (School of Environment, Griffith University)
Lecturer: Dr Syezlin Hasan (Australian Rivers Institute, Griffith University)

Problem-Based Learning (PBL) projects

Parallel PBL projects and field trips run through the trimester, comprising roughly 50% of the assessment weight. Full-time students complete two PBL projects per trimester, while part-time students complete one PBL per trimester.

PBL projects for the Integration trimester comprise:

- PBL3: Integrated catchment management – developing strategies for change (Individual project)
- PBL4: Learning lessons from integrated water management in practice (Individual project)

Field trips

Participants begin the Integration trimester with a 10-day field trip to Cairns, Queensland. The cost of the trip is covered in course fees.

For a complete list of field trips that participants undertake during the Integration trimester, please refer back to “Field trips” on page 6 of this syllabus.
7940ESC - Community, livelihoods, development and water
Integration course (Specialisation stream #1: WASH and development)

Course description
This specialist course is part of the ‘WASH and development’ stream and led by Ubon University’s Dr Kanokwan Manoram. It is delivered as a ten-day field trip in Thailand.

Participants spend time at a remote village on the Mun River in Northeast Thailand. They learn about how local livelihoods are bound up with water and the river. They learn firsthand about water resources development, environmental change and social conflict, and discuss these issues with community members, NGO workers and government officers.

Participants live with local families and experience the realities of water in village life, learning about how it relates to culture, livelihoods and health, and how the construction and operation of the nearby Pak Mun Dam is leading to profound changes to lives and livelihoods.

This field trip is partially subsidised by IWC.

Course introduction
This course explores water, energy and development issues from the perspective of rural villagers living along the Mun River in Northeast Thailand, as well as from multiple stakeholders including government, academics and state enterprises.

The course introduces participants to some of the current issues in water and development through a 10-day field trip to a rural community and community-based organisation (CBO) in the Mekong region. Participants travel to rural village communities in Khong Jiam in Northeast Thailand, where the Mun River meets the Mekong.

Participants are hosted by the CBO Villagers’ Committee for the Rehabilitation of Life and Livelihood on the Mun River and local villages along the river. This CBO has become well known in Thailand and around the world for its activities and campaigns against the human and ecological impacts of the Pak Mun Dam, constructed on the Mun River in 1994. It also played a leading role in the Assembly of the Poor, the first nation-wide grassroots movement to emerge in Thailand.

The Villagers’ Committee represents about 2,000 families from 50 villages along the lower Mun River and has very useful facilities at its headquarters, including offices and seminar rooms, a museum and meeting hall, an agricultural cooperative and community radio. Participants learn from ordinary villagers, CBO leaders and NGO advisors about their experiences of mobilising people and resources, establishing and managing a highly effective community-based organisation, networking and campaigning to defend the sustainability of river ecology and local people’s livelihoods.
While in Khong Jiam participants are accommodated in ‘homestays’ with village families to gain an insight into their day-to-day lives and their perspectives on water, local livelihoods, water resources development and community development.

During the field trip, participants learn about village water supply systems in the past and present, the role of water in local rice cultivation, villagers’ relationships with the Mun River and fishing ecology and the cultural meanings of rivers and waterways. They learn some local skills from villagers such as rice harvesting, fish net and trap making, and helping their homestay hosts prepare a local meal and other household tasks.

They also learn from villagers through dialogue and discussion, participatory research methods such as PRA, visits to the river, the Pak Mun Dam, village walks, and learning by doing with villagers. They explore the sustainable livelihoods approach and asset-based community development, and critically examine the roles of the state and NGOs to develop a critical understanding of local responses to dam development, environmental, economic and cultural change.

Finally, participants link the local experience of the Mun River communities with development issues across the whole Mekong Region, and consider how local lessons about water and development can be related to development issues across the Mekong.

Assumed background

The following courses are pre-requisites for this course: ‘New perspectives on project management’, ‘Science of water’, ‘Water, sustainability and development’, ‘Water governance and policy’.

Learning objectives

After successfully completing this course participants are able to:

- Explain the relationships between water, local livelihoods, development and socioeconomic change in a lower Mekong community;
- Employ a range of qualitative and participatory methods for Rapid Rural Appraisal of water, livelihoods and development, and water security;
- Analyse the environmental, social and economic impacts of a large dam, and relate the field case study to broader issues in the lower Mekong region;
- Analyse and explain lessons learned from local processes of community organising and community development;
- Participate successfully in an integrated group project exploring detailed aspects of water sustainability at the community level;
- Demonstrate the use of personal reflection and social learning to improve their ability, individually and as part of a team, to analyse and explore integrated solutions to practical water planning and management problems exemplified in case studies presented in this course.

Teaching staff

Lecturer: Assoc. Prof. Kanokwan Manorom (Director of the Mekong Sub-Region Social Research Centre at Ubon Ratchathani University)

Problem-Based Learning (PBL) projects

Parallel PBL projects and field trips run through the trimester, comprising roughly 50% of the assessment weight. Full-time students complete two PBL projects per trimester, while part-time students complete one PBL per trimester.

PBL projects for the Integration trimester comprise:

- **PBL3**: Integrated catchment management – developing strategies for change (Individual project)
- **PBL4**: Learning lessons from integrated water management in practice (Individual project)
Course description

This specialist course is part of the ‘WASH and development’ stream and provides participants with an understanding of social, environmental, financial and technical principles and approaches to meeting the water supply, sanitation and hygiene needs of people in impoverished communities. These principles and approaches apply to impoverished people and communities in developing and emerging economic country contexts.

Key topics of the course include: understanding the environmental health and wellbeing basis for work in this sector; understanding WASH inequalities and principles for WASH development; key principles, approaches and technologies for sanitation in different settings (urban, rural, informal settlements, schools), including the social dimensions of participation, shifting behaviours and management; principles and approaches to water supply including access, water quality, quantity, affordability, local management and sustainability, and hygiene promotion and behaviour change in different settings.

Course introduction

This course provides participants with an understanding of technical engineering and socio-economic principles and tools for designing and operating domestic water supply and sanitation systems that are sustainable, appropriate and affordable for poor communities in developing countries.

Course delivery

- Full-time (on-campus) students, including international students, are required to enrol in the internal offering in trimester 2.
- Part-time (external) students are required to enrol in this course in trimester 1 or trimester 2. These trimesters begin with an intensive face-to-face session and field trip and the remainder of the course is taught externally on-line.
Assumed background

The following courses are pre-requisites for this course: ‘New perspectives on project management’, ‘Science of water’, ‘Water, sustainability and development’, ‘Water governance and policy’.

Learning objectives

After successfully completing this course participants are able to:

- Demonstrate understanding of the wide range of health and wellbeing issues related to water, sanitation and hygiene, how WASH diseases are transmitted and can be prevented through improvements in the use of sanitation, hygiene and water systems;
- Explain the inequalities that presently exist in access and use of WASH, and the political, socio-economic and technical principles underlying the development of appropriate, sustainable water supply and sanitation services in low-income contexts;
- Demonstrate understanding of the elements of sanitation service chains, including systems for sanitation collection, storage, treatment and disposal of human waste, both on-site and off-site, their function, design and modes of operation, and suitability in different settings (urban, informal, rural and schools);
- Discuss the need for and fundamental principles involved in establishing a hygiene behaviour change program alongside other components of WASH improvements;
- Explain the principles involved in designing simple water supply systems which aim to provide sustainable and safe water for health and wellbeing outcomes;
- Show knowledge of the range of suitable technologies and management approaches for domestic water supply in low- and middle-income countries, considering risk management and resilience for disasters;
- Show knowledge of the range of suitable technologies and management approaches for domestic water supply in low- and middle-income countries, considering risk management and resilience for disasters;
- Show how relevant theories, integration tools and approaches presented in this course can inform the analysis of case studies and help to identify practical, integrated solutions to water planning and management problems.

Teaching staff

Lead Lecturer: Dr Regina Souter, International WaterCentre
Lecturer: Mr Ben Fawcett (Advanced Water Management Centre, The University of Queensland), Dr Cara Beal (Cities Research Institute, Griffith University).

Problem-Based Learning (PBL) projects

Parallel PBL projects and field trips run through the trimester, comprising roughly 50% of the assessment weight. Full-time students complete two PBL projects per trimester, while part-time students complete one PBL per trimester.

PBL projects for the Integration trimester comprise:

- PBL3: Integrated catchment management – developing strategies for change (Individual project)
- PBL4: Learning lessons from integrated water management in practice (Individual project)

Field trips

As part of this course (Water supply, sanitation and hygiene), full-time participants undertake a two day field experience in well digging, emergency water tank construction, concrete sanitation platform construction and water quality testing (Pinjarra Hills, Queensland).

For a complete list of field trips that participants undertake during the program, please refer back to “Field trips” on page 6 of this syllabus.
Course introduction

Challenges confronting cities and towns around the world include climate change, population growth, demographic shifts, ecosystem degradation, resource limitations and evolving societal expectations. These challenges have implications for almost every aspect of water in our urban environments and it is now widely recognised that traditional water systems, based on large-scale centralised infrastructure, are no longer capable of meeting all societal needs related to urban water. In this context, governments, practitioners and scientists are exploring new approaches for the planning, design and management of urban water systems. The concept of a Water Sensitive City has emerged in science, policy and practice in response in Australia and beyond.

While there is not yet an example of a Water Sensitive City in the world, the concept is being explored and deepened through research and industry experience. The Cooperative Research Centre (CRC) for Water Sensitive Cities provides a fundamental platform for these activities. This course brings together insights from the CRC program to enable the adoption of water sensitive planning and design principles in support of cities making the transition towards liveable, sustainable, productive and resilient water futures.

Course developed in collaboration with the Cooperative Research Centre (CRC) for Water Sensitive Cities:
Course aims

This course envisions and explores a new paradigm for how the hydrological cycle interacts with the urban landscape to support liveable, sustainable, productive and resilient cities. This course aims to provide participants with an interdisciplinary understanding of the interplay between society, technology and urban design to ensure water security, water resource efficiency, waterway health, flood mitigation, public health and amenity. Participants will critically engage with the underlying principles of a Water Sensitive City and examine socio-technical pathways for facilitating its delivery.

Course delivery

- **Full-time** (on-campus) students, including international students, are required to enrol in the internal offering in trimester 2.
- **Part-time** (external) students are required to enrol in this course in trimester 2. There is no face-to-face part-time intensive for this course and all course content will be delivered via regular on-line sessions throughout the trimester.

Assumed background

The following courses are pre-requisites for this course: ‘New perspectives on project management’, ‘Science of water’, ‘Water, sustainability and development’, ‘Water governance and policy’.

Learning objectives

After successfully completing this course participants are able to:

- Understand current problems and future drivers for hydrological cycle management in cities and appreciate the new water sensitive paradigm;
- Unpack the foundations of and interconnections between key elements of a water sensitive city;
- Identify and select water technologies and water quality standards for fit-for-purpose water production;
- Understand the potential and limitations of green infrastructure in a water sensitive city;
- Identify and select water sensitive elements that best fit local biophysical contextual conditions;
- Demonstrate knowledge on how urban configuration can influence the climate resilience of cities;
- Apply water sensitive urban planning and design principles to enhance cities’ ecosystem services;
- Apply frameworks to characterise actors and institutions and understand constraints and opportunities for institutional change;
- Understand how socio-technical system change can be facilitated through different forms of governance;
- Identify and select socio-technical strategies for influencing transition pathways towards a water sensitive city.

Teaching staff

**Lead Lecturers:** Dr Annette Bos (Monash University); David Robertson (Monash University)

**Guest Lecturers:** Prof Tony Wong (CRC for Water Sensitive Cities); Prof Ana Deletic (University of New South Wales); Assoc Prof David McCarthy (Monash University); Dr Peter Breen (CRC for Water Sensitive Cities & E2DESIGNLAB); Prof Rebekah Brown (Monash University).

Problem-Based Learning (PBL) projects

Parallel PBL projects and field trips run through the trimester, comprising roughly 50% of the assessment weight. Full-time students complete two PBL projects per trimester, while part-time students complete one PBL per trimester.

PBL projects for the Integration trimester comprise:

- **PBL3:** Integrated catchment management – developing strategies for change (Individual project)
- **PBL4:** Learning lessons from integrated water management in practice (Individual project)

Field trips

As part of this course, students undertake four half-day field trips looking at aspects of urban waterways and water sensitive urban design.

For a complete list of field trips that students undertake during the program, please refer back to “Field trips” on page 6 of this syllabus.
7951ESC - Urban metabolism: resource and energy recovery systems
Integration course (Specialisation stream #2: Urban water)

Course description

As more than half of the global population live in urban environments, the sustainability of water dependent services including water supply, food and energy generation to urban areas is crucial. There is a need to reduce the linear flow through of water, material resources and energy, by promoting technologies and practices which achieve recovery, re-use and demand reduction.

This course challenges current patterns of water, energy and nutrient use in cities as inefficient and unsustainable. Emphasis is placed on understanding and evaluating the ‘water’ mass balance - a fundamental and powerful new way of quantifying the hydrological performance of cities. Through this course, this balance is used together with the coverage of technologies and management approaches to manipulate urban systems so as to improve ‘metabolism’ by reducing raw water intake and recovering and using the resources that wastewater carries, particularly energy, nitrogen and phosphorous. In doing so the course covers urban metabolism theory and more broadly resource efficiency and how they relate to sustainability, cities and water; mass balance modelling, Life Cycle Assessment and Input / Output modelling, water recycling and reuse; energy and nutrient recovery technologies; water-energy interactions in cities; issues surrounding the best scale for the recovery and re-use of water, energy and nutrients; urban agriculture and alternative production and consumption models as ways of improving the urban metabolism and consequently sustainability. A number of participatory approaches include an “integrated water-energy planning tournament” and hands on city building exercises are used together with field visits to build experience, understanding and tangible practical skills.

The aim of this course is to equip participants to be able to critically assess the resource efficiency and sustainability of cities across a range of scales; to be able to systematically quantify physical flows in complex urban systems; to construct and use urban metabolism models to characterise and evaluate options for improving urban sustainability.

This course comprises key skills that are important for a rigorous understanding of integrated water management problems.
Key topics include: resource efficiency, urban metabolism and sustainability, defining systems and subsystems; mass balance modelling, life cycle assessment; water recycling; energy recovery; nutrient recovery; urban agriculture; water-energy nexus; decentralisation.

Course introduction

This course equips participants with the skills, tools and technologies for studying urban areas as systems with inputs and outputs (wastes); to critically assess the relationships between metabolic information and urban sustainability, and, to understand the strengths, weaknesses and opportunities of urban metabolism and more broadly resource efficiency as a framework for informing policy and management.

The course is developed in six major topics as follows:

- Overview of metabolism (the need for change, the inefficiency of cities, metabolic theory and principles);
- Modelling, measuring and evaluating direct flows of water, energy and nutrients (system boundaries, states, systems characterisation, mass balance analysis principles, techniques and challenges);
- The water-energy nexus; characterising and optimising water-energy flows (current and future trajectories of water-related energy, key points of intersection and influence);
- Modelling, measuring and evaluating indirect flows (techniques for quantifying and evaluating embodied flows of water, energy and nutrients);
- Options and technologies for recycling/regenerating water, energy and nutrients (technologies and other approaches);
- Integrating understanding of metabolism (measure metabolism, goal setting and communicating metabolism).

Course delivery

- Full-time (on-campus) students, including international students, are required to enrol in the internal offering in trimester 2.
- Part-time (external) students are required to enrol in this course in trimester 1. The trimester 1 intensive six-day workshop is held at the beginning of the trimester. The remainder of the course is taught externally online.

Assumed background

The following courses are pre-requisites for this course: ‘New perspectives on project management’, ‘Science of water’, ‘Water, sustainability and development’, ‘Water governance and policy’.

Learning objectives

After successfully completing this course participants are able to:

- Conduct mass balances of water in cities across a range of scales (precinct through to city scales), characterising inputs, outflows and losses from a range of sources, and understand the diverse impacts of water mass balance on energy and related flows (e.g. greenhouse gas emissions);
- Understand and be able to critically appraise urban metabolic theory as a basis for delivering urban sustainability;
- Construct an urban metabolism model based on mass balance principles, urban metabolic theory and resource efficiency frameworks;
- Critically use urban metabolic theory and models to characterise and assess options for improving urban sustainability through improved water, nutrient and energy recovery;
- Describe and assess the strengths and weaknesses of key water management and resource recovery approaches and technologies for improving urban metabolism including recycling and energy and nutrient recovery;
- Appreciate the importance of engagement and collaboration in delivering changes to urban production and consumption behaviours and systems.

Teaching staff

Lead Lecturer: Assoc Prof Steven Kenway (School of Chemical Engineering, The University of Queensland)

Lecturer: Dr Brian McIntosh (International WaterCentre)

Lecturer: Assoc Prof Steven Pratt (School of Chemical Engineering, The University of Queensland)

Lecturer: Dr Marguerite Renouf, The University of Queensland

Lecturer: Mr Joe Lane (Global Change Institute, The University of Queensland)

Lecturer: Phil Woods, Sydney Water

Brisbane river (photo: Brisbane Marketing)
Course description

Population growth, urbanisation, changing food consumption patterns and the effects of climate change on water availability and quality are global challenges that have major impacts on agriculture and agricultural water use.

Participants in this course will be introduced to some of the main challenges and opportunities for water and agricultural landscapes. They will develop the capacity to think broadly about and assess the positive and negative ecological, social and economic impacts of agricultural water use, and will be introduced to some tools and critical thinking that can help harmonise agricultural systems. Participants will develop new knowledge and skills to help them converse with agriculturalists as informed water managers.

The course methodology departs from the experience and expectations of each student participant, ‘back-casting’ from their individual objectives and building a learning progress process along the Course that supports the participant to understand, filter and incorporate each learning activity into his/her own learning objectives. It is expected that participants will contribute substantially to discussions and workshops, proactively adding their own experiences to support peer learning, enthusiastically absorbing the experiences of others, and actively seeking to connect what they hear, see and do with their own Personal Learning Objectives.

Course introduction

Participants will be introduced to both dryland and irrigated agriculture, and will develop an understanding of how land use relates to the water cycle with examples of agricultural systems in both developed and developing country contexts. Principles of sustainable management at a range of scales, from soil profiles to global systems, will be discussed. Efficient water use in irrigation and conservation of water in dryland systems and saline agriculture will be emphasised.

This unit will address the issues of intensification of land use that has led to degradation of affected ecosystems, and will introduce participants to remediation techniques to counter land and water degradation through better management. Alternative water use and urban encroachment on agricultural land will also be examined.

An understanding of agricultural water management and methods of environmental protection will prepare participants for problem-based learning (PBL) work. Risk-based decision making in water management will be embedded into the course, with an emphasis on linking management to governance.
Course delivery

- **Full-time** (on-campus) students, including international students, are required to enrol in this course in the summer trimester. They are required to attend an eight-day, Perth-based teaching block, including two days of field work. Preparation work may be undertaken beforehand online.

- **Part-time** (external) students are required to attend the same eight day, Perth-based teaching block including two days of field work. Preparation work may be undertaken beforehand online.

Assumed background

This is a postgraduate course in general water science offered as part of the International WaterCentre Masters of Integrated Water Management, and one of two specialist courses for those participants following the ‘Water, Land and People’ stream. Participants are expected to have basic background knowledge through undergraduate science or engineering programs, however this is not essential. It is anticipated that the student group will have diverse range and depth of professional experience, including some participants with no postgraduate work experience. Participants must have successfully completed the Masters foundation courses: ‘New perspectives project management’, ‘Science of water’, ‘Water, sustainability and development’, and ‘Water governance and policy’.

Learning objectives

After successfully completing this course participants are able to:

- Have an understanding of global trends for population growth, climate change, water demand and food security;
- Understand key directions in water resource management for sustainable agriculture;
- Understand the different modes of agricultural production for rain-fed and irrigated systems and their impacts on land management, water resources, ecosystems and community;
- Have an overview of innovative solutions for efficient and effective use of water and land resources for different agricultural systems;
- Understand the context of water redistribution in landscapes of different climate regions and its impact on agricultural practices and ecosystems;
- Achieve a comprehensive view of the harmonisation of economic, social and ecological dimensions of agriculture;
- Have an understanding of the integrative components of land and water management in an agricultural context.

Teaching staff

Course coordinators and lecturers for this course are from The University of Western Australia, with guest lecturers from UWA, government agencies, industry and non-government organisations.

Course Coordinators and Lead Lecturers: [Dr Susana Neto](#) (University of Lisbon) and [Prof Jeff Camkin](#) (University of Western Australia)

Lecturer: [Prof Mark Rivers](#) (University of Western Australia)

Lecturer: [Assoc Prof Ed Barrett-Lennard](#) (University of Western Australia)

Lecturer: [Adj Prof Edward Hauck](#) (University of Western Australia)

Guest lecturers: from government agencies, industry and NGOs

Problem-Based Learning (PBL) projects

Parallel PBL projects and field trips run through the trimester, comprising roughly 50% of the assessment weight. Full-time students complete two PBL projects per trimester, while part-time students complete one PBL per trimester.

PBL projects for the Integration trimester comprise:

- **PBL3**: Integrated catchment management – developing strategies for change (**Individual project**)
- **PBL4**: Learning lessons from integrated water management in practice (**Individual project**)

Field trips

As part of this course (Water and agricultural landscapes), both full-time and part-time students also undertake:

- A one-day field trip to the Peel-Harvey Catchment and Harvey Irrigation Area, and
- A one-day field trip to Gnangara mound, or
- A one-day field trip to the Wheat Belt

These two day trips are part of an eight-day teaching block in Perth, undertaken during the summer trimester.

For a complete list of field trips that participants undertake during the program, please refer back to “Field trips” on page 6 of this syllabus.
7961ESC - Collaborative planning
Integration course (Specialisation stream #3: Water, land and people)

Course description

This specialist course introduces participants to participatory methods and evaluation frameworks and extends their knowledge of social science concepts and the application of social theories to real life scenarios, especially at a regional scale. Planners agree that community input should be included in the development of water resource plans or strategies and find that they need principles, methods and skills about collaboration with local communities as well as between organisations.

To foster a greater understanding of collaboration, participants explore how and when collaboration is useful; gain an understanding of the various terminology used (such as participation, engagement and consultation); and explore different approaches that can be used to engage with communities and organisations, including action research and social learning.

The course focuses on how to integrate different stakeholder perspectives and knowledge systems, including Indigenous and cross-cultural, conflict management and negotiation; as well as evaluation methodologies, especially for social and process evaluation.

Lessons from real-life case-studies in water planning are shared by a range of experts in the field, with time for in-depth workshops.

Course delivery

- **Full-time** (on-campus) students, including international students, are required to enrol in the internal offering in trimester 2.
- **Part-time** (external) students are required to enrol in this course in trimester 1. The trimester 1 intensive six-day workshop is held at the beginning of the trimester. The remainder of the course is taught externally on-line.
Assumed background

The following courses are pre-requisites for this course: ‘New perspectives on project management’, ‘Science of water’, ‘Water, sustainability and development’, ‘Water governance and policy’.

Learning objectives

Learning objectives

After successfully completing this course participants are able to:

• Explain the theoretical underpinnings of community based participatory engagement, community participation and organisational collaboration, and its applicability to water resources;

• Critique different participatory frameworks and assess when and why these need to be used in water and catchment management planning;

• Demonstrate understanding of cross-cultural and specifically Australian Indigenous engagement issues as related to water planning and management;

• Employ a range of analytical frameworks for understanding the links between water and local community values and ideas;

• Explain and have a critical appreciation of knowledge systems, conflict resolution, negotiation and power relations and their links to water and catchment planning;

• Demonstrate an understanding of their own ability to implement participatory processes;

• Participate successfully in an individual project designing participatory approaches for integrated water planning;

• Undertake an individual project evaluating participatory approaches in a water planning case study.

Teaching staff

Lead Lecturer: Mr Andrew Davidson (Department of Infrastructure, Local Government and Planning)

The International WaterCentre also invites a range of guest lecturers from different fields to teach in this course:

Guest Lecturers: Christine Rinehart (Rinehart Consulting Pty Ltd), Chris Manning (Townsville City Council)

Problem-Based Learning (PBL) projects

Problem-Based Learning (PBL) projects

Parallel PBL projects and field trips run through the trimester, comprising roughly 50% of the assessment weight. Full-time students complete two PBL projects per trimester, while part-time students complete one PBL per trimester.

PBL projects for the Integration trimester comprise:

• PBL3: Integrated catchment management – developing strategies for change (Individual project)

• PBL4: Learning lessons from integrated water management in practice (Individual project)

Field trips

Field trips

Participants begin the Integration trimester with a 10-day field trip to Gladstone, Queensland. The cost of the trip is covered in course fees.

They also participate in a one-day field trip around Warrill Creek and Aratula, in South East Queensland, exploring issues around community engagement and environmental rehabilitation.

For a complete list of field trips that participants undertake during the Integration trimester, please refer back to “Field trips” on page 6 of this syllabus.
Aims

To demonstrate individual inquiry and the ability to plan, execute and deliver a high quality submission that illustrates skills, knowledge and critical assessment of contemporary aspects of integrated water management (IWM).

Learning objectives

The final project enables participants to:

- Discover through practical application how to apply tools and concepts of integrated water management to an existing or emerging focal water resource issue that is of professional or personal interest
- Undertake self-directed project work aimed at demonstrating skills in planning, executing and delivering a high quality submission that demonstrates individual inquiry, critical problem solving and effective communication of complex issues
- Develop skills in critical inquiry of conceptual and operational aspects of water management, adopting multi-disciplinary / multi-stakeholder perspective of a current or emerging water issue
- Build professional links and networks in the water practitioners throughout the project experience, develop leadership skills and advocated integrated, reflective practice.

Course description

The Master of Integrated Water Management (MiWM) creates future water leaders who can cross social, environmental and technological boundaries to find sustainable solutions to global water challenges in urban and rural contexts. The program has been designed to provide graduates with a strong theoretical foundation in IWM best practice, strengthened by a practical skill set developed through problem-based learning projects, field trips and a final project experience.

The IWM project is a compulsory course, undertaken as the ‘final project’ component of the Master of Integrated Water Management (MiWM) program (see Figure 1 on the left). Here, participants design and undertake self-directed project work to consolidate and apply concepts, principles and methodologies learned in the MiWM Foundation, Integration and Specialisation courses.

Participants are encouraged to base their project on a focal issue that is of personal or professional development interest, which they will explore under the guidance of dedicated professional and academic supervisory expertise. Professional placements with NGOs, research institutes, water industry clients and service providers, private consultants, or natural resources management organisations are encouraged. Where possible, participants will be linked with IWC partners and associates.

The project is assessed by means of a report which represents the academic effort attributable to one trimester of full-time work, or two trimesters of part-time work (40 credit points at Griffith University). Participants should discuss and agree the overall scope and outcomes of the project with the staff of the IWC and secure academic supervisors prior to commencing work.

Scholarship and visa conditions permitting, projects can be undertaken in Australia or overseas.

Enrolment options

The final project is offered in both full-time and part-time delivery modes. Participants have the option to select ONE of the following enrolment options to complete the course:

Full-time enrolment options:
- Trimester 1: Feb - Jun
- Trimester 2: Jul - Oct

Part-time* enrolment options:
- Trimester 1: Feb - Oct
- Trimester 2: Jul - Jun

* Part-time delivery options are available only to domestic students.
Pre-requisites
Prior to undertaking their final project, participants must:
• Successfully complete the MIWM Foundation, Integration and Specialisation courses; and
• Obtain permission from Griffith University and the International WaterCentre.

Teaching staff
• Course Coordinator: Dr John Kirkwood (International WaterCentre)

Student knowledge base at the commencement of the final project
At the commencement of the final project, MIWM participants have been exposed to a mixture of theoretical and evidence based learning from systems, planning and the philosophy of science to firmly root the nature of water management as a practical discipline dealing with complex issues and situations. Questions are raised over the need for change in water management practice, and why future generations will need to think and act differently about water.

Student skills are developed to help them characterise contemporary water-related challenges across the world, anticipate emerging and future challenges, and map out the dimensions of some of the responses which will be required. Questions of social purpose are raised to stimulate reflection on professional purpose and ambition, and incorporation of personal values into a reflective professional praxis.

At IWC, we believe this reflective professional praxis will be essential for future water professionals to effectively and justly engage in the complex, potentially conflict ridden changes required across the sector.

“Since the program’s launch in 2008, IWC students have delivered more than 200 projects in 45 countries, in collaboration with 140 organisations across the globe.”

Maria Belén Andrade (Ecuador)
Engaged or Disengaged? Bringing motivations and emotions into the study of multi-stakeholder platforms for Integrated Catchment Management – A case study of multi-stakeholder platforms in the Pumicestone Region Catchment, Queensland, Australia

Multi-stakeholder Platforms (MSPs) are widely promoted to attain a new water governance system known as Integrated Catchment Management (ICM). MSPs are often considered to be conflict-free and rational spaces for participation, leaving aside the fact that they are composed of human beings, who are far more complex than this. MSPs are usually initiated by the government or an NGO (due to the skills required to facilitate a positive environment for dialogue).

However, one must ask: what motivates people to join, remain active in and leave MSPs, and what experiences and emotions make some individuals who have left cynical about joining other participatory initiatives?

Belen undertook a six-month research project to answer this question through the examination of three government-invited MSPs from the Pumicestone Catchment Region in Queensland, Australia. She approached the study of engagement and disengagement of participants in MSPs through the socio-psychological lens of motivations and emotions, and how they influence behaviour in order to attain ICM goals.
Project options

The final project offers an opportunity for participants to demonstrate integration of the different MIWM program elements within a coherent, self-directed project experience.

There are three broad project options for participants to choose from:

- Professional placement
- Applied research
- Desktop research

Mode of delivery

The mode of project delivery is flexible. This enables participants to tailor the project experience to their demonstrate strengths, and achieve personal and professional development aspirations.

Project delivery can take the following forms:

- A project with a host organisation or community group (professional placement or applied research),
- A project within the student’s current workplace (for part-time students, a project tailored to their job and adding value to their employer), or
- A self-driven research project (involving either field work or a piece of critical desk-based research).

Guidance will be provided by IWC staff throughout the taught trimesters of the MIWM program to help participants decide which option is best for them.

Assessment

The IWM final project submission will either take the form of a 14,000 word report, OR a multimedia submission (audio, video, graphic design, phone app) accompanied by a 10,000 word report.

Participants are assessed on their ability to:

- Select a focal issue, relevant to a current or emerging water challenges, to explore and develop their IWM inspired project
- Effectively communicate the aims, objectives (or activities) and contextual ‘need’ for the project
- Rationalise project design and approaches used to achieve identified aims and objectives (or activities)
- Present project outputs appropriate to the audience and critically evaluate overall findings in the broader context of the focal issue
- Reflect upon observed gaps between theory, practice, rhetoric and reality of IWM from their project experience and suggest a way forward.

The ‘Final Project Student Handbook’ provides detailed guidance on milestones and assessment criteria which should be followed closely.

Project topics

Project topics to date have covered a broad array of water related issues, stimulated through the foundation, integration and specialisation streams as well as MIWM networking events and discussions.

Examples of topics covered to date (list non exhaustive):

- Participatory approaches to water management
- Water supply planning for informal settlements
- Sanitation marketing
- Hygiene behaviour change
- Changing role of women in communities caused by improved water infrastructure
- Indigenous water rights and service planning
- Whole of water cycle planning for urban development
- Water related energy use measurement and management
- Water utility strategic planning and transformation
- Reforming catchment management policy and practice
- Flood risk management
- Coal seam gas regulation and risk management
- Sustainable mine water practices in developing countries

Projects topics are developed in accordance with the participant’s chosen specialisation stream (1. WASH and development; 2. Urban water; or 3. Water, land and people). Participants are encouraged to select a project topic that fits within their personal and professional development aspirations.

See featured projects: www.watercentre.org/scholars-alumni/tab/projects/
Supervisors, hosts & funding support

Supervisors
During the final project, program participant’s knowledge and skills are tested against current or emerging water issues under the guidance of professional and academic expertise.

Each student is required to have at least one academic supervisor from their enrolling university to be eligible to undertake the final project course.

Depending on the type of project undertaken, participants may elect to engage additional academic and/or industry expertise to guide them through their project experience.

Collaborative project opportunities
Program participants are encouraged to design and implement collaborative projects with organisations or communities seeking integrated solutions to complex water-related challenges.

Project placements might include renumerated positions for time spent on project work, or in-kind contributions to cover project costs under voluntary work arrangements.

Alternatively, fixed-value scholarship top-ups can be offered to attract MIWM participants to explore a particular challenge facing one or more organisations who are looking for novel solutions.

Formalised agreements
All final project placements require approval by IWC and/or the enrolling university for administrative and insurance purposes. Approval is to be formalised by way of a counter-signed agreement, established between IWC and all relevant parties.

The content of these agreements relates to: student supervisor and placement organisation responsibilities, financial support offered to academic supervisors (if deemed appropriate), student insurance coverage, confidentiality arrangements and IP status.

IWC student funding and resources
MIWM participants have access to a AU$1,000 Professional Development Grant of which AU$500 can be used towards the final project and AU$500 towards other professional development opportunities (e.g. conferences) or to subsidise the costs of some field trips.

Limited funding may also be available to offset academic supervisor workloads for the duration of the final project experience. The specifics of these funds are to be negotiated between IWC and the supervisor.

Information for prospective project collaborators
IWC welcome nominations for professional placements and collaborative project opportunities with NGOs, research institutes, water industry, or natural resources management organisations.


Expressions of interest are open all year round:
- Register your interest to host a final project (online form): https://watercentre.wufoo.com/forms/express-your-interest-to-host-a-final-project/

Contact
For enquiries relating to the final project, please email Dr John Kirkwood at j.kirkwood@watercentre.org.

For enquiries relating to the MIWM program, please email admin@watercentre.org or call +61 7 3028 7600.

Hong Hanh Nguyen (Vietnam)
Integrating sanitation marketing into a national program: A case study in Vietnam

Despite the high annual rate of economic growth in Vietnam, poor sanitation has caused a loss of approximately 1.3% of the country’s annual GDP. Since 2003, International Development Enterprises (IDE), a non-profit development organisation, has implemented several rural sanitation marketing pilot projects in various parts of Vietnam, achieving promising results.

As a result, Hong Hanh, who was undertaking an internship with IDE Vietnam, conducted a pilot project to integrate a sanitation marketing model into the National Target Program for rural water supply and sanitation. The field research analysed the potential as well as the constraints for scaling up this innovative model into a national governmental program.