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DRAFT REPORT
on a
VISIT TO FUZHOU, FUJIAN PROVINCE, CHINA
5th to 14th OCTOBER 1997

UK SPECIALIST SUPPORT FOR INTEGRATED DISASTER MANAGEMENT
IDNDR-FJNDR
SUPPORTED BY BRITISH COUNCIL and
FUJIAN PROVINCE SCIENCE AND TECHNOLOGY COMMISSION

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R J MOORE Institute of Hydrology.

SUMMARY

British Council [BC] have supported contributions to the FuJian Natural Disaster Reduction programme for a number of years now. Interest expressed by the FuJiang Province Science and Technology Commission[FPSTC] in the establishment of a Disaster Management Centre [DMC] could provide the basis for more coherent BC/UK support, building on earlier efforts. Since the DMC would interact with many different organisations [both technical and executive] throughout the rapidly developing Province, a pre-feasibility study [PFS] is essential to its proper establishment and execution, especially if substantial external investment is anticipated. Resources available to BC are probably insufficient for the complex PFS required, so a three phase approach is recommended, with Phase I being scoping activities to make a PFS more attractive to donors or development banks.

OBJECTIVES

The purpose of the visit from British Council viewpoint, was to provide relevant UK technical expertise to contribute to the Fujian Province annual event marking the International Decade for Natural Disaster Reduction. The Fujian Provincial Science and Technology Commission which supports the event [FJNDR] is interested in obtaining [UK] technical support for a more coherent and effective approach to integration of disaster management into the sustainable development of the province. Visits by Fujian scientists and decision makers to UK and BC supported visits to the same event in previous years had been relatively successful, but lacked substantial outcome. BC therefore requested that attempts be made this year to provide a framework for continued linkages with substantive objectives.

ACTIVITIES

The two scientists, Bob Moore a hydrological/flood system modeller and Jim Williams, environmental scientist with remote sensing and information management skills, visited Fujian Province in south eastern China during the week 6-13th October. They visited scientists in the meteorological service, the hydrological forecast system, the Information centre [remote sensing] and the Commission's computer network centre. They attended a seminar on Water in Sustainable development at which substantial presentations were made by a wide variety of contributors. They participated in public awareness raising meetings both formal [with the deputy

governor of the province] and informal in the main square. The week's work concluded with preparation, presentation and discussion of ideas for going forward together.

FINDINGS

The approximately 30 million people in Fujian Province are subject to a variety of natural disasters including floods, droughts, typhoons, tidal surges, earthquakes, wild-fires, water pollution events, agricultural pests and diseases, and other threats to sustainable development. As a province, Fujian is developing rapidly and the provincial government is committed to sustaining this process making best use of science and technology for further development and to prevent or mitigate any natural disasters that may arise.

The FPSTC is perhaps unique in the world in trying to develop a coherent approach to all these problems through its broad ad-hoc committee, using the IDNDR as a mechanism to advance its objectives and widen public awareness. FPSTC recognise this uniqueness as a strength and envisage developing capacity further both for local benefit and for engendering high level training capability for use in the international arena from its role as pioneering model.The benefits achieved so far from the disaster management programme [e.g. much reduced flood river levels in Fuzhou] lend credibility to this approach, which has overt political support, for example from the Vice Governor of Fujian province, Wang Liangtuan in his January 1997 paper to the International Forum on combining the Science of Calamities with Public Control. That the Environment Protection Bureau is also part of the Ad Hoc committee should help to ensure that slowly developing [pollution type] disasters are also taken into account.

While the technical capability of the many organisations involved in the current 5[1] component disaster defence system appears to be generally good, it is clear that there are a number of ways that UK expertise and technology could assist the process of improving and helping coordinate progress in diverse activities, not least in the areas of flood forecast/warning, satellite environmental monitoring and information management. A clear opportunity for further directed collaboration exists. FPSTC see joint execution of a pre-feasibility study to identify requirements and evaluate benefits from an integrated approach to natural disaster management in the province as a priority, with a view to subsequently seeking substantial investment towards implementation.

One particular source for concern that any such study would need to examine carefully is the difficulty of maintaining and improving effective inter-institutional links both between rapidly evolving technical organisations in Fujian [as elsewhere], and between these organisations and decision makers, during what is clearly a period of major development and fundamental change in many aspects of life in China today. Would better information supply be matched by better implementation decisions and benefits for all, or is the element of technology push excessive? For instance it is well recognised that one disadvantage arising from the several existing barrages on the river Min, is that pollutants now have a much longer transition period in the river. Flushing of the river consequent on prior notification of exceptional wet weather might be beneficial but would require good co-ordination of the meteorological, hydrological and executive services up and down the river. Present evidence suggests that such links may not be sufficiently strong, even between the technical units. A highly flexible, evolutionary approach will need to be taken in any improvement of the disaster manageemnt system, to ensure that it is 'future compatible' and

[1] The five principal components of the existing disaster defence system include: biological belts, flood control dykes, early warning of Min river floods, early warning of foul weather/typhoons, reservoirs to control river flows.

capable of adapting to the major technological and institutional changes likely to occur over the next 10 years or so.

FPSTC would like to continue with Sino-UK collaboration, extending along five thrusts, namely:

- Expert exchange programme
- Co-operative Research
- Training exchanges
- Information exchange
- Studies towards establishment and development of an integrated Disaster Management Centre.

The intended DMC would be developed to work with all the many institutions and people involved in risk/hazard/disaster management in Fujian Province, and seek to improve their combined effectiveness. FPSTC see further UK support [exchange visits, training, information exchange, co-operative research] assisting within a framework provided by the overall objective of developing this world class institution.
The main constraint on going forward however, is the lack of immediately accessible funds.

CONCLUSIONS

1. Both FPSTC and BC see the value of having a more focused approach to Sino/UK collaboration in Fujian. Development of the DMC could provide the required framework, with technical inputs designed to ensure best capacity utilisation, and this course of action for sustained collaboration is recommended for consideration by BC.

2. UK expertise does appear to have the necessary discipline breadth and technical depth to be able to respond effectively to such an approach, though this is distributed through many organisations and will need co-ordinating or networking.

3. Although a structured programme and a network of experts will provide a more efficient approach than ad hoc visits, the scale of the problems and the needs involved mean that an increased level of funding will likely be required if significant impacts are to be realised. Likely rates of technology change [especially satellite communications] must be included in forward planning.

4. Inter-institutional linkages are always difficult for the visitor to guage on a quick visit without speaking the language. However the very rapid current rates of change in Fujian are inevitably going to strain communications and links between institutions. In any joint way forward, greater understanding of inter-institutional linkages and the collective ability of stakeholders to manage and use information effectively, must feature prominently if external funding is to be sought.

WAY FORWARD

The first priority is to develop and seek funds for a pre-feasibility study to determine how best the DMC might operate, and where external technological inputs might be appropriate. There are however several actions that could be accomplished first, that would increase the likelihood of obtaining funding for a pre-feasibility study.
Thus three phases in the way forward are identified to help establish the Disaster Management Centre, and support it towards meeting its objectives. These comprise:

1. Scoping Activities: Objective: to prepare pre-feasibility proposal and seek funding: duration 6-9 months : target to be completed by FJNDR 1998 estimated cost small.

2. Pre Feasibility Study: Objective: to establish linkages between different hazards and response mechanisms, and prepare structured proposals for major funding. duration 6- 9 months: target to be completed by FJNDR 1999. estimated cost £100 000.
3. Establishment of operational DMC with major donor or development bank support for infrastructural/technical imputs: target for agreement: January 2000. Cost will depend critically on components and functions.

NEXT STEPS and ACTION POINTS

Suggested activities for the **Phase I scoping** of the problem include:

1. UK Specialists [Moore and Williams] draft proposal and submit to BC and FJNDR ad hoc Committee. [ACTION: BC to send names of UK specialists who have attended FJDND events in earlier years],
2. Establishment of Fujian Province Hazard Network including ad hoc Committee in Fuzhou /UK specialists having visited: [UK ACTION Moore and Williams],
3. Prepare resource list of pertinent UK expertise from IDNDR and other routes [ACTION: Moore, Williams and network]
4. Explore UK information sources [including websites of pertinence, distance learning opportunities on hazard management, disaster networks, etc.] and link to FJNDR publicity,
5. Stakeholder Analysis with Institutional Mapping: Understanding of beneficiaries and pertinent institutional arrangements in Fujian Province to support PFS, and provide baseline data sources,
6. Identify priority training requirements related to PFS development,
7. Prepare example list of possible 'component' projects for joint research and seek opportunities for related technical research/demonstrations,
8. Identification of possible matched Fujian/UK team and contributors for PFS,
9. Prepare proposal for PFS [and other project options],
10. Seek funding opportunities for PFS.

Phase II Pre Feasibility Study:
Phase II: establishment and external support for DMC objectives.

ANNEX 1: DRAFT PRELIMINARY OUTLINE FOR SCOPING PRE-FEASIBILITY STUDY

The purpose of this annex is to provide a basic list of the kinds of activities that might be expected to be included in a pre-feasibility study. The list is for information, and to provide a baseline for development during the scoping activities.

Pre-feasibility Study on Hazard Management
for Sustainable Development in the Fujian Province, China
Disaster Management Centre

1. User Requirement
   - types of hazard and their nature (occurrence in space and time)
     storm (typhoon), flood, drought, landslide, eathquake, fire, pest, ecological
   - stakeholder identification and participation: needs and expectations
   - user needs (forecast points, areas at risk, lead time and precision requirements)

2. Review of existing situtation
   - institutional arrangements
   - infrastructure, communications and information management,
   - case studies of hazards
   - procedures for hazard management
   - monitoring, forecasting, warning, emergency response; structural measures
   - interrelations between management of different hazards

3. Needs for improvement
   - Need for revision (including integration and strengthening) of institutional arrangements
   - Need for enhancement and evolution of existing systems
   - Need for new systems
   - Need for integration of systems
   - Need for sustainable development

4. Solutions for improvement
   - strengthening of institutional framework
   - integrated, evolutionary solutions for hazard management
   - systems for forecasting, warning, control and decision support
   - risk assessment
   - structural solutions
   - technological opportunities: remote sensing, digital terrain models, GIS, telemetry

5. Implementation Plan
   - Implementation tasks
   - Priorities for implementation
   - Timetable for implementation
   - Procedure for implementation
   - Funding mechanisms
   - Budgetary costs
   - Cost-benefit

ANNEX 2 LIST OF CONTACTS

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ANNEX 3 COMMENTS FROM TECHNICAL VISITS: RJ Moore and J B Williams.

Arriving in Fuzhou on 6 October, the next day was spent visiting the Meteorological and Hydrological services for the Fujian Province along with the Fujian Computer Centre and Information Division of the Science and Technology Commission.

The visit to the **Meteorological Services** highlighted activities associated with mid-range weather forecasting of relevance to natural disaster reduction. The monitoring infrastructure was advanced and included a weather radar network, currently being upgraded and expanded based on the USA NEXRAD style of S-band Doppler radar, along with satellite imagery and lightning detection.

Forecasts were based on access to weather forecast products produced by the Chinese Numerical Weather Prediction Model, operated from the National Meteorological Centre in Beijing, along with those produced by the ECWMF, Japanese and USA models. The main natural hazards of concern were typhoon (storm and flood), drought, freeze and hailstorm. Problems were transmission failure due to lightning strikes and the use of 0.1 mm tipping buckets for raingauges, with oscillations at high rain rates registering as zero rainfall. Improved typhoon tracking was a priority issue, and informal cooperative links with Taiwan were proving beneficial.

The **Hydrological Services** flood warning capability has been greatly enhanced by the donation of Japanese equpment supporting the Min River Flood Forecasting System. This employs a radio-based telemetry system supporting 71 outstations measuring rainfall and water level. The first phase, covering the northern half of the basin was completed in April 1995 and the second phase covering the southern half may be completed circa the year 2000.
As well as the centre in Fouzhou the system supports activities in 11 local (county) offices, with each provided with a warning car/ loudspeaker system to support evacuation. Major floods can occur as frequently as every 3 years, and the 1992 flood resulted in a flow of 30,000 cumecs through Fuzhou city. Reservoirs in the lower part of the basin can provide significant flood storage if operated correctly, with the possibility of reducing flood levels by 1 m to 1.24m. Although the Japanese system is newly implemented, the control centre technology looks dated through its use of a large console with control buttons, rather than a configurable computer display providing access to control functions. These are elements of a monolithic, fixed design as opposed to an evolutionary modern software design.

The system suffers from disruption of power due to lightning strikes (particularly on hilltop repeater stations), with failures occurring typically 5 times per month. Alternative solutions based on low power satellite communications and solar power might provide a more appropriate solution in the light of recent operational experience; this deserves further investigation.

The forecasting model employs the model of Renjun Zhao, widely respected internationally. There is a focus on providing forecasts of the inflow to the lower reservoirs, to support their control in reducing flood levels in Fuzhou city. A lead time of 40 hours on forecasting the flood peak can be achieved. There seems to be less concern for providing model-based flood forecasts in the upstream county areas. This may be an area where British assistance might be directed, with priority given to the safety of the more deprived rural communities. Effective forecasts for these upstream areas will require stonger links to meteorological monitoring and forecasting of rainfall than currently exists. At present no products from the Met Service appear to be used in the flood forecasting system,

whilst the potential exists to make use of rainfall estimates from weather radar and the Numerical Weather Prediction models. Dual networks of raingauges are supported by the Met. and Hydrological services suggesting significant opportunities exist for integration and improvement.

The visit to the **Fujian Computer Centre** focussed on development work to use a digital terrain model and satellite-inferred rainfall to map flood extent on an operational basis at 12 hour intervals. The conversion of rain amount to flood volume employed a hydrological model: an impressive match to the actual flood extent obtained by remote sensing was very encouraging. Improvements might come from strengthening links with the Hydrological Service, both on the hydrological model and on the end-use of this technique.

The visit to the **Information Division of the Science and Technology Commission** was informative. It showed just how rapidly IT was being taken up and used in Fuzhou after a slow start, particularly by the scientific community. INTERNET connectivity is growing rapidly with much enthusiasm and enterprise. The on-line scientific information library is growing quickly in both size and availability, and satellite links to Beijing ensure that both internal and external usage is optimised. Potential for individuals and institutions to network more effectively is growing more rapidly than many managers can possibly realise.