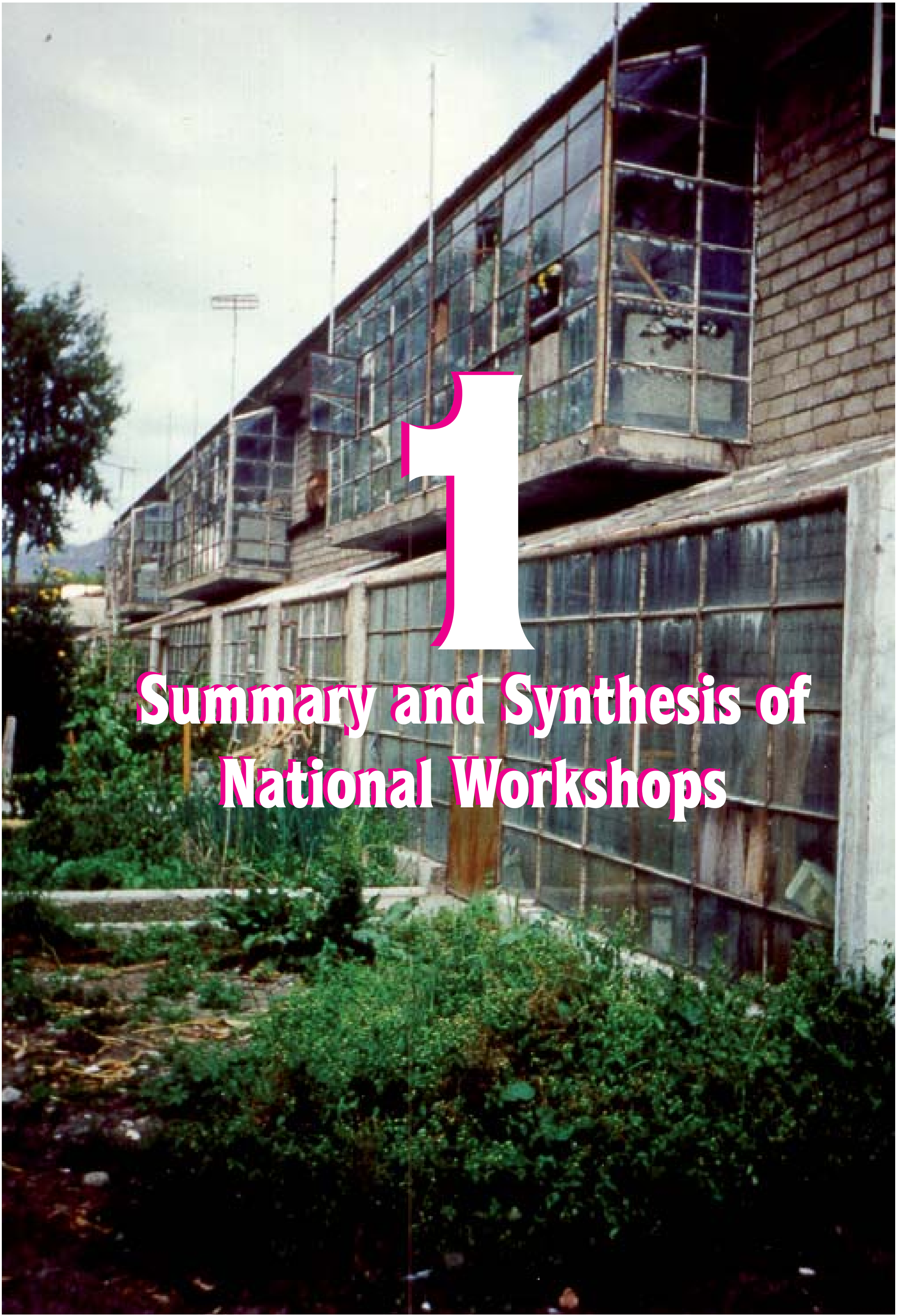

1 Summary and Synthesis of National Workshops

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Introduction

The International Centre for Integrated Mountain Development (ICIMOD) is committed to improving the living standards of mountain people, especially of those living in rural areas of the Hindu Kush-Himalayas (HKH). In light of this objective, the Centre took the initiative of organizing four national workshops on Passive Solar Building Technologies in China, India, Nepal, and Pakistan. In these countries, solar passive programmes have been in progress for some time, and most of the HKH region lies in their mountain areas. The basic objectives of these workshops were to review the status of passive solar technologies, identify gaps in technology that need further development, and create a network of experts and policy-makers in this field to use appropriate technologies. The proceedings of each workshop contained a great deal of information which forms the basis of this book.

Synthesis

The general problem in the HKH region is heating buildings during winter. This is usually done by using fuelwood or dung for the dual purpose of cooking and space heating. Using fuelwood has resulted in large-scale deforestation and the ill effects of smoke on the health of mountain people, especially women and children. These problems are common to almost all areas of the HKH.

Solar radiation is available in most parts, and it is sensible to use solar energy consciously in designing buildings in order to reduce the use of fuelwood and dung for space heating purposes. Concrete efforts have been made in China and India to promote a solar passive heating programme, whereas there have been individual efforts in Nepal and Pakistan to build passive solar homes.

The Chinese Programme

Information about the availability of solar radiation in various provinces of China is very good. According to the solar map of China, solar energy of about 1,160-1,140 kwh/m^2 per annum is available in most of the North-East, with 2,600 hours of annual sunshine. The normal practice is for people to take advantage of solar energy by installing windows in the south. As a result of research efforts, information has been provided about the advantage of orienting buildings towards the south and installing collector-cum-storage walls with material and surface characteristics, thermosyphoning effects, and heat concentrating devices.

The Chinese government has formulated national standard "Technology Requirements for Passive Solar Houses and Methods for Heat Performance Tests". The standard specifies the division of districts, technological conditions, methods for heat performance tests, methods of economic analysis, and rules for examining solar houses. The standard was accepted in 1994 and implemented in 1998.

Under programmes supported by the UNDP and the Federal Republic of Germany, two projects; namely, (i) Experimental Demonstration Centre for Solar Heating and Cooling and (ii) Renewable Energy Village in Daxin (Beijing) were carried out. About 231 solar passive houses were built, covering a floor space of 80,000 square metres, were simulated, and measured. These buildings clearly demonstrated that solar passive building technologies can save 60 to 70 per cent of conventional energy. Some form of conventional energy is, however, absolutely necessary for thermal comfort. The additional investments to incorporate pasive solar building technologies (PSBTs), which amount to about 12-20 per cent of the cost, are payable over a five- to eight-year time period. The 7th and 8th five-year plan periods represented a stage of comprehensive research and demonstration, as well as sizeable introduction and application of solar buildings. The buildings were constructed with different heat collection modes, namely, direct heating, heat collection, and storage walls and an attached greenhouse.

The Indian Programme

The solar passive programme in India is nearly two decades old. It commenced with the construction of three solar passive houses in locations in Delhi, Jodhpur, and Srinagar, representative of three different climatic conditions in the country. The performance of these houses was evaluated to gain experience and to help in designing the future programme. A comprehensive review of climatic conditions, definition of climatic zones, and study of vernacular architecture was undertaken to identify the various methods used in traditional architecture to keep houses warm in winter and cool in summer. A handbook of basic guidelines was prepared and simultaneously awareness and training programmes were organized all over the country. Himachal Pradesh took the lead in formulating a Solar House Action Plan. Under this programme, many buildings have been constructed with a conscious effort to use solar passive concepts and optimise them. The Solar House Action Plan of Himachal Pradesh aims to develop simple design guidelines for solar passive building and to monitor solar passive building in Himachal Pradesh.

Unlike in China, however, no standards have been drafted and therefore the implementation of the programme is not definitive. A directed approach would help to apply the existing knowledge in an effective manner.

The Nepalese Programme

In Nepal, buildings are normally designed to use solar energy to keep the interiors warm. In Solukhumbu and Manang, houses have been oriented to the south-east, keeping the large glazed windows towards the south with few or no openings on the north and west. Sometimes, the interior walls have wooden boards fixed to them to act as insulation. In Nepal, however, passive solar building development and implementation are in the initial stages and a comprehensive programme is needed to provide the knowhow required. Nepal needs support to adopt and formulate an appropriate passive solar building technology suitable to the physical, socioeconomic, and cultural context of the country.

The Pakistan Programme

In Pakistan, there is an appreciable awareness about the use of solar energy for buildings and for day to day use. Climatic analysis of the mountain areas of Pakistan has been undertaken. This analysis tells us that Gilgit and other areas in the Hindu Kush-Himalayan region have mean dry-bulb temperatures varying between -2.7°C in January and 36.1°C in July; such climates have substantial heating requirements. Various techniques used for solar passive heating have been reviewed: direct gain, indirect gain, isolated, and hybrid systems. It is, nevertheless, clear that the use of such systems is rather rare because of the lack of a directed programme. In a few institutions, educational programmes covering passive solar building technology are being introduced. A couple of architects have used the principles of passive heating and cooling. Academically, researchers have been working on thermal simulation models such as '**CHEETAH**' and '**ARCHIPAK**', underground structural models, computer simulation of transparent insulation covered buildings, and so on. Nevertheless, the impetus to use these technologies was lacking from the workshop proceedings. One architect/planner designed and constructed a passive solar house with a roof garden and an earth air tunnel to keep the building comfortable throughout the year.