

Executive Summary

Overview

Tsinghua University and the University of Melbourne have developed a very productive collaboration in the area of water management since 2010. The outcomes include: 5 collaborative research projects, 5 PhD students and academic exchange, 7 co-published journal papers and a Tsinghua student study tour program to the University of Melbourne involving 15 Tsinghua undergraduate students and two early career academics. Tsinghua University and the University of Melbourne are now developing two five-year flagship research programs in water resources and water quality. These are built on previous and on-going research programs including:

- “Managing the Threats to Sustainable Water Resources Development”, funded by Aus-AID Australia-China Environment Development Program (ACEDP),
- “The Australia China Joint Research Centre on River Basin Management (Water resources and water quality)” funded by DIISRTE Australia,
- “Integrated Hydrology-ecology-economical Model for Inland River Basin Management” funded by Natural Science Foundation of China and
- “Internet Water in River Basins” funded by the Ministry of Science and Technology China.

The new programs will look to demonstrate three Australian water technologies (Total Channel Control (Rubicon), FarmNet (NICTA) and Water trading (DEPI)) in an inland river basin in North-western China. The research programs will also foster an additional 3-5 joint PhD candidates to work across the two institutions. It is expected that a water centre between Tsinghua University and the University of Melbourne will be formally established in the first half of 2014 and that academics from Tsinghua University will be involved in a major Australian funding bid towards improving “Regional Water Productivity” in mid-2014.

International River Basin Management Course

The development of an international course on river basin management was proposed in 2011 during the implementation of the ACEDP research project. The aim of the course was to provide future water managers with practice-driven knowledge by linking cutting-edge science and technology with updated policy and management methods in the river basins of Australia and China. The course was delivered as a single intensive week and aimed to give graduate students insights into the diverse and complex world of river basin management. In addition, the course covered topics and examples that were deliberately chosen to be broad and cross-disciplinary, exploring and focusing on issues of governance, environmental management, climate science, water engineering, economics and the social consequences of the reforms in both Australia’s Murray Darling Basin and China’s Yellow River Basin.

An initial trial course was conducted at Tsinghua University over a week in August 2012. Participants were awarded one credit at Tsinghua University, which is equivalent to half of a 12.5 point subject at the University of Melbourne. Twenty-two students enrolled in this course. Lecturers for the course were Professor John Langford (40%) from the University of Melbourne, Professor Zhongjing Wang (40%) from Tsinghua University and Mr Weigong Luan (20%), Deputy Director of the Gansu Provincial Water Resource Department. The course received excellent feedback from the students, and Professor Si Yuan, the Provost of Tsinghua University strongly supported its continuation. The ACEDP review panel also highly recommended this course as a product of the combination of science and practice in river basin management between Australia and China.

Following this successful trial, the 2013 International River Basin Management Course was conducted in two stages, as outlined below.

Stage One

An intensive one week program was held at Tsinghua University in July, 2013. The purpose of this part of the program was to give Chinese students knowledge and practice in the planning and management of the Yellow River and to introduce them to management practices in the Murray-Darling Basin. The course structure is provided in Table 1. Twenty students attended this program. Students from Tsinghua University again received one credit for this aspect of the course.

Table 1: Topics covered in Stage One of the International River Basin Management Course, held in China

Lecturers	Topics
Prof Peter Scales	Water Quality in Australia Comparison between Australia and China
Prof Andrew Western	Water Resources in Australia Comparison between Australia and China
Prof Zhongjing Wang	River planning and management
Prof Hongbo Yang	English reading in River Basin Management

Stage Two

The second stage of the course involved another intensive one week program at the University of Melbourne in August. A group of sixteen students were chosen from Tsinghua University to attend the course and 12 students were selected from the University of Melbourne. Tsinghua students received one credit for successful completion of the second stage of the course. The University of Melbourne students did not receive credit as the course has not yet been officially approved by the Academic Board of the University.

This second stage comprised of six topics across the Murray Darling River Basin and the Yellow River Basin and a field visit to Goulburn Valley. These six topics included Understanding the Murray Darling Basin, Development of Water Resources, Drivers of Reform, Water Productivity, Comparison between the Murray Darling Basin and the Yellow River Basin, and the Yellow River Basin Management over 5000 years. The detailed structure of the course is provided in Table 2.

Table 2: Structure of Stage 2 of the International River Basin Management Course

Course topics	Contents
Understanding the Murray Darling Basin	<ul style="list-style-type: none"> • Overview of the Basin • Australia's Uncertain Climate – The major driver of water reform • Water Resources – Impact of Climate & Land Use Change
Development of Water Resources	<ul style="list-style-type: none"> • Governance • Water Allocation Policy • Environmental Impacts of River Regulation
Drivers of Reform	<ul style="list-style-type: none"> • Economic reform: COAG 1994 - Water Markets • Environmental reform: The Water Act (2007) and The Basin Plan
Water Productivity	<ul style="list-style-type: none"> • Technology • Opportunities for Mutual Benefit • Agriculture <ul style="list-style-type: none"> ○ Modernization of Irrigation Systems ○ Farming Systems and Smart Irrigation ○ Environment

	<ul style="list-style-type: none"> ○ Environmental Works and Measures ○ Management of Environmental Water Holdings
Comparison between the Murray Darling Basin and the Yellow River Basin	<ul style="list-style-type: none"> ● Comparison between the Murray Darling Basin and the Yellow River Basin from the perspectives of law, governance, policy and management practice
The Yellow River Basin Management in 5000 years	<ul style="list-style-type: none"> ● The history of management strategies of Yellow River in last 5000 years ● The story and executives of “87” Act of water allocation in Yellow River ● The Challenge of environmental flow of Yellow River in recent years
A field trip to the Goulburn Valley	<ul style="list-style-type: none"> ● To see firsthand the complexities involved in modernizing an irrigation system in the river basin system, including its irrigated farms. This included an overnight stay at the University of Melbourne’s Dookie Campus where a variety of agricultural and water technology were demonstrated.

Organisations

Nine organizations across university, research institutes, governance departments, the water industry and consulting companies were involved in this one-week program. 30 people were involved in lecturing and coordination of the course, as detailed in Table 3.

Table 3: Organisations and individuals involved in delivering the International River Basin Management Course material in 2013

Organizations	Name of Lecturer
Aither Consulting	Mr Will Fargher
CSIRO Land and Water	Dr Ian Prosser Dr Francis Chiew Dr Lu Zhang Dr QJ Wang
Department of Environment and Primary Industry, Victoria	Mr Campbell Fitzpatrick
Goulburn-Murray Water	Mr Peter Egglestone 2 Water Managers
Murray-Darling Basin Authority	Dr Sharon Davis Dr Ben Dyer
Murray-Darling Freshwater Research Centre	Dr Darren Baldwin
Rubicon Water	1 Technical Expert
The University of Melbourne <ul style="list-style-type: none"> ● Department of Chemical Engineering ● Department of Electronic Engineering ● Department of Infrastructure Engineering ● School of Land and Environment 	Prof Peter Scales Prof Iven Mareels A/Prof Erik Weyer Prof Andrew Western Prof John Langford A/Prof Michael Stewardson Dr Yongping Wei, Dr Dongryeol Ryu Prof Snow Barlow Dr Kithsiri Dassanayake

<ul style="list-style-type: none"> School of Law School of Earth Science 	Prof Sandford Clark Dr Anita Forester Prof David Karoly
Tsinghua University	Prof Zhongjing Wang

Students

The sixteen students of Tsinghua University came from the School of Social Sciences, the School of Governance, the School of Environment and the School of Civil Engineering. Twelve students of the University of Melbourne came from the Department of Infrastructure Engineering, Department of Electronic Engineering, School of Land and Environment and Office of Environment Programs. For details, please see Table 4.

Table 4: Discipline background of students participating in the 2013 International River Basin Management Course

Name of University	Departments/Schools	Number of Students
Tsinghua University	School of Social Science	1
	School of Governance	2
	School of Environment	5
	School of Civil Engineering	8
The University of Melbourne	School of Engineering	4
	School of Science	2
	School of Land & Environment	6

Assessment

Students from Tsinghua University were assessed in two parts, a presentation and mini-thesis. Five groups of 6 students prepared 20-minute presentations on the five most important issues and associated research questions they had identified. A mini-thesis of 3500-4000 words on one of the topics covered in the course was required for each Tsinghua student. The thesis was graded as either Pass or Fail.

Contribution

The international course was financially supported through the Australia China Centre on River Basin Management (led by the University of Melbourne) and by Tsinghua University. Tsinghua University and the University of Melbourne also made significant in-kind contributions to this course by providing the majority of lecturers, lecture rooms and other facilities. Aither Consulting, CSIRO Land and Water, Department of Environment and Primary Industry, Victoria, Goulburn-Murray Water, Murray-Darling Basin Authority, Murray-Darling Freshwater Research Centre and Rubicon Water contributed to the course by providing lecturers, field visits and factory visits.

Conclusion

A short survey was conducted after the course and all students from both universities rated this course at excellent and/or very good indicating that the course was well run and highly valued. The students welcomed the overwhelming majority of topics and greatly appreciated the interdisciplinary nature of the course. The field trip to the irrigation district undergoing substantial modernisation in the Goulburn Valley was also highly appreciated. In addition, students from the University of Melbourne expressed a strong interest in attending the follow-up course in China next year.

Recommendations

It is proposed that this international course be registered at the University of Melbourne as a 12.5 point graduate level selective subject in Engineering. The course is to be delivered at Tsinghua University next year and the University of Melbourne will select and organize a group of student to attend. Professor Si

Yuan, Provost of Tsinghua University suggested that students from a university in the USA (possibly Harvard) also joined the course in 2014. Professor Zhongjing Wang, Vice Dean of School of Civil Engineering at Tsinghua University is responsible for the planning of the course for 2014. In the longer term, Professor Si Yuan hopes that this course will also be open to Chinese water officers, managers and engineers.