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Report to International Development Research Centre (IDRC) &  
the Chinese Academy of Sciences

Final report on a joint  
Chinese Academy of Science -  
University of British Columbia - IDRC Collaboration

# **Geographic information systems for the conservation of the biological diversity of biosphere reserves of China**



Dinghushan Biosphere Reserve, Guangdong, China, December, 1991 photograph by Gordon Brent Ingram



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## Executive summary

This is the final report on an aborted collaboration between

1. the Man and the Biosphere Programme of China (MAB China) of the Chinese Academy of Sciences (CAS),
2. the Landscape Ecology Geographic Systems Laboratory (LEGIS) of The University of British Columbia (UBC) and
3. the Singapore office of the International Development Research Centre (IDRC).

The recommendations of this report reflect the UBC decision to not collaborate directly with MAB China at the present time and an unwillingness to work with IDRC Singapore on subsequent biological diversity conservation research, and related development of geographic information systems, in the near future. Other conservation and research collaborations in China are being developed instead.

The biosphere reserves of tropical and subtropical China have strategic importance for conservation of the biological diversity and genetic resources of the region. China and Canada were both early signatories of the *Convention on Biological Diversity*. These internationally recognized nature reserves, as well as those that lie between them, will undoubtedly be the subjects of expanded conservation efforts. Geographic information systems (g.i.s.), involving data entry, storage, and simulation in conjunction with biodiversity inventorying, mapping, monitoring, modelling and decision-making, hold considerable promise for the better land use planning and management of the territories and ecosystems within China's biosphere reserves.

However, the current administrative, personnel and technical contexts of China, both in Beijing and in the countryside, are in great flux and, in some cases, are in crisis. Given the declines in Chinese government funding of conservation and research, in recent years, the

position of foreign assistance programmes, in solving funding shortfalls for bureaucracies such as these, is problematic without extensive inside knowledge of administrations, both in Beijing and in the regions of respective protected areas. Over the next several years, the promise of g.i.s., for effective conservation of biological diversity in remote parts of southern China, can be only partially realized.

I was originally invited to China in 1989, while still a Ph.D. student at Berkeley, and finally found the time and funding to conduct a reconnaissance of some biosphere reserves in 1991. This reconnaissance was funded by the British Columbia Scholars in China Program and was conducted under the auspices of MAB China with additional funding support from The University of British Columbia. Subsequently, a collaboration was proposed by Stephen Tyler of IDRC Singapore between CAS and UBC with support from the IDRC. There was slightly over \$20,000. provided by the IDRC in 1992 and 1993 for UBC to service the CAS. I was asked to develop a proposal involving CAS, UBC, and IDRC to be originally completed by mid to late 1993. However, major problems became evident. The most serious obstacle was the unwillingness of MAB China to cooperate with other units of the CAS, ones that have had a much longer history at developing g.i.s. for nature reserves and working with land managers. For example, there had been virtually no contact between MAB China and the recently formed Biodiversity Committee of the Chinese Academy of Sciences nor the CAS Laboratory of Quantitative Vegetation Ecology headed by Professor Chang Hsin-Shih.

In May of 1993, MAB China abruptly insisted that a pilot project be developed for Xishuangbanna Biosphere Reserve, a southern China biosphere reserve that I had not visited. Coincidentally, while in Beijing in 1993, I was informed that there were already two other international projects in Xishuangbanna which appeared identical to the one requested by the MAB China unit of the CAS. And it became evident by mid-1993, there would be not funds available from IDRC for minimum levels of UBC participation in a collaboration and MAB China focused on obtaining funding directly from IDRC. Given that the human resources for the project provided by UBC had been without charge, work on the proposal was deferred and eventually cancelled.

This report functions as an overview of the UBC activities funded by IDRC through two seed grants in 1992-93. Monthly expense reports on the project account activity, involving IDRC funds, were sent directly to IDRC Singapore by UBC.

The accompanying reports recommend against Canadian funding of projects with MAB China until some basic conditions for cooperation, efficiency, and accountability are assured. Rather than moving to develop a prototypic g.i.s., at the present time, this report recommends a number of forms of IDRC support, for enhancing cooperation and technical exchange within the Chinese Academy of Sciences and affiliated institutions, which, if properly implemented, might lead up to an international collaboration for a biodiversity conservation-oriented g.i.s. in the coming years.

The benefits and products of the aborted collaboration, with its funding by UBC and IDRC have included:

1. intensive contact between Chinese and Canadian scientists including a visit to Canada and another to China;
2. identification of the needs for biodiversity conservation-oriented geographic systems for the biosphere reserves and other nature reserves of southern China particularly for MAB China;
3. assessment for requirements for long-term development of conservation planning and management capabilities for the tropical and subtropical forests of southern China;
4. employment of students at UBC in research on conservation of biological diversity in China; and
5. the completion of a number of reports expressly for the IDRC entitled:
  - i. **Conservation of biological diversity in the biosphere reserves of subtropical China: Obstacles and opportunities;**
  - ii. **Geographic information systems for the biosphere reserves of subtropical China: Some methodologies and prototypes; and**
  - iii. **Feasibility study for a geographic information system for biological diversity conservation in Xishuangbanna Biosphere Reserve, China.**

Based on my experiences working on this project, as well as having had over 12 years of international work and 20 years of forest and biodiversity conservation work, this report emphasizes the need for inter-agency cooperation within China and for long-term personnel development well beyond that needed for computer technicians. It is these things that will be crucial to successful geographic information systems and to actual increased levels of conservation and not the transfer of the computer technology which is becoming increasingly available in China without foreign assistance.



### **Goals of the project**

The goal of the project was to explore the needs of the CAS in its effort to strategize for the use of geographic information systems for decision-making related to the conservation of the biological diversity and genetic resources of the biosphere reserves of southern China. The emphasis has been exploration of the uses of g.i.s. technology, in

conjunction with better inventorying and monitoring, for more comprehensive and effective conservation in tropical and subtropical forest contexts - ones with extensive fragmentation and under extreme threat of loss of species and genetic erosion. A secondary goal was the development of a proposal for a prototype geographic information system for biodiversity conservation planning.

### **Intended benefits**

The benefits of the project were to go largely to the Chinese Academy of Sciences (CAS) and to the small office within it of MAB China. However, it became clear that administrative contradictions were emerging. Funding for MAB China was being within the CAS and the formation of a China Biodiversity Committee within the Chinese Academy of Sciences and did include much participation from MAB China.

A secondary benefit of the project could have been the building up of support facilities from within UBC and, in particular, from LEGIS in the Department of Forest Resources Management and the Landscape Architecture Program. However, the prospects of the IDRC funding necessary to develop UBC capabilities, somewhere between \$50,000. and \$100,000. spread over several years, began to look highly unlikely. Along with the IDRC support, this project was heavily subsidized by UBC. Prospects of such continued support from this university, at a time when it is looking increasingly for outside funding for basic operations let alone for training Chinese government personnel, are virtually nil.

### **Chronology**

- 1987 Mr. Zhao Guang and I worked together in a workshop at the East-West Centre Environment and Policy Institute, Honolulu on Biodiversity and Protected Areas.
- 1988I was invited to advise on a project on g.i.s. in Changbaishan Biosphere Reserve in northeast China.
- 1989The Director of the Changbaishan Biosphere Reserve, Professor Zhao, visited me at the Landscape Architecture G.I.S. Lab at the University of California at Berkeley.
- 1990I received a grant from the British Columbia Scholars in China programme to conduct research on biosphere reserves in China.<sup>1</sup>
- 1991Through the generous assistance of the Man and the Biosphere Programme, Unesco, Paris, a visit is arranged with MAB China, Beijing, along with two field visits to Fanjingshan Biosphere Reserve and Dinghushan Biosphere Reserve.<sup>2</sup>
- 1992Stephen Tyler of IDRC Singapore proposed support for project development.

■ There was an initial problem statement and literature reviews.

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<sup>1</sup> The Changbaishan project, by that time, was being conducted through ESRI-Germany in Munich and several conservation scientists suggested looking at the biosphere reserves of tropical and subtropical China is suggested.

<sup>2</sup> The field visits were under the auspices of MAB China in order to advise them on the development of an expanded programme for use of geographic information systems for biodiversity conservation. I filed "Report on a visit to the People's Republic of China hosted by the Man and Biosphere (MAB) National Committee of the Chinese Academy of Sciences 12/91" at UBC in January 1992.

■ There was a visit to Canada from a delegation from MAB China<sup>3</sup> to Waterton Lakes Biosphere Reserve, Alberta and LEGIS, UBC. It became evident that there were major differences in the goals and practices of MAB China personnel.<sup>4</sup>

1993 ■ I completed additional of literature reviews.

■ In May, I returned to Beijing to develop some joint reports and proposals with MAB China.

■ MAB China insisted that I quickly complete a case study for a g.i.s. for Xishuangbanna Biosphere Reserve on the Burmese frontier.

■ MAB China made it clear that they wanted me to develop a funding proposal for them directly to IDRC without funding for UBC. I explained that this was not really possible given that I was on salary and being funded by UBC.<sup>5</sup>

■ Conditions at MAB China continued to deteriorate in 1993.

1994

■ The final reports for the MAB China - UBC - IDRC collaboration were developed and reviewed.

■ The monthly record of UBC project accounts were submitted.

1995

■ The final version of the 1994 reports were forwarded to IDRC Singapore and Ottawa.

### **Achievements of collaboration**

1. The most important achievement of the project was to allow for increased contact between MAB China and UBC to develop realistic appraisals of both the needs for and constraints on the development of biodiversity conservation geographic

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<sup>3</sup> This rather large delegation consisted of the following individuals:

1. Zhao Xianying, Secretary-General of the China MAB (Man and the Biosphere Programme) National Committee (Chinese Academy of Sciences, 52 Sanlihe, 100864 Beijing China, fax +86 1 80 11 095)
2. Zhao Yong, China MAB National Committee (Chinese Academy of Sciences, 52 Sanlihe, 100864 Beijing China, fax +86 1 80 11 095)
3. Sun Danyuan, Research Director, Fanjingshan Biosphere Reserve (Fanjingshan Nature Reserve, China Department of Forests, Jiankang County, Guizhou Province 554400 China, telephone: +86 851 177)
4. Xie Zhi Xin, Director, Wuyishan Biosphere Reserve Fujian Wuyi Mountain National Nature Reserve (Sangang, Wuyishan, 354315 Fujian, China, telephone: +86 32382)
5. Zhang Quanyi, Director, Shennongjia Biosphere Reserve (Shennongjia Nature Reserve, Muyu Town, Shennongjia, Hubei 442421, China)

<sup>4</sup> After receiving funds from UBC, two individuals admitted to at least "double dipping" in per diems from both IDRC and Unesco for the same project and travel days. However, it was not possible for UBC to confirm this. Suspicions were reported back to the IDRC administrator for the grant, Stephen Tyler in Singapore. That 1992 visit from the CAS personnel took up much of the total funds provided to UBC by the IDRC. More problematic was the rift between the delegates from southern China and Professor Madam Zhao and Mr. Zhao based in Beijing. The "bad blood" even became worse. For example, Madam Sun, the wife of the Director of the Fanjingshan Biosphere Reserve, was not present at UBC in the last week in Vancouver to reportedly buy souvenirs and gamble in Vancouver's Chinatown. Some of these events were verified. All and all, it was a taxing visit for those of us at UBC.

<sup>5</sup> Professor Madam Zhao and Mr. Zhao indicated that they did not feel that UBC collaboration was a priority for them and asked me to provide services directly to them as an IDRC consultant. I politely declined.

information systems in Beijing and south China. This dialogue was not easy to develop given communications and disparities between the institutions, languages, and countries.

2. The project provided the support for one (rushed) feasibility study for the use of geographic information systems for one biosphere reserve, Xishuangbanna.
3. The project provided support for UBC's LEGIS, to upgrade its 1990-93 bibliography on new initiatives in biodiversity conservation-oriented geographic information systems, and to review related material for south China.

### **Analysis of obstacles**

By May of 1993, some very glaring obstacles became apparent for the long-term development of institutional capabilities for development, maintenance and use of biodiversity conservation-oriented geographic information systems.

1. "Biosphere Reserve" is an added label to most secure of the current Chinese government categories of protected areas, the "Nature Reserve." Nature Reserves are usually managed under the auspices of a national agency such as the Ministry of Forestry which has responsibility for the largest number of nature reserves. The Reserve Administrator / Director / Administrator is usually a major local official with only limited involvement with Beijing and will have the central role in development and use of geographic information systems. The relationships of managers to MAB China are highly variable and are not obligatory. Without clear, long-term agreements between the reserve manager and MAB China, an initiative for a g.i.s. by MAB China is doomed to be ineffective if not highly disruptive to efforts for local management of nature resources. The disparity in perspectives between MAB China in Beijing and local reserve managers, at a time when MAB China's base funding is effectively declining, is increasing.
2. Within the institutional frameworks of CAS, are a number of research institutions both in Beijing and in provincial capitals. Some of these institutions have focused their work on natural areas which have eventually become nature reserves and which have recently been overlaid with the additional label of biosphere reserve. In terms of both data and research infrastructure, it is these institutions, and not Beijing, that will determine the nature of expanded programmes of monitoring of biodiversity. Again, without very clear agreements between MAB China and potential several local research agencies, that extend to those for funding and the involvement of donor agencies, expanded research programmes are bound to be highly inefficient, if not of questionable jurisdiction and legality.
3. MAB China, while an important member of the international MAB network, has declining

core funding<sup>6</sup> and support from within CAS. There appear to be serious obstacles to the development of a prototype g.i.s through MAB China because of its lack of contact with the Biodiversity Committee of CAS, the Institute of Quantitative Vegetation Ecology, Institute of Botany of CAS, and managers of some biosphere reserves.

4. The most problematic obstacle to development of a "sustainable" programme of use of g.i.s. in biosphere reserves is due to the economic and personnel conditions within China. An institution would need several well-trained individuals to act as the g.i.s. designers, administrators, managers and users. This will invariably require at least two years of post-graduate training in English. Beyond the more rudimentary technical aspects of such systems, which cannot extend to system design, there is no such training in China nor is there expected to be in the next several years. Consequently, the individuals necessary to develop and produce on-going benefits from these systems would have at least Master's degrees from foreign universities. Within China, they would be highly prized individuals who could probably make 5 to 10 times the government salaries while working the private sector. There is absolutely no way to force such an individual, that might have been trained under the auspices of MAB China and with the support of IDRC, to stay working on poorly funded biodiversity conservation projects.

### **Policy recommendations**

1. It is very possible to develop a prototypic g.i.s. for biodiversity conservation in the biosphere reserves of south China. But there will need to be several years of prerequisite project support which focuses on the following:

- a. extensive theoretical research in conservation biology, landscape ecology and information systems that involves collaboration between Chinese and foreign universities;
- b. fostering authentic linkages between MAB China, the Biodiversity Committee of CAS, and the Institute of Quantitative Vegetation Ecology, Institute of Botany, CAS;
- c. fostering authentic linkages between MAB China, the nature reserve administrations, and the regional / local research institutions; and
- d. preparing potential overseas graduate students with English studies and workshops on theoretical and applied aspects of g.i.s.

Without this, it is unlikely that even a largely, well-funded g.i.s. project would be successful and effectively used in ongoing management of ecosystems and biological resources

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<sup>6</sup> Reportedly, there were personnel cuts in MAB China Beijing in 1992-93 from 7 to 5.

as well as in the procurement of germplasm of genetic resources. In order to implement these preparatory programmes, it will probably be necessary to chose a lead agency unit, within CAS other than MAB China, in order to develop a joint administrative structure that provides the long-term personnel and service framework which MAB China is expected to lack in the near future.

2. Because of the involvement of other international organizations, Xishuangbanna Biosphere Reserve may well be the best candidate for the prototypic g.i.s. However, if this were the case, the administration of the project might best be supported directly through a local institution such as the Institute of Ecology and Geobotany in Kunming or the reserve administration. It may well take 2 to 3 years of negotiating to develop an administrative structure that also included such crucial agencies as MAB China, the Biodiversity Committee of CAS, and the Quantitative Vegetation Ecology Laboratory of the Institute of Botany.
3. Given the problems with inflation and rapid changes in Chinese administrative procedures, it is strongly recommended that any funding to any of these prospective institutions, particularly MAB China, involve a significantly higher level of accounting review and monitoring than is normally involved in an IDRC project.