



Australian
Academy of
Science

SYMPOSIUM WITH CHINESE ACADEMY OF SCIENCES 2004

**Funded by Department of Education, Science and Training
under International Science Linkages Programme**

Background

In November 2003 the Australian Academy of Science coordinated a visit to Australia by Professor Lu Yongxiang, President of the Chinese Academy of Sciences (CAS) and Vice Chairman of the Standing Committee of the National People's Congress of the People's Republic of China.

Professor Lu visited Canberra on 13 November 2003, and met with the then Federal Minister for Science, the Hon Peter McGauran. One of the outcomes of this meeting was an agreement to organise a series of annual symposia with the aim of strengthening cooperative research links between Australia and China in areas of mutual priority.

The Department of Education, Science and Training (DEST) subsequently entered into discussions with the Academy and the Australian Academy of Technological Sciences and Engineering (ATSE) and requested them to organise the first symposium in 2004. The Academy of Science has a long-standing MOU with CAS. They were commissioned by DEST to organise the workshop along with ATSE.

In consultations between DEST, the Academies and CAS, it was decided that the symposium should be on the topic of sustainability, a subject of great importance to both countries, to be held in Australia in October 2004.

Participants

Professor Frank Larkins, Deputy Vice Chancellor (Research) at the University of Melbourne and a Fellow of both Academies, the Australian convenor of the symposium was ably assisted by Professor Andrew Smith FAA. Professor Chen Zhu, Vice President of the Chinese Academy of Sciences, led the Chinese delegation. A report from Professor Yongguan Zhu, Head of the CAS Research Center for Eco-environmental Sciences, is provided at **Attachment 1**.

The Symposium was organised around four workshops, addressing ecosystem restoration, energy and environment, sustainable agriculture, and water. Each workshop had an Australian and a Chinese convenor expert in that field.

Invitations were extended to leading Australian scientists from a range of research institutions around Australia. A total of twenty participated and made presentations. A list of the Australian participants is **Attachment 2** of this report.

The Chinese delegation included fifteen leading researchers in the field. In addition to Professor Chen Zhu, the Chinese delegation included Professor Cao Jinghua and Professor Xing Xuerong from the Bureau of International Cooperation of CAS. A list of the Chinese participants is at **Attachment 3**.

The Chinese delegates came roughly half from CAS institutes and half from universities. CAS supported the researchers from its own institutes, while the National Natural Science Foundation of China (NSFC) supported those from universities.

The Ambassador of China, Madam Fu Ying, was kept informed on this activity and expressed interest in participating, but due to prior commitments, was not able to do so. In her place, the Embassy of China sent Mr Liu Zuozhang, Minister Counsellor (Economic and Commercial) and Mr Zhao Qingqing, First Secretary (Science and Technology), as representatives to the symposium.

Convenors for the four concurrent workshops were:

Ecosystem restoration workshop

Professor Mike McLaughlin
Research Director
CSIRO Land and Water
Adelaide

Professor Fu Bojie
Director General
Key Laboratory of Systems Ecology
Research Centre for Eco-Environmental Sciences (CAS)
Beijing

Energy and Environment workshop

Professor Bill Charters FTSE
Emeritus Professor, Mechanical & Manufacturing Engineering
University of Melbourne

Professor Tao Shu
Laboratory for Earth Surface Processes
College of Environmental Sciences
Peking University
Beijing

Sustainable Agriculture workshop

Professor Andrew Smith FAA
School of Earth and Environmental Soil and land Systems
University of Adelaide

Professor Luo Shiming
President
South China Agricultural University
Guangzhou

Water workshop

Professor John Langford FTSE
Director
Melbourne Water Research Centre
University of Melbourne

Professor Xia Jun
Institute of Geographical Sciences and Natural Resources Research (CAS)
Beijing

A copy of the program of the first two days in Lindenderry is at **Attachment 4**. Professor Chen, Professor Larkins and Mr Walters (Group Manager, Science Group, Department of Education, Science and Training) opened the symposium and welcomed the participants.

Participants took the opportunity to network over the two days, including during the reception organised to open the event, coffee breaks and meals.

The group then travelled to Melbourne to attend a dinner at which the Chief Scientist, Dr Robin Batterham, and the President of the Australian Academy of Technological Sciences and Engineering, Dr John Zillman, spoke about the importance of international collaborations. The dinner was supported in part by the University of Melbourne.

Site visits

The following day, Tuesday 19 October, the Chinese researchers, flew to Adelaide to participate in a two-day program of site visits (**Attachment 5**). ATSE also organised a separate program of visits in Melbourne for Prof Chen Zhu and Professor Cao Jinghua on that day to the University of Melbourne, Monash University, and the Walter and Eliza Hall Institute of Medical Research (**Attachment 6**).

It should be noted that the CRC for Water Quality and Treatment, the University of South Australia, the University of Adelaide, CSIRO Land and Water, organised excellent tours of their facilities according to the research background of the Chinese scientists. The University of South Australia and the University of Adelaide each also organised a lunch at their institution with staff from various relevant schools and faculties. This allowed for networking between Australian and Chinese researchers.

The University of South Australia organised visits to their Centre for Water Science and Systems, the Agricultural Machinery Research and Design Centre, the Centre for Contamination Assessment and Remediation, and the Ian Wark Research Institute. In the evening a dinner was organised for the Chinese delegation to meet Australian researchers based in Adelaide.

The University of Adelaide and CSIRO Land and Water hosted the Chinese delegation on the second day. The group was given a tour of CSIRO as well as the Waite Institute. Professor Sally Smith, Director Centre for Plant Root Symbioses at the University of Adelaide and two of her colleagues gave talks to the group, and explained their cross-agency collaborative work with CSIRO Land and Water. The delegation was very impressed with the philosophy of cross-agency collaboration and resource sharing system in the Waite Campus. Many delegates believe that this is a

type of system that China could possibly model on to improve the efficiency of investment in science and technology.

The South Australian Research & Development Institute also organised a tour of their facilities for the delegation on the day.

Outcomes

Australian and Chinese convenors were asked to present a set of outcomes as a result of each workshop. Recommendations/actions in relation to each thematic workshop are summarised below. The convenors' full reports are provided at **Attachments 7-10**.

Ecosystem Restoration workshop

The following areas of joint interest were identified as topics for potential collaboration between scientists in the two countries.

1. Ecological knowledge to re-establish ecosystems on degraded soils (polluted, salinised, eroded, acidified, desertification, mine-affected, etc.).
2. Research to develop risk-based regulations for controlling contamination in waters, sediments and soils – both scientific and regulatory exchanges of information/data needed. Includes analytical/ecotoxicological methodologies. Possible proposal for a “Metals in Asia Initiative” to link Australian and Chinese research on regulations and remediation.
3. Modelling ecosystem changes with time and with different management (e.g. climate change).

Additional recommendations to foster collaboration between Australia and China were

- Student exchange/access to demonstration/contaminated and/or degraded case study sites.
- Paired/parallel sites/studies examining common issues/problems in both countries.

Since the workshop, Professors McLaughlin, Ma, and Zhu have been negotiating a joint research proposal under Issue (2) above entitled “Metals in Asia”, which has the aim of developing risk-based criteria for soil protection from pollution by heavy metals. Interest in this proposal has already been expressed by the mining industry and CAS/CAAS (Chinese Academy of Agricultural Sciences), and the proponents are seeking further sponsorship opportunities.

Energy and Environment workshop

With initial contacts made between key workers it was seen to be essential that in the future a consolidated data base be established both in Australia and China on the DEST and Academy Websites so that national workers can quickly access the appropriate staff, laboratories and main programmes in the partner nation. In this

respect the Virtual Centre proposal generated by the Water Workshop may provide a suitable prototype for the other Workshop sessions.

The following topics were clearly identified as being appropriate for joint work in the energy and environment field between the two countries.

- Clean coal technologies focussing strongly on coal gasification with a possibility of China joining in with the Australian CSIRO/Industry demonstration project.
- Geo sequestration site search techniques for locating and matching Sources and Sinks of carbon dioxide available through the CO2 CRC.
- Exchange and utilisation of background material on oil and natural gas exploration methodologies developed within Australia by CSIRO who have already generated contact with China on this topic.
- Research work on third generation photovoltaic cells with the potential to achieve high solar conversion efficiencies with minimal use of high grade silicon. This could involve the solar industry and universities and lead to early demonstration and adoption of these technologies.
- Distributed power systems involving fuel cells, wind and PV power, and micro turbines with a strong focus on remote area power generation systems suitable for use in mining camps and indigenous settlements. The Australian "Bushlight" Programme could form a basis for this cooperation.
- Contamination of heavy metals and organic pollutants caused by coal combustion.

Sustainable Agriculture workshop

- The Workshop delegates saw benefit in the formation of 'Virtual (electronic) Centres' for networking.
- A priority area that was singled out is environmental modelling and systems analysis, where Australia has skills that are already being applied in collaboration in China, and can be expanded.
- Another area that would benefit is handling large environmental data sets that have accumulated in China and should be made accessible internationally: not a simple task.
- Other areas, where new collaborative opportunities will arise, to the benefit of both countries, include improving fertilizer application and soil quality, and development of better plant varieties (especially rice).
- In relation to development of collaborations (past, present and future), the 'bottom-up' approach that arises from personal contacts and hence knowledge of complementary research expertise was seen as very valuable; it can lead to larger scale initiatives, starting with short visits by established researchers and selected postgraduate students and post-docs.

Water workshop

The workshop identified six issues as having potential for mutually beneficial collaboration:

1. integrated river basin management;
2. linking research to water managers and industry;
3. water (allocation) policy;
4. groundwater management;
5. irrigation water efficiency; and
6. linking climate and catchment models

The workshop recommended that the Chinese Academy of Sciences, the National Natural Science Foundation of China, the Australian Academy of Science, and the Australian Academy of Technological Sciences and Engineering consider establishing a China – Australia Water Research Centre to foster collaborative water research in the two countries. It is proposed that the Chinese Academy of Science, through the Institute of Geographic Science and Natural Resources Research, and the University of Melbourne (through the Melbourne Water Research Centre) will sign a Memorandum of Understanding to establish a virtual China Australia Water Research Centre, in Beijing on the afternoon of Friday 14 October.

Professor John Langford and Professor Xia Jun are proposing that a strategic Water Workshop be held in March 2006 to develop a small number of carefully selected research projects addressing critical water management challenges facing both countries. The Workshop will also stimulate mutually beneficial research, staff exchanges and other related activities.

Conclusion

Sustainability is an important issue for both Australia and China and the topic and related workshop themes were chosen to reflect key issues that both countries face in the wake of future development.

The calibre of the Australian and Chinese participants was of a very high standard. The level of command of the English language by the Chinese researchers was excellent, which made communication between the scientists easy and reflected very good outcomes of the symposium. Many of the participants were mid-career researchers which will ensure that the collaborations between both countries continue for a long time.

**REPORT ON THE CHINA-AUSTRALIA JOINT SYMPOSIUM ON
SUSTAINABILITY 17-22 OCTOBER 2004
By Professor Yongguan Zhu, Chinese Convenor**

With the diminishing of natural resources, development in all sectors around the globe is facing the issue of sustainability. This issue is particularly pressing in China and Australia. While Australia is the driest continent in the world, China's fast development in conjunction with population growth is also largely limited by water shortage, both in quantity and quality. The issue of water, mining and ecosystem recovery is another common sustainability issue shared by Australia and China. It would not be inappropriate to stress that Australia is to a great extent resource-based economy, as it exports large volume of minerals and fossil fuels, and China is one of the major recipients of these exports. On the other hand, China today is a somewhat resource-thirsty country, and mining activities domestically are very active, thus the issue of ecosystem recovery after resource extraction is also nicely shared by both countries. In conclusion, the theme of joint symposium was very well chosen to reflect the key issues of both countries, in the wake of future development.

A good theme alone is not at all the key of successful symposium. Active and qualified participants are equally important, if not more. In this regard, it is evident from the two-day interactive workshops that, the two academies have selected the right scientists. These scientists have very broad coverage of background, from policy to technical solutions, from molecular sciences to ecosystem management. Scientists on both sides have good command of the knowledge in respective areas from each country, which assured that the discussion on possible collaboration was sensible and appropriate. It is worth commenting that, given the fact that English is not the native language for Chinese delegates, the communication in English between Australian and Chinese scientists was remarkably good. This excellent communication is reflected by very good outcomes of the symposium (see below for details).

Seeing is believing as an old saying goes, the other important feature of this symposium that brought much success is the site visit to Adelaide. Adelaide, particularly the Waite Campus of the University of Adelaide is well positioned in the global scale both in research and education sustainability sciences. This site visit provided an opportunity for the Chinese scientists to meet more scientists who are practicing sustainability research in all aspects, and to inspect the state-of-art research facilities and laboratories engaged in water, soil and plant sciences in South Australia. The Chinese scientists are very impressed with the philosophy of cross-agency collaboration and resource sharing system in the Waite Campus. Many delegates believe that this is a type of system that China could possibly model on to improve the efficiency of the apparently ever-growing investment in science and technology. It is also noted that the site visit further promoted the potential collaboration between scientists.

Major outcomes

Overall

- To promote the communication between scientists from both countries, and help to establish a network of scientists in each discipline, which will likely be explored in coming years in international collaboration;
- To promote the cross-disciplinary collaboration among all scientists from both countries and *within* each country;
- To effectively promote the exchange of advancements in dealing with sustainability in the areas of water, energy and agriculture between the two countries;

Specifically

- A joint program on “Metals in Asia” is to be initiated after the symposium between Chinese Academy of Sciences and CSIRO with external funding from industry. This project will likely expand to include other countries in Asia, which will further promote the development of sustainability in mining industries in the region;
- A potential China-Australia Center for Water Resources is being initiated during the symposium, this will be a major step forward in promoting the collaboration in water science between the two countries, and will be a key complement to the existing China-Australia joint lab on soil environmental sciences;
- A joint program in environmental management and policy is under consideration as a result of the site visit to CSIRO in Adelaide.

PARTICIPANTS FROM AUSTRALIA

Australian Convenor:

Professor Frank Larkins FAA FTSE
Deputy Vice Chancellor (Research), University of Melbourne

Mr Colin Walters
General Manager, Science Group, Department of Education, Science and Training

Professor Clive Bell
Executive Director, Australian Centre for Mining Environmental Research

Dr Bill Bellotti
School of Agriculture and Wine, University of Adelaide, Roseworthy Campus

Mr Don Blackmore FTSE
Past Chief Executive, Murray Darling Basin Commission

Professor W W S (Bill) Charters FTSE
Workshop Convenor
Chairman of Cooperative Research Centre for Spatial Information

Dr Deli Chen
Senior Research Fellow, School of Resource Management, Institute of Land and Food Resources, University of Melbourne

Dr Gavin Conibeer
Deputy Director – Third Generation Strand Centre of Excellence for Advanced Silicon Photovoltaics and Photonics, UNSW

Ms Bronwyn Deane
Assistant Director, International S&T Collaboration Branch, Science Group,
Department of Education, Science and Training

Professor Rodger Grayson
Director, CRC for Catchment Hydrology

Dr David J Harris
CSIRO Energy Technology

Dr Sandra Kentish
Research Project Leader, CRC for Greenhouse Gas Technologies

Professor John Langford FTSE
Workshop Convenor
Director, Melbourne Water Research Centre, University of Melbourne

Dr Keyu Liu
Senior Research Scientist, CSIRO Petroleum

Professor Bruce McKellar FAA
Foreign Secretary, Australian Academy of Science
Professor of Theoretical Physics, University of Melbourne

Dr Mike McLaughlin
Workshop Convenor
Research Director, CSIRO Land and Water

Dr Yibing Ma
CSIRO Land and Water

Professor Tom McMahon FTSE
Department of Civil and Environmental Engineering, University of Melbourne

Professor Zed Rengel
Soil Science and Plant Nutrition, University of Western Australia

Professor Jim Scott
Chair Mixed Farming Systems, Centre for Sustainable Farming Systems, School of Rural Science and Agriculture, University of New England

Professor Andrew Smith FAA
Workshop Convenor
Soil and Land Systems, School of Earth and Environmental Sciences, University of Adelaide

Dr Jennifer Stauber
Senior Principal Research Scientist, Centre for Environmental Contaminants Research, CSIRO Energy Technology

Dr Caixian Tang
Associate Lecturer, Department of Agricultural Sciences, La Trobe University

Dr Mark Tibbett
Director, Centre for Land Rehabilitation, University of Western Australia

Dr Stephen D White
Distributed Energy Theme Leader, CSIRO Division of Energy Technology

PARTICIPANTS FROM THE PEOPLE'S REPUBLIC OF CHINA

Chinese Convenor:

Professor Chen Zhu
Vice President, Chinese Academy of Sciences

Professor Cao Jinghua
Assistant Director General, Bureau of International Cooperation, CAS

Professor Fu Bojie (Workshop Convenor)
Director General, Key Lab of Systems Ecology, Research Centre for Eco Envir
Sciences, CAS

Professor Kang Shaozhong
Professor in Irrigation Science and Water Resources; Director Center for Agricultural
Water Research in China, China Agricultural University, East Campus

Dr Li Xin
Cold and Arid Regions Environmental and Engineering Research Institutes, CAS

Professor Liu Baoyuan
School of Geography, Beijing Normal University

Professor Liu Guobin
Deputy Director, Institute of Soil & Water Conservation (CAS)/Ministry of Water
Resources

Mr Liu Zuozhang
Minister Counsellor, Embassy of the People's Republic of China, Canberra.

Professor Lu Yonglong
Bureau of Comprehensive Planning, CAS

Professor Luo Shiming (Workshop Convenor)
President, South China Agricultural University

Professor Peng Shaolin
Director, Institute of Ecology and Evolution, Zhongshan University

Professor Qin Boqiang
Nanjing Institute of Geography and Limnology, CAS

Mr Tang Jian
Attache, Embassy of the People's Republic of China, Canberra.

Professor Tao Shu (Workshop Convenor)
Laboratory for Earth Surface Professes, College of Environmental Sciences, Peking
University

Professor Wu Jinshui
Vice Director Institute of Subtropical Agriculture, CAS

Professor Xia Jun (Workshop Convenor)
Institute of Geographical Sciences and Natural Resources Research, CAS

Professor Xing Xuerong
Chinese Academy of Sciences

Professor Yang Yunfei
Institute of Grassland Science, Northeast Normal University

Professor Zhang Jiabao
Institute of Soil Science, CAS

Professor Zhang Lei
Institute of Geographical Sciences and Natural Resources Research, CAS

Mr Zhao Qingqing
First Secretary, Embassy of the People's Republic of China, Canberra

Professor Zhao Xueyong
Cold and Arid Regions Environment and Engineering Research Institute, CAS

Professor Zhu Yongguan
Head Research Centre for Eco-environmental Sciences, CAS

AUSTRALIA CHINA SYMPOSIUM 2004 PROGRAM

SUNDAY 17 OCTOBER 2004

15.30 Introduction and Official Welcome by Professor Frank Larkins AM FAA FTSE

15.45 Keynote Presentations:

CAS Vice President, Dr Chen Zhu

DEST General Manager Science Group, Mr Colin Walters

16.15 Presentations for 5 minutes by Symposium Convenors on thematic areas of S&T.

Ecosystem Management Workshop:

Australian Convenor: Dr Mike McLaughlin

Chinese Convenor: Professor Fu Bojie

Environment and Energy Workshop:

Chinese Convenor Professor Tao Shu

Australian Convenor: Professor Bill Charters FTSE

Sustainable Agriculture Workshop:

Australia Convenor: Professor Andrew Smith FAA

Chinese Convenor: Professor Luo Shiming

Water Workshop:

Chinese Convenor: Professor Xia Jun

Australian Convenor: Dr John Langford FTSE

MONDAY 18 OCTOBER 2004

08.30 to 10.30 Commencement of Four Workshops covering Ecosystem Management, Environment and Energy, Sustainable Agriculture and Water.

11.00 to 12.30 Workshops continue

15.15 to 15.45 Closing Session: Mutual Collaboration and Closing Remarks

SITE VISITS - ADELAIDE, SOUTH AUSTRALIA

TUESDAY 19 OCTOBER 2004

- 10.30 **CRC for Water Quality and Treatment, Australian Water Quality Centre**
Host: Dr Denis Steffensen, Deputy Chief CEO
- 13.00 **University of South Australia**
Delegation met by Ms Pauline Lowe, International Relations Officer
Welcome by Professor Andy Koronios, A/g Pro Vice Chancellor & Vice President, IT, Engineering & Environment
- 13.45 Research Projects:
Water:
Professor Bill Richards, Director, SA Centre for Water Science and Systems
Dr Bo Jin, Senior Research Fellow, Natural and Built Systems
Sustainable Agriculture:
Professor John Fielke, Director, Agricultural Machinery Research & Design Centre
Ecosystem Management:
Professor Ravi Naidu, Director, Centre for Contamination Assess & Remediation
Dr Zuliang Chen, Adjunct Research Fellow, IT, Engineering & Environment
Energy and Environment:
Dr Jerzy Filar, Foundation Professor of Mathematics and Statistics
- 15.15 **Ian Wark Research Institute (IWRI)**
Hosts: Professor Ian Davey, Pro Vice Chancellor & Vice President, Research and Innovation, and Professor John Ralston FTSE
Presentation on Ian Wark Research Institute: Prof John Ralston FTSE, Director, Ian Wark Research Institute
Tour of Institute: Dr Terry Wilks, Centre Manager and Ms Shuhua He

WEDNESDAY 20 OCTOBER 2004

- 09.20 **Waite Institute, University of Adelaide/ CSIRO Land and Water**

Morning Tea
Host: Dr Michael McLaughlin, Research Director, CSIRO Land and Water
- 10.00 Tour of CSIRO
- 11.15 Presentations by:
Professor Sally Smith, Director, Centre for Plant Root Symbioses
Dr Petra Marschner, Lecturer, Soil and Land Systems
Dr Murray Unkovich, Adjunct Lecturer, Soil and Land Systems
- 13.30 Tour of Waite Institute

SITE VISITS FOR PROFESSOR CHEN ZHU – MELBOURNE, VICTORIA

TUESDAY 19 OCTOBER 2004

09.55. Bio21 Institute Office

Host: Professor Richard Wettenhall

10.40 Walter and Eliza Hall Institute of Medical Research

Host: Professor Peter Colman FAA FTSE, Head of Institute's Structural Biology Division

12.30 Monash University

Host: Professor David de Kretser FAA FTSE, Director and Professor Institute of Reproduction and Development

Also attending:

Dr Andrew Elefanty, Dr Ed Stanley, Dr Paul Simmons, Peter McCallum Institute, Dr Paul J. Verma, Senior Research Fellow, Monash Institute of Reproduction & Development, Centre For Early Human Development.

14.00 Monash Medical Centre, Institute of Reproduction and Development

Host: Dr Martin Pera, Professor and Co-Director of Centre for Early Human Development

SUMMARY OUTCOME OF THE ECOSYSTEM MANAGEMENT WORKSHOP

Convenors: Professor Zhu Yougguan, Dr Mike McLaughlin

Background

Despite large differences in population, Australia and China share many environmental problems that threaten ecosystem health:

- Increasing pressures on farmers to produce more from less land
- Pressure to stop land clearing
- Increasing urbanisation of populations leading to local environmental pressures on ecosystems
- Recognition of economic values of ecological resources (“ecosystem services”)
- Imperative in global food and fibre markets to remain clean and green, and to be seen this way
- Kyoto protocol/greenhouse issues

The science underpinning the study of these issues is common, so that collaboration between the two countries is likely to yield benefits in both Australia and China.

Workshop

Several presentations were made by the Australian and Chinese in the general areas of ecosystem management to control biodiversity and desertification and in environmental pollution assessment and remediation.

China

Prof Yongguan Zhu: Research Center for Eco-environmental Sciences, CAS (convenor)
Prof Bojie Fu: Bureau of Environment and Resource, CAS
Prof Xueyong Zhao: Cold and Arid Zone Institute of Environment and Engineering, CAS
Prof Keping Ma: Institute of Botany, CAS
Prof Yunfei Yang: Northeast Normal University
Prof Shaolin Peng: Zhongshan University

Australia

Professor Mike McLaughlin: CSIRO Centre for Environmental Contaminants Research (CECR), CSIRO Land and Water (convenor)
Professor Clive Bell: Australian Centre for Mining Environmental Research
Dr Jenny Stauber: CECR, CSIRO Energy Technology
Dr Mark Tibbett: Centre for Mined Land Rehabilitation, University of Western Australia
Prof Yibing Ma: Institute for Soils and Fertilisers, CAAS and CSIRO CECR

Workshop Recommendations

Many common areas of interest were identified at the workshop, and some very fruitful outcomes are already developing from the workshop.

The following areas of joint interest were identified as topics for potential collaboration between scientists in the two countries.

1. Ecological knowledge to re-establish ecosystems on degraded soils (polluted, salinised, eroded, acidified, desertification, mine-affected, etc.).
2. Research to develop risk-based regulations for controlling contamination in waters, sediments and soils – both scientific and regulatory exchanges of information/data needed. Includes analytical/ecotoxicological methodologies. Possible proposal for a “Metals in Asia Initiative” to link Australian and Chinese research on regulations and remediation.
3. Modelling ecosystem changes with time and with different management (e.g. climate change).

Additional recommendations to foster collaboration between Australia and China were

- Student exchange/access to demonstration/contaminated and/or degraded case study sites
- Paired/parallel sites/studies examining common issues/problems in both countries.

Since the workshop, Profs. McLaughlin, Ma, and Zhu have been negotiating a joint research proposal under Issue (2) above entitled “Metals in Asia”, which has the aim of developing risk-based criteria for soil protection from pollution by heavy metals. Interest in this proposal has already been expressed by the mining industry and CAS/CAAS, and the proponents are seeking further sponsorship opportunities.

Professor Mike McLaughlin
7 January 2005

Professor Yongguan Zhu

**SUMMARY OUTCOME OF THE ENERGY AND ENVIRONMENT
Convenors: Professor Tao Shu, Professor Bill Charters**

In this workshop the presentations from China focused strongly on energy policy and planning issues, environmental degradation due to increasing use of finite fossil fuel reserves, and methodologies useful in the prediction of future energy use with increasing economic development. A critical factor in the success of Government planning for increased energy efficiency technologies, and for a gradual transition to renewable energy resources is the sole ownership of the energy resources by the State in China. There was full recognition also however that fossil fuels in general and coal in particular would form a short term to medium term bridge to a future energy economy based possibly on nuclear power and renewable energy supplies.

From the Australian side the presenters concentrated mainly on new technologies for energy supply and environmental protection. This included steps towards “cleaner coal” utilisation, methodologies for more efficient exploration techniques involving natural gas and oil, possibilities for geo sequestration of carbon dioxide formed from fossil fuel burning in stationary plant, manufacturing of advanced third generation photovoltaic cells, and the introduction of distributed energy systems to supplement the predominant conventional centralized energy grid system currently in operation throughout Australia.

The format of the Workshop allowed adequate time for both formal presentations on the above topics, for an extensive and fruitful exchange of views on the critical topics concerned, and for a preliminary think-tank session of future topics for research, development, demonstration and even commercialisation suitable for inclusion in a joint China/Australia Energy and Environment Programme.

Workshop Recommendations

Now that initial contacts have been made between key workers it was seen to be essential that in the future a consolidated data base be established both in Australia and China on the DEST and Academy Websites so that national workers can quickly access the appropriate staff, laboratories and main programmes in the partner nation. In this respect the Virtual Centre proposal generated by the Water Workshop may provide a suitable prototype for the other Workshop sessions.

The following topics were clearly identified as being appropriate for joint work in the energy and environment field between the two countries.

- Clean coal technologies focussing strongly on coal gasification with a possibility of China joining in with the Australian CSIRO/Industry demonstration project.
- Geo sequestration site search techniques for locating and matching Sources and Sinks of carbon dioxide available through the CO2 CRC.
- Exchange and utilisation of background material on oil and natural gas exploration methodologies developed within Australia by CSIRO who have already generated contact with China on this topic.
- Research work on third generation photovoltaic cells with the potential to achieve high solar conversion efficiencies with minimal use of high grade silicon. This could involve the

solar industry and universities and lead to early demonstration and adoption of these technologies.

- Distributed power systems involving fuel cells, wind and PV power, and micro turbines with a strong focus on remote area power generation systems suitable for use in mining camps and indigenous settlements. The Australian “Bushlight” Programme could form a basis for this cooperation.
- Contamination of heavy metals and organic pollutants caused by coal combustion.

SUMMARY OUTCOME OF THE SUSTAINABLE AGRICULTURE WORKSHOP

Convenors: Professor Andrew Smith, Professor Luo Shiming

The Sustainable Agriculture Workshop comprised presentations from delegates whose expertise covers important fields that fall well within national research priorities in Australia and China. Maintaining and improving soil quality was a topic that ran through most of the presentations.

The context in China, where agricultural practices are rapidly changing, was well illustrated in the first presentation, in which the Workshop Co-Chair, Professor Luo Shiming (President of the South China Agricultural University, Guangzhou) emphasized the wisdom of combining traditional farming practices with modern science and technology in the diverse agro-ecosystems in China. Dr Caixian Tang (La Trobe University) assessed problems in agriculture that are associated worldwide with soil acidification and inherently acid soils, and also with soil salinization. Professor Wu Jinshui (Vice Director, Institute of Subtropical Agriculture, CAS, Changsha) described the need to manage soil organic matter in the subtropical region of China. Dr Deli Chen (University of Melbourne) focused on the pressing need to optimise water and nutrient (especially nitrogen) input while minimizing environmental impacts: another area of huge importance worldwide and especially in present-day China. Professor Zed Rengel (University of Western Australia) addressed the needs to use nutrient-efficient crop genotypes as well as combining crops by intercropping, with examples from his considerable collaborative work with scientists from China. Professor Zhang Jiabou (Institute of Soil Science, CAS, Nanjing) presented data from soil surveys carried out over 20 years in the North China plain, in which approximately 50% of China's food is grown, that demonstrate increases in organic matter and phosphate but also in soil pollutants. Dr Bill Bellotti (University of Adelaide) described his work on the Loess Plateau, Gansu Province that initially focused on demonstrating usefulness of conservation tillage in rainfed farming systems, but has evolved from 'proof of concept' to farmer evaluation of research outcomes. The Loess Plateau is also the site of work by Professor Liu Gobin (Institute of Soil and Water Conservation, CAS, and Ministry of Water Resources, Yanling, Shaanxi); this covers restoration and sustainable management at watershed scale. Lastly, Professor Jim Scott (University of New England) gave an excellent overview on prospects for sustainable agriculture at the whole-farm scale, partly from an Australian perspective but also building on his experiences in south central China. Unfortunately, Professor Liu Shirong (Vice President, Chinese Academy of Forestry Sciences) was unable to attend; he had planned to address issues relating to forest restoration, including hydrology, in sub-alpine western Sichuan.

In my introductory remarks to the Symposium I touched on two themes that were to receive significant attention in the individual presentations. The first was the 'Triple Bottom Line', a concept that originated in sustainable forestry, and comprises economic, environmental and social issues in relation to needs for profitability of sustainable agriculture. This theme was picked up, for example, with respect with the need to curb over-use of fertilizers beyond what are actually needed to maximize yields (as opposed to what farmers believe are needed), and so to reduce water pollution. It is important that social issues in sustainable agriculture are receiving much attention in China, especially in the context of 1) changing farm practices towards high-value produce (where educating farmers in modern practices is seen as important) and 2) ongoing population losses from the rural to urban employment. (China recently became a net importer of rice.)

The second theme that I touched on related to scales: i.e. scales of research (test-tube – glasshouse – field trials – farm application) and the time scales associated with putting research discoveries into practice. Risk management is an important factor at the top end of

the scale, and one that is receiving increasing attention. The Workshop had clear links to the others in the Symposium in all these respects.

The Workshop delegates did not discuss detailed priorities for future collaborations, but we see benefit in the formation of 'Virtual (electronic) Centres' for networking. A priority area that was singled out is environmental modelling and systems analysis, where Australia has skills that are already being applied in collaboration in China, and can be expanded. Another area that would benefit is handling large environmental data sets that have accumulated in China and should be made accessible internationally: not a simple task. There are many other areas, including improving fertilizer application and soil quality, and development of better plant varieties (especially rice), where new collaborative opportunities will undoubtedly arise, to the benefit of both countries.

In relation to development of collaborations (past, present and future), the 'bottom-up' approach that arises from personal contacts and hence knowledge of complementary research expertise was seen as very valuable; it can lead to larger scale initiatives, starting with short visits by established researchers and selected postgraduate students and post-docs. However, there is then a need to have dedicated funding to underpin such visits by supporting research costs. At higher scales of collaborations, awareness of government priorities in sustainability and ecosystem management, and willingness to exploit these in seeking funding for major initiatives, are essential. Australia has several funding schemes that allow research collaborations. The DEST International Science Linkage programs, including that for China (in which I am involved as Chair of the assessment panel), are highly competitive and are under review. Research institutions in Australia certainly have much to offer, though I have some concerns about our decreasing research emphasis on aspects of agricultural science (especially soil science) that are relevant to needs in Australia, China and elsewhere in the world.

I was personally delighted not only with the Workshop that I convened but with the Symposium overall – it was a most welcome outcome of the visit by Professor Yongxiang Lu, President of the Chinese Academy of Sciences, to Australia in 2002. (I was even more delighted that so many delegates from China followed Professor Lu's footsteps by visiting Adelaide.) The interlinked workshop themes in 'Living sustainably – what does it mean for you?' have made an excellent start to the series of Australia-China Symposia. I am aware of common interests in the two countries in nanoscience and technology that may form the theme of another Symposium, and I believe that 'Health science – healthy people' would also be a good theme. Whatever the theme for the third Symposium, my own University is very interested in being the host.

SUMMARY OUTCOME OF THE WATER WORKSHOP

Convenors: Professor John Langford, Professor Xia Jun

1. INTRODUCTION

The Australia China Symposium: Living Sustainability – What does this mean for you? was a joint venture between Chinese Academy of Sciences, the China Natural Science Foundation, the Australian Department of Education Science and Training, the Australian Academy of Science, and the Australian Academy of Technological Sciences and Engineering. This inaugural symposium is viewed by both governments as an extremely significant opportunity – not only to discuss areas of mutual interest between China and Australia, but also to act as a platform to develop a platform to develop strategic relationships in the area of sustainability including water resources.

This report sets out the findings of the Water Workshop including a recommendation to establish a China – Australia Water research Centre.

2. INSTITUTIONAL ISSUES

2.1 Integrated River Basin Management

The presentations and discussion at the Water Workshop highlighted the importance of integrated river basin management in achieving sustainable utilization of water resources. Both China and Australia are facing challenges in achieving sustainable utilization of water and could learn from each other by studying the diversity of approaches to these challenges.

Selection of river basins such as the Murray Darling Basin in Australia, and the Haihe River Basin in China, for example, and establishing a ‘twinning’ arrangement between the river basin management authorities would be a valuable initiative. The management authorities, scientists, hydrologists and other professionals could then share experiences, exchange staff and embark on shared projects to mutual advantage.

The first step in establishing a twinning arrangement between two river basin management authorities could be to benchmark the arrangements for integrated river basin management against an agreed set of criteria such as:

- a stable treaty or agreement establishing the river basin authority;
- clearly defined governance of the river basin authority;
- a river basin authority with technical and administrative resources;
- integration across natural resource issues;
- a strategy for research, knowledge generation and application.

The benchmarking would identify areas of mutually beneficial collaboration and provide an agenda for follow up discussions. Reviews of case studies of integrated river basin management will identify the important challenges facing river basin managers, and provide the framework for determining research priorities.

2.2 Linking Research to water managers and industry

Development of research that is focussed on solving the important land and water management challenges is vital. Ensuring that the results of that research are applied with beneficial outcomes is also vital. Both Australia and China have experience in linking

industry, and water management agencies which could be shared to mutual advantage. Australia has developed the Cooperative Research Centre (CRC) concept linking industry, research and educational organizations in a joint venture. The CRC for Catchment Hydrology is a virtual research centre linking the resources of the partners to develop and implement program of research focussed on solving important water management challenges. The CRC also has a program to stimulate adoption of the Centre's research outputs.

Exploring approaches to linking research, water managers and industry is an area of potentially beneficial collaboration between China and Australia.

3. WATER POLICY & MANAGEMENT

3.1 Water (allocation) Policy

Water (allocation) policy is the foundation of good water management. China and Australia have different approaches to water policy providing opportunities to explore the different policy approaches, particularly in situations where the water resources are stressed. Accounting for water use, and linking allocations to appropriate shares of the available water resource is a policy question of importance to hydrologists. A workshop structured around water policy and planning issues of importance to both Australia and China would facilitate sharing of experiences and identification of areas of mutually beneficial collaboration.

3.2 Groundwater Management

Managing stressed groundwater resources is a vital issue for both Australia and China. Comparing the experiences of Australia and China would be a valuable learning experience for both countries, and assist in defining mutually beneficial research projects that could be conducted in parallel in both Australia and China. Such paired research projects would create a network of Chinese and Australian hydrogeologists, and groundwater managers.

3.3 Irrigation Water Efficiency

The water resources of Australia and North China are stressed and it is vital that irrigation gives the best return in terms of food production and economic output relative to water use. Improving the water efficiency both of the channel conveyance system and on farm irrigation is therefore relevant to both countries. Sharing experiences and developing collaborative or linked research projects could be mutually beneficial.

4. CLIMATE & CATCHMENT MODELING

4.1 Linking Climate and Catchment Models

Evaluating the potential impacts of climate change on available water resources is a crucial issue for both countries. Often Global Climate Models do not produce output in a form that readily allows calculation of the effects of climate change on water resources. Sharing experiences in the linkage of climate change and hydrological models is an area with significant potential for developing collaborative research.

5. A CHINA AUSTRALIA – WATER RESEACH CENTRE

The Water Workshop of the Australia China Symposium: Living Sustainability – What does this mean to you? Identified the 6 issues described above as having potential for mutually beneficial collaboration:

1. integrated river basin management;
2. linking research to water managers and industry;
3. water (allocation) policy;
4. groundwater management;
5. irrigation water efficiency; and
6. linking climate and catchment models

The concept of establishing a China Australia Research Centre was strongly supported by the participants in the Water Workshop. The Centre could be a virtual research centre, or forum that facilitated initiation of mutually beneficial research that could be carried out in parallel in both countries. The Centre could also facilitate exchange of researchers, and organization of workshops on the outcomes of the parallel research projects. The concept of establishing an– Water Research Centre should be discussed with the respective Academies and developed into a detailed proposal.

6. FOLLOW UP WORKSHOP

In order to finalize and agree on the detailed arrangements for establishing a China - Australia Water Research Centre a meeting will be required. This meeting could be held in conjunction with a workshop of research leaders to develop, from the strategic issues listed above, a small number of focussed research projects suitable for implementing in parallel in both countries. Starting the Centre with a small number of carefully selected research projects addressing critical water management challenges facing both countries will enhance the chances of success in this important venture.

Holding such a meeting in China would allow participation of a wider group of Chinese researchers and save them the time consuming and costly travel to Australia. The Australian participants would gain from seeing the challenges facing their Chinese counterparts.

7. RECOMMENDATIONS

The Water Workshop of Australia China Symposium (October 2004) recommends that the Chinese Academy of Sciences, the China Natural Science Foundation, The Australian Academy of Science, and the Australian Academy of Technological Sciences and Engineering consider establishing a China – Australia Water research Centre to foster collaborative water research in the two countries.

Professor John Langford