



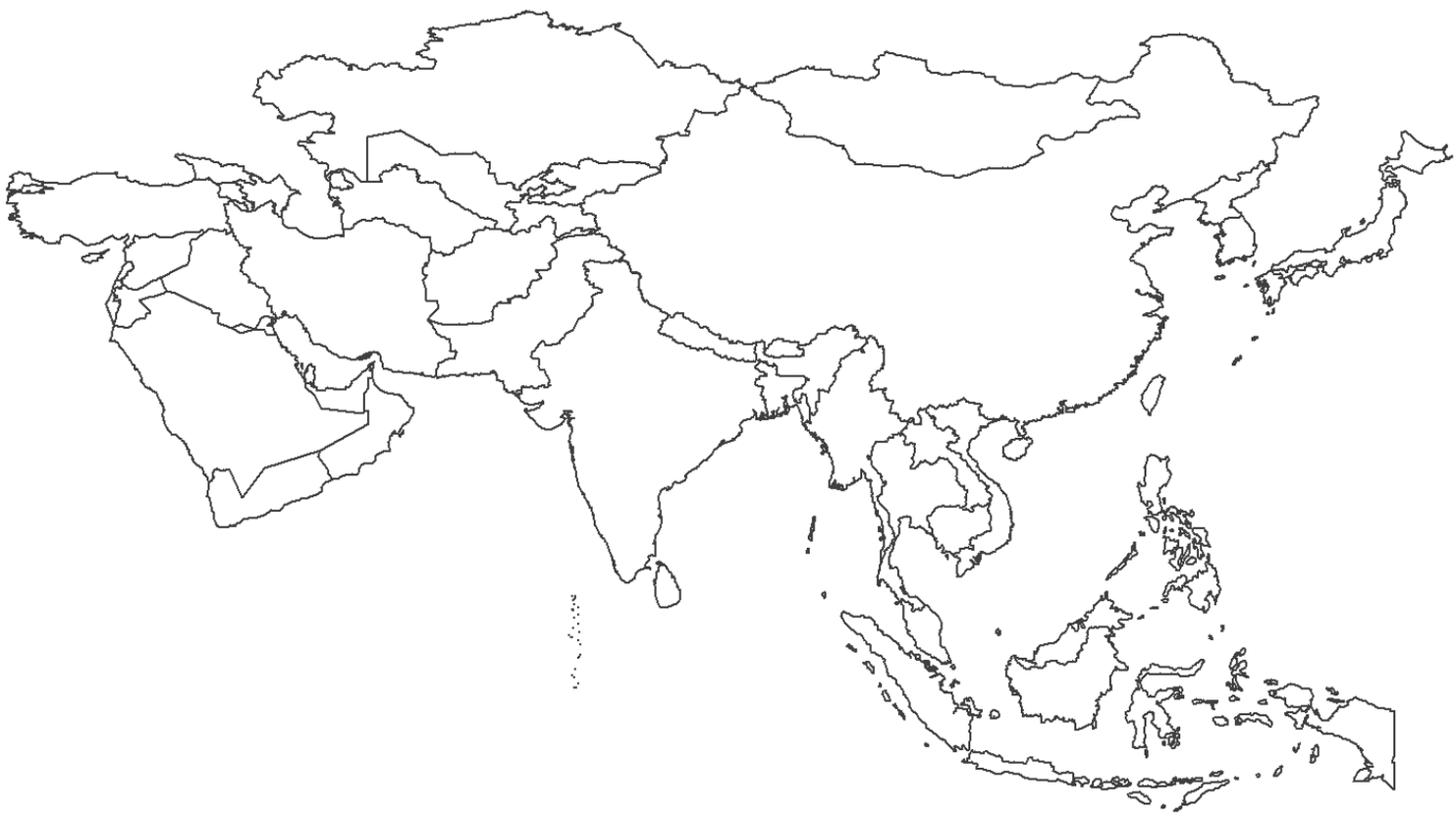




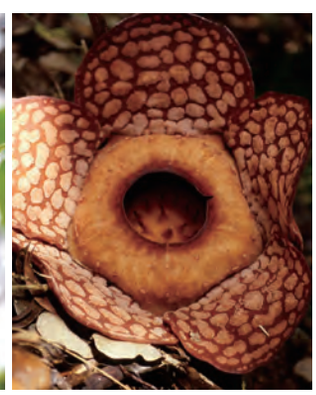


The Convention on Biological Diversity

The First Asian Plant Conservation Report

A Review of Progress in Implementing
the Global Strategy for Plant Conservation (GSPC)

IUCN CNC-DIVERSITAS IB-CAS

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FORWARD

The contents of this report on progress on plant conservation in Asia demonstrate clearly the beneficial global influence of the Global Plant Conservation Strategy of the Convention on Biological Diversity. As a result of the efforts of many botanists and conservationists in the region and beyond, a good deal has been accomplished, and one can feel confident about the prospects for accelerated progress in relation to the goals that will be established for the second decade. The floras of China, Thailand, and the Malay Peninsula are becoming reasonably well known, and we hope they will lead other countries into a careful determination of the conservation status of their plants in the years to come. This will require arduous and prolonged efforts, but will be necessary if this precious part of the world patrimony, which contributes so much to the welfare and future prospects of the countries of the region, can be preserved in the face of habitat destruction; the accelerating spread of invasive species, pests, and pathogens; the selective gathering of species for medicine, building materials, and other diverse purposes; and global climate change, which is progressively rendering the probability of many species to survive in nature increasingly doubtful. Even for botanical gardens, it remains to be seen what plants can be grown in the regional climates of the future; this problem emphasizes the very great importance of seed banks such as the one established by the Chinese Academy of Sciences at the Institute of Botany, Kunming.

Knowing and articulating goals and objectives enhances greatly the chances of meeting them. The accomplishments of the past decade in plant conservation for Asian countries have been impressive, and we wish our colleagues well for even greater ones in the years to come!

Peter H. Raven
President Emeritus
Missouri Botanical Garden
St. Louis, MO, U.S.A.

FORWARD

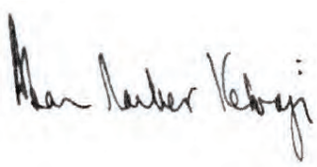
The adoption of the Global Strategy on Plant Conservation (GSPC) by the Convention on Biological Diversity (CBD) in 2002 set targets for 2010 and was a major achievement towards global plant biodiversity conservation. At the CBD COP 10, world leaders and the conservation community review the achievements of the past decades and renew their political commitment by setting new conservation targets.

At this juncture, it is important to measure the successes achieved, and identify those areas that still need urgent attention to ensure effective plant conservation. This report helps us do that by providing an overview of the implementation status of the GSPC in Asia.

I am very pleased to note that positive results have been reported in a number of GSPC targets for Asia. I also recognize that renewed efforts are required in achieving targets where the progress has been limited. Asia is highly rich in biodiversity, and therefore conservation in Asia has a significant impact on the status of global biodiversity. Conservation of plant life is vital for humanity, and especially in Asia where poverty and dependence on natural resource for food, fiber, medicine and multitude of other purposes is very high. To ensure the wellbeing of present and future generations, it is critical that we are successful in conserving plant life. IUCN encourages all concerned to use the GSPC to guide their work in plant conservation.

IUCN has been deeply involved in conservation efforts in many parts of Asia. Because conservation is a complex issue, partnership among states, institutions and communities is required for translating policies into actions, and actions into real outcomes. IUCN works through its member organizations and individual commission members, who are leaders in their own fields, to influence, encourage and assist societies to conserve the integrity and diversity of nature in an ecologically sustainable and equitable manner.

Professor Ma Keping of Chinese Academy of Sciences, an IUCN Councilor, has spearheaded publishing this milestone report for Asia. I am pleased to offer my congratulations to Professor Ma, and his team in the Chinese Academy of Sciences in preparation of this report. I hope this report will inspire planners and actors across Asia to focus on their policies, programmes and actions related to plant conservation.



Aban Marker Kabraji
Regional Director
IUCN Asia

PREFACE

Global Strategy for Plant Conservation, since its inception in 2002 in the 6th COP, has provided the much needed framework to enhance effort in plant conservation all across the globe. Parties in Asia as those in other continents contributed a lot to the development and implementation of GSPC. What is the current status and where are the best practices and gaps, in terms of plant conservation in Asia, under the framework of GSPC? In order to find answers to these questions and beyond, I talked with Mrs. Aban Marker Kabraji, Regional Director, IUCN Asia and Dr. Jane Smart, Director, Species Program, IUCN about the possibility of preparing a report to assess the progress, identify best practices and major gaps, and make recommendation for future strategy for plant conservation in Asia, at the occasion of the 74th Meeting of IUCN Council in June 2010. The very positive response from them and other colleagues encouraged me to start the project with the help of IUCN umbrella, in particular the kind support from the Asia Regional Office, the Biodiversity Conservation Group, as well as the West Asia & Middle East Regional Office.

Two features of this booklet should be highlighted: one is the map on progress made by each Asia country; and the other one is the case study to demonstrate the progress made under each target. National Reports submitted to Secretariat of Convention on Biological Diversity (SCBD) by the parties were extensively studied classifying progress into four distinctive categories: solid progress, much progress, little progress and data deficiency. Each category is color coded on map of Asia to indicate the state of progress of each country for a given target. It should be noted carefully that the assessment was dependent on the information provided by each country in their respective National Reports. It was the sole information source used for preparing the maps. The maps are, therefore, indicative only and may not necessarily depict the real conservation picture in a country. Some countries, for example, may have made solid progress, yet score poorly in assessment as their National Reports did not provide detailed information related to the targets. But this should not lead us to ignore the part which National Reports play in synthesizing information on biodiversity conservation from each country. This is the first attempt to assess progress of GSPC implementation in Asia, and there are rooms for improvement in future with more in-depth information collected from each country. Case studies included in this report provide an excellent overview on interesting plant conservation tools and practices exist in different parts of Asia. These case studies are testimonies of Asia's progress in plant conservation. Only a limited number of case studies were included, party due to availability of information in National Reports and also limited submission received from experts of different countries.

Asia is a huge continent. It is not physically possible to collect detailed information from all of the countries for preparing *The First Asian Plant Conservation Report* in such a short period of time. Without the 4th National Report of parties to CBD and valuable

materials provided by colleagues from IUCN network and my friends from related countries, the drafting team could not complete the task to get the final draft ready on time.

This is really a collective work. Firstly, I would like to thank IUCN which provides the working basis for the project, in particular the contribution from Dr. Jane Smart, Mrs. Aban Marker Kabraji, Dr. Odeh Al Jayyousi, Director for West Asia & Middle East Regional Office, Mr. Kent Jingfors, Regional Program Coordinator and Ms. Hao Zhuang, China Program Coordinator. Secondly, I highly appreciate contributions from Dr. Leng Guan Saw, Dr. Noriachi Sakaguchi, Prof. Benito Tan, Dr. Ahmad Jauhar Arief, Dr. Benchamaporn Wattanatongchai, Dr. Vongvilay Vongkhamsao, Dr. Mathew Hall, Ms. Leslie Ann Jose, Dr. Baorong Lu, Prof. Youyong Zhu, Prof. Chunlin Long, Prof. Hang Sun and Prof. Dayuan Xue, Dr. Wei Shen, Mr. Jie Cai, Mr. Yihua Tong, Mr. Rihong Jiang, Mr. Zhixiang Yu, Mr. Lei Chen and Mr. Yanjun Du for providing valuable photos for best cases related to conservation targets; Dr. Sulma Warne, Dr. Filiberto A. Pollisco and Dr. Somchai Bussarawit for helping us set up contact with the right people for gathering more information. Finally, I would like to take this opportunity to thank the members of the drafting team, Dr. Guoke Chen, Mr. Bing Liu and Mr. Bin Chen, in particular, for working hard on the preparation of the draft for a couple of months and Mr. Raquibul Amin for his great effort in editing the text. I would also like to thank following experts to take part in a questionnaire survey and provide us with valuable information: Dr. Haseeb Mohammed Irfanullah, Dr. Jasim Uddin, Dr. Khairul Alam, Dr. Ranjith Mahindapala, Mr. Chandranimal Dilup, Dr. Suresh Kumar Ghimire, Dr. Krishna K. Shrestha, Prof. Kunio Iwatsuki and his team, Mr. Anshuman Saikia, Dr. Chanhsamone Phongoudome, Dr. Somchanh Bounphanmy, Mr. Rafiul Haq, Dr. Michael Dine, Dr. Luu Hong Truong, Dr. Jack Regalado, Mr. Kimsreng Kong, Mr. Roger Karlsson, Dr. Vichit Lamxay, Mr. Kongmany Sydara and Dr. Jérôme Millet.

Hope this booklet is of help for further actions in promoting plant conservation in Asia and beyond.

Keping Ma
Councilor of IUCN
Secretary-General for CNC-Diversitas
Deputy-Director and Secretary-General for CAS Biodiversity Committee
Research Professor for Institute of Botany, Chinese Academy of Sciences (CAS)
12 October, 2010

EXECUTIVE SUMMARY

Our planet is in a critical junction that biological diversity is being lost at an unprecedented rate. Taking a long-term view of human self-interest, it is very urgent to reduce the biodiversity loss rate of our planet. Plants contribute most to the primary production of terrestrial ecosystems, and also play a fundamental role in ecosystem function. It acts as indicator taxa of global biodiversity management. Conservation of plant diversity is necessary to halt the overall loss of our planet's biodiversity. This is exactly what the Global Strategy of Plant Conservation (GSPC) intend to do since its inception in 2002.

Asia countries have accomplished a great deal in understanding and documenting plant diversity. We have also made significant progress in plant conservation in this region. Edition of *The First Asian Plant Conservation Report*, will expose the readers to many exciting progress and successful cases of plant conservation in Asia, and also point out what is needed to achieve the targets of GSPC in future.

Here is a section-by-section synopsis of this booklet. **Section 1** introduces the GSPC. **Section 2** and **3** contains some basic information about the features of plant diversity in Asia. Major threats to plant diversity in Asia are also reviewed in **Section 4**. Details of the GSPC implementation status in Asia are discussed in **Section 5**. The 16 targets of GSPC are listed one by one in this section. The readers can get basic information from the **Introduction** of each target. The most striking part in this section is the map of progress made by each country in Asia. Further, 2-3 successful cases of plant conservation are selected to illustrate the progress made by Asian countries.
The future strategies of plant conservation in Asia are then discussed in **Section 6**.
The Focal points and related organizations for the GSPC in Asia are provided in **Annex 1**. **Annex 2** contains information of the important websites for GSPC.

Plant diversity is exceptionally high in Asia. Tens of thousands of plant species with high proportion of endemic species and more than 100 endemic families are found in Asia. 10 out of 34 international biodiversity hotspots are in Asia. These hotspots have been identified by Conservation International based on endemism of plant and remnant original vegetation. Vegetation types in Asia covariate with combination of precipitation and temperature, with a full spectrum of vegetations from tundra to tropical rainforest, with a typical latitudinal distribution pattern of vegetations. Asia is the origin of many crops. Rice, beans, tea, citrus, litchi, lacquer and tung oil trees originated in East Asia; mango, banana, sugarcane, castor and eggplant originated in South Asia; onions, spinach, alfalfa, dates, carrots and melon originated in West Asia; and apple, pea and broad bean originated in Central Asia. Asia is a paradise for plant diversity in the world. It really deserves a high priority in conservation practice.

The progress in plant conservation in Asia is detailed under 16 targets of GSPC. The 16 targets of the Global Strategy of Plant Conservation can be classified into 5 categories: understanding and documenting plant diversity; conserving plant diversity; using plant diversity sustainably; promoting education and awareness about plant diversity; and building capacity for the conservation of plant diversity.

Understanding and documenting plant diversity

This part of the Global Strategy of Plant Conservation includes **Target 1, 2** and **3**. To date, 30 Asia countries has already made their statistics of vascular plants. 12 Asia countries have published their flora or checklists. Further, 12 Asia countries have publications about the assessment of the conservation status of plants.

Conserving plant diversity

Establishment of protected areas is one of the important ways to conserve plant diversity. The proportion of terrestrial areas protected in Asia increased a lot over the past 20 years. Importantly, the proportion of terrestrial areas protected in 2 Asia countries is more than 50%. Further, 27 Asia countries joined the survey and assessment of Important Plant Areas (IPAs). In order to achieve **Target 6** of protecting plant diversity in production lands, about 17 Asia countries have set down relevant managements. For achieving **Target 7** of *in-situ* conservation of threatened plants, 18 Asia countries have established related managements. Similarly, for achieving **Target 8** of *ex-situ* conservation of threatened plants, 21 Asia countries have accomplished a substantial progress. For achieving **Target 9** of conserving the genetic diversity of crops and other major socio-economically valuable plant species, 23 Asia countries have set down manage plan. For management of major alien species, most of the Asia countries have relevant plans to achieve **Target 10**.

Using plant diversity sustainably

In order to prevent species of wild flora from being endangered by international trade, more than half of Asia countries are members of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and 8 Asia countries are members of the International Tropical Timber Organization (ITTO). Further, for sustainable management of plant resources, 22 Asia countries have set down specific strategies to achieve **Target 12**. Finally, to halt the decline of plant resources and associated knowledge, 18 Asia countries have established management plans according to **Target 13**.

Promoting education and awareness about plant diversity

Asia countries have accomplished a great deal in achieving **Target 14** of promoting education and awareness about plant diversity. 36 countries have established managements and action plans.

Building capacity for the conservation of plant diversity

Two targets focus on capacity building for the conservation of plant diversity, 23 and 22 Asia countries have already established specific managements to achieve **Target 15** and **16** respectively.

Despite the progress made so far, the rapid growth of population, economy, and urbanization has greatly threatened the plant diversity in Asia. The rate is even higher than the global mean. Illegal trade of plants, such as orchids and medicinal plants contribute a lot to the loss of plant diversity in this continent. The major threats to plant diversity in Asia are habitat fragmentation, over-harvesting of natural resources, expansion of areas for economical plants, pollution, invasive species and climate change.

Climate change is a potential threat with high degree of uncertainties to plant biodiversity in Asia. Future conservation effort requires long term monitoring programs that can cover the whole continent to assess impacts of climate change on plant diversity. Any future strategies of plant conservation in Asia should consider the national priorities in developing activities and milestones to achieve making synergies with poverty reduction strategies and programs for achieving Millennium Development Goals. Asia has vast cultural treasures and traditional communities who are storehouse of indigenous and local and knowledge. Blending of modern technological innovation and indigenous knowledge can bring sustainable solutions to loss of plant biodiversity. In such case, the countries should promote the access and benefit sharing provisions of the CBD.

Countries in Asia should develop sub-regional or regional cooperation in plant conservation. Regional program should be developed among countries within similar biogeographical region. Asia can benefit in plant conservation by transferring knowledge and technology, and building of individual, institutional and systemic capacity through regional cooperation.

Brief introduction of GSPC

Global Strategy for Plant Conservation is a series of plant protection measures, proposed under the framework of the Convention on Biological Diversity. The purpose is to halt the continuing loss of plant diversity, and also to contribute to poverty reduction and sustainable development.

Plants play important roles in the ecosystem functioning and the diversity of plants is critical to the safety of human society. Plants provide properties to people, not only timber, but also food, medicine, fiber, fuel. What's more, they provide ecosystem services, such as preventing soil erosion and fixing carbon dioxide. However, more than 1/3 of the plant species on earth are under threat due to the explosion of population, habitat fragmentation and loss, deforestation, over-exploitation, invasive species, pollution and climate change and other factors.

The Sixteenth International Botanical Conference which held in 1999 at St. Louis called the priority for the conservation of global plant biodiversity. In response to that call, in 2000, the International Conference of Botanical Gardens held a special meeting, the participants, including 14 leading botanists and conservationists from international and national organizations, research institutions and other entities. The Gran Canaria Declaration which emphasizes the importance of international cooperation in the conservation of plant diversity is the outcome of the meeting. It influenced the adoption of the Global Strategy for Plant Conservation at the 6th meeting of the Conference of Parties to the Convention of Biological Diversity in 2002.

The GSPC framework consists of following five major items with 16 outcome oriented targets.

1. To understand and record plant diversity
2. To conserve plant diversity
3. The sustainable use of plant diversity
4. To promote the education of plant diversity and
5. To establish organizations focusing on conservation of plant diversity

The Global Strategy for Plant Conservation has been implemented at national, regional and international level since 2002.

Overview of Asia

Asia is the world's largest continent with the area of 44 million square kilometers, amounting for 29.4% of the total terrestrial area. Asia is a complex continent, with the highest plateau, Qinghai-Tibet Plateau - also called the third pole of the world. The Mount Everest of Himalayas, with 8844.43m above sea level is the highest peak on earth. Peaks above 8,000 meters above sea level are all located in this area. The world's largest peninsula, Arabian Peninsula, has an area of 3 million square kilometers. Other peninsulas including the Indian subcontinent, Indochina Peninsula, Malay Peninsula, Asia Minor peninsula, the Korean Peninsula are equally intriguing. There are a large number of islands surrounding the mainland of Asia, especially at the southeast. The Yangtze River, which is 6397 km long, is the longest in Asia and the third longest of the world. There are well-known inland waters mainly in Central Asia, including: the Syr Darya and Amu Darya river and the Tarim River. Lake Baikal is the world's deepest freshwater lake, a depth of 1620 meters. The Caspian Sea is the world's largest lake.

Asia has the most diverse climate. It crosses the boreal, temperate, subtropical and tropical zone. In the northern tip, tundra zone near the Arctic Ocean, it is cold for most of the year with a very short cool summer. Towards south, the largest coniferous forest on earth lies in the Siberia and Far East: the taiga, with continental climate. It is the coldest place of the northern hemisphere, with freezing and dry winter, cool and wet summer. Central Asia is also influenced by continental climate, there are large areas of grasslands, the middle and eastern part of the Eurasian steppe. Eastern and southern Asia is heavily affected by monsoon from the Pacific and Indian Ocean, and often with significant wet and dry season. Large areas of evergreen broadleaved forests are distributed in this area, including the vast subtropical evergreen broad-leaved forests and tropical rain forests. There are large areas of desert in West Asia, due to the impact of subtropical high pressure. The monsoon from the Indian Ocean has been blocked by the Qinghai-Tibet Plateau. Ultimately, the Taklimakan Desert, the largest temperate desert formed due to lack of rainfall.

The total population is about 3.8 billion in Asia, accounting for more than 60 per cent of the world. China, India, Indonesia, Japan, Bangladesh and Pakistan together have more than 100 million population. Most densely populated regions are eastern China, the Pacific coast of Japan, the island of Java, and Indo-Ganges River Basin.

Asia is also rich in cultural diversity. The Mesopotamia gave birth to the famous Babylonian civilization. The Indus Valley civilization developed in ancient India. The Chinese civilization developed in the Yellow River Basin. The continent is often divided into East Asia, Southeast Asia, South Asia, West Asia, Central Asia and North Asia.

Asia is rich in plant diversity and facing the greatest challenge, because of the heavy human disturbance arising from rapid growth of economy and population.

Key features of plant diversity in Asia

The complex topography, diverse climate and old biotic history in Asia, gave birth to tens of thousands of plant species with high proportion of endemic species and more than 100 endemic families. Based on endemism of plant and remnant original vegetation, Conservation International identified 34 international biodiversity hotspots among which 10 are located in Asia.

Taking Kalimantan as an example, there are more than 6,000 endemic species out of 15,000 species of vascular plants. Over 400 new species found in this island since 1994. The world's largest flower, *Rafflesia*, parasites at the understory. The high diversity and productivity of rainforest provides food and shelter, making it to be a paradise for animals. It was reported that, there are as many as 220 species of mammals, 420 species of birds, 100 species of amphibians and more than 400 species of fish in Kalimantan[1]. Sumatra island is also extremely rich in plant diversity. 218 species of vascular plants were found in 200 square meters in Tesso Nilo in central Sumatra[2]. Sundaland covers the western half of the Indo-Malayan archipelago. It is really rich in species diversity. The total number of plants in this area is about 25,000 species of plants with 15,000 endemic species. Western Ghats is covers only the 5% of India, but it holds more than 4,000 species, as much as 27% species of higher plants, in which more than 1,600 are endemic species[3]. Endemic families of plants in East Asia is also rich, such as Ginkgoaceae, Sciadopityaceae, Cephalotaxaceae, Nandinaceae, Glaucidiaceae, Circaeasteraceae, Trochodendraceae, Rhoipteleaceae, Stachyuraceae, Dipentodontaceae, Kirengeshomaceae, Bretschneideraceae, Davidiaceae, Aucubaceae, Toricelliaceae, Helwingiaceae, Trapellaceae. Irano-Anatolian area in Western Asia, forming a natural barrier between the Mediterranean Basin and the dry plateaus of Western Asia, has served as both a refuge and a corridor between the eastern Mediterranean and Western Asia, resulting in many patches of local endemism throughout the area. At least, 2500 species of endemic plants can be found in this area[4].

Vegetation types in Asia covariates with combination of precipitation and temperature, with a full spectrum of vegetations from tundra to tropical rainforest, with a typical latitudinal distribution pattern of vegetations. In this continent, you can see giant trees, creeping vines, variety of flowers and herbs throughout the tropical rainforest. You can also see the rich subtropical evergreen broadleaved forests, well developed temperate forests, vast steppes and desert, and the colored alpine vegetation landscapes. Asia's tropical forests are mainly distributed in Southeast Asia such as Malaysia, the Philippines, Indochina, and South Asia, such as the eastern part of Bangladesh and India. Dipterocarpaceae is the dominant family in the tropical rainforests. Broadleaved forests dominate across China, and extend to the Korean Peninsula and Japan. It is the largest evergreen broad-leaved forest in the world, with high species diversity and endemic species of plants. In different climatic zones, vertical distribution pattern have also formed to show the diversity of ecosystems with zonal features. The abrupt rise of the Himalayan Mountains from less than 500 meters to more than 8,000 meters results in a diversity of ecosystems that range, in only a couple of hundred kilometers, from alluvial grasslands (among the tallest in the world) and subtropical broadleaved forests along the foothills to temperate broadleaved forests in the mid hills, mixed conifer and conifer forests in the higher hills, and alpine meadows above the treeline[5].

Moreover, Asia is the origin of many crops. Rice, beans, tea, citrus, litchi, lacquer and tung oil trees originated in East Asia; mango, banana, sugarcane, castor and eggplant originated in South Asia; onions, spinach, alfalfa, dates, carrots and melon originated in West Asia; and apple, pea and broad bean originated in Central Asia.

Asia is a paradise for plant diversity in the world. It really deserves a high priority in conservation practice.

1. http://www.mongabay.com/borneo.html
2. http://www.savesumatra.org/index.php/species
3-4. http://www.biodiversityhotspots.org
5. http://www.biodiversityhotspots.org

Major threats to plant diversity in Asia

Quite recently, a global analysis of extinction risk for the world's plants, conducted by the Royal Botanical gardens, Kew together with the Natural History Museum, London and IUCN, has revealed that the world's plants are as threatened as mammals, with one in five of the world's plant species threatened with extinction[1]. The rapid growth of population, economy, and urbanization has greatly threatened the plant diversity in Asia. The rate is even higher than the global mean. Illegal trade of plants, such as orchids and medicinal plants contribute a lot to the loss of plant diversity in this area too. The major threats to plant diversity in Asia are briefly addressed as follows.

• Habitat fragmentation

Fragmentation of habitat represents the greatest threat to biodiversity in Asia. A continuous habitat may be lost and fragmented by logging, reclamation, roads expansion and so on. The pace of habitat loss and fragmentation in Asia accelerates due to human disturbance. The fragmentation may adversely affect the population of local species, particularly the rare species. Taking Western Ghats and Sri Lanka as an example, the forests of this area have been dramatically impacted by the demands for timber and agricultural land. Remaining forests of the Western Ghats are heavily fragmented; in Sri Lanka, only 1.5 percent of the original forest remains. Population levels are also applying increased stress on the fringes of protected areas where many farms, loggers, and poachers use the resources illegally. Rampant logging and establishment of oil palm plantations have devastated forests in west pacific islands[2].

• Over-harvesting of natural resources

Illegal logging of forests in Southeast Asia, overgrazing in China and West Asia, and unsustainable collecting of medical plants caused serious damage to the natural resources and plant diversity in Asia. As a source of medicine, food and health products, plant has long been collected. This became a major threat of plant diversity today. The number of medicinal plants is over 6,000 in India. More than 9,000 herbal related factories require large amount of medicinal plants was reported in India. It is estimated that more than 319,500 tons of plants are consumed each year in this country[3]. Of the 960 species of trade-related medicinal plants, 178 species has exceeded 100 tons. More than 12,000 species of plants are consumed as traditional medicine in China.

1. http://www.iucn.org
2. http://www.biodiversityhotspots.org
3. http://nmpb.nic.in/FRLHT/Contents.pdf

• Area expansion of economical plants

Asia has a long history of farming and plant cultivation. The expansion in area of economical plants has threatened local plant diversity in Asia. The promotion of rubber tree, Eucalyptus species, oil palms and Jatropha plantation often begin with clear-cutting of natural forests. The area of such kind of economic plants increase very rapidly in recent years which exerting heavy pressure on plant diversity in this region.

• Pollution still a serious problem

Pollution is an unintended side effect of industrial activity which brought measurable benefits to people. Pollution in both water and air are serious in developing countries of Asia. Of most concern are phosphorus and nitrogen which mainly originate as run-off from fertilizers applied on agricultural fields. These nutrients stimulate rapid growth of algae and aquatic plants, ultimately limiting the amount of oxygen and light available to other organisms in the ecosystem. Toxic discharges are also a problem in urban areas. This includes metals, organic chemicals, and suspended sediments usually found in industrial and municipal effluents that are discharged directly into waterbodies. Acid precipitation is the air pollutant that has the most significant impact on forest ecosystems in subtropical and tropical Asia.

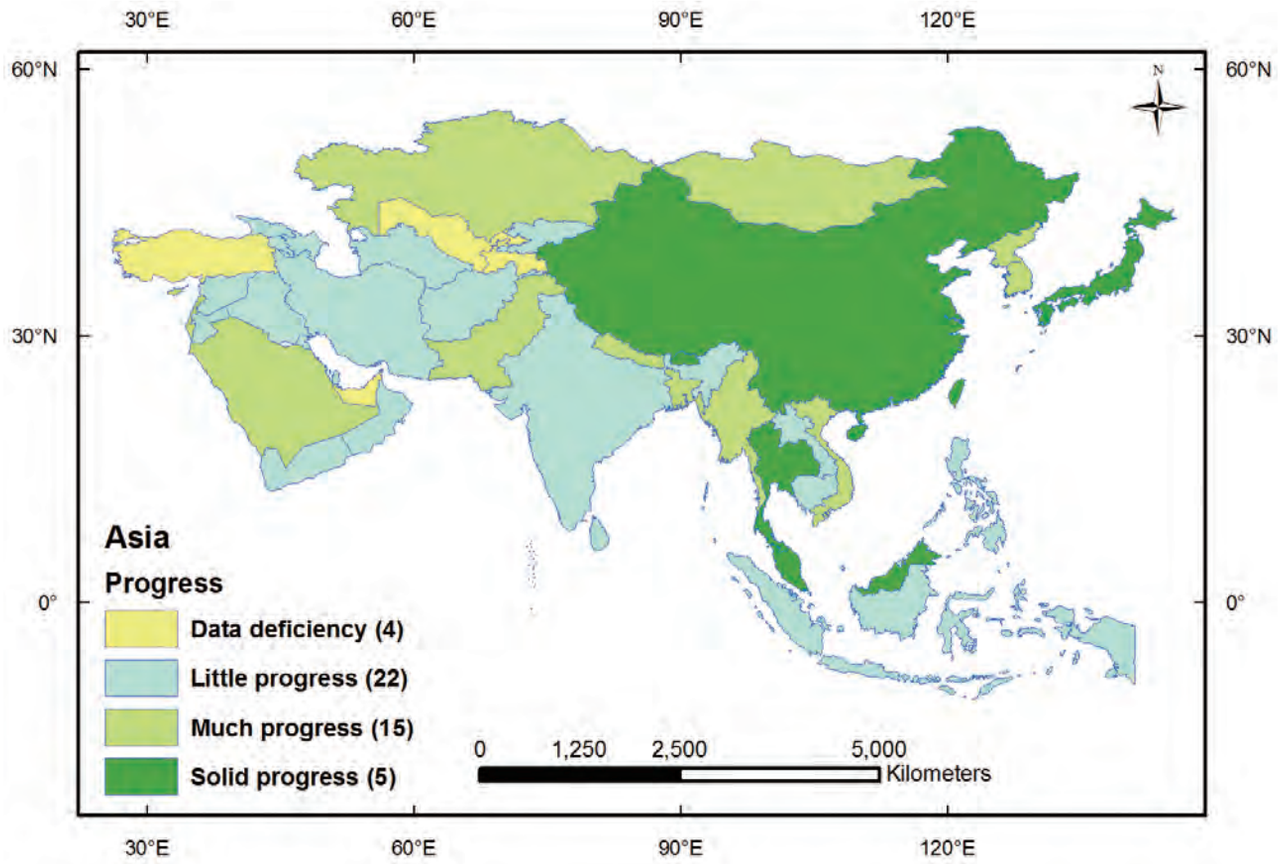
• Destructive impacts of invasive species

The influences of invasive species on plant diversity become a serious environmental problem in Asia. Invasive plants are highly competitive; such as *Eupatorium adenophorum*, *Eupatorium odoratum*, *Ipomoea cairica* all are spreading in Southeast Asia and south western China which are very harmful to terrestrial ecosystems and *Eichhornia crassipes* and *Alternanthera philoxeroides* have caused serious damage to the aquatic ecosystems in southern China.

• Consequences of climate change

The speed of climate change is much more accelerated than in the past, which may pose a serious threat to slow-growing communities which cannot respond quickly, and which may shrink the range of plants that need cooler environments. Global warming may increase the frequency of climatic disturbances such as fires, disease, insects, storms, etc. It is altering migratory species patterns, and increasing coral bleaching. Plants are also facing the negative impacts of climate change.

TARGET 1:
A widely accessible working list of known plant species, as a step towards a complete world flora



Introduction

Asia is the largest continents in the world, with an area of ca. 44 million km^2. It extends across the frigid, temperate and tropical zones. With complex terrains, large span of altitude, varied climates (strong continental climate and typical monsoon climate), and diverse habitat types (from coast to desert, plain to alpine belt, and also from tundra to rainforest), Asia is rich in biodiversity, owning 90,000-100,000 vascular plant species. There are 7 countries possessing more than 10,000 species, namely, China, Indonesia, Malaysia, India, Thailand, Myanmar, and Vietnam. China, Indonesia, India and Malaysia are among the important megabiodiverse countries.

The current progress of working list in Asian countries is uneven. Among the Asian countries, 30 of them have provided the species account on higher plants or vascular plants; 12 have published checklists of native flora. *Flora of Japan* has been revised for several times; *Flora Reipublicae Popularis Sinicae* (Chinese version of flora of China), as the largest flora in the world, has entirely been finished; *Flora of Bhutan* has been completed, including more than 5,500 vascular plant species in Bhutan and adjacent areas (Sikkim and Darjeeling). *Flora Malesiana*, *Flora of Thailand*, etc., are publishing in succession. There are also some checklists of plants available, e.g., China Plant Catalogue, *A Checklist of the Trees, Shrubs, Herbs, and Climbers Recorded from Myanmar*.

Progress

Case 1: China Plant Catalogue

CNPC (China Plant Catalogue) database, as a part of COL (Catalogue of Life) - China, provides plentiful information about the vascular plants and mosses in China, containing data of more than 34,000 species with 100,000 nomenclatures. The information, especially nomenclature, distribution, vernacular name, economic data and endangerment status, promotes CNPC as a powerful tool for the floristic and biodiversity conservation studies in China.

Catalog of Life - China

COL-China is an annual checklist, and so far, 4 versions are available. Main plans for 2010 are improving and detailing the data and establishing an interactive website with data updates and search capacity.

Multiple data resources provide a promising future development for CNPC, for instance, the published *Flora Reipublicae Popularis Sinicae*, and its second edition - *Flora of China* (a revision of the former).

All the 80 volumes of *Flora Reipublicae Popularis Sinicae*

Flora Reipublicae Popularis Sinicae

CNPC database is a collaborative effort from all the Chinese taxonomists. The database is mainly directed, developed and maintained by the Institute of Botany in Beijing. Moreover, the data of CNPC is widely checked, evaluated, revised and then improved by more than 80 taxonomic specialists from twenty different institutions and universities in China.

Case 2: Flora of Thailand [1]

Thailand is well known as a tropical country with diverse flora and vegetation. The total amount of vascular plant species takes 5th place among Asian countries. The progress of Flora of Thailand Project has greatly exceeded many other countries which have even more species than Thailand does.

Aiming to produce a complete floristic treatment of the entire vascular flora, the Flora of Thailand Project was initiated in 1963 under Thai-Danish collaboration. The study of the flora of Thailand, with its estimated 10,000 vascular plants species, has been gathering momentum in the last few years and now achieving a well-advanced stage.

The project results in a large number of collections deposited in several herbaria around the world, and the success is partly due to a very efficient international collaboration and regular meetings for planning the Flora work ahead every three years.

The first publication was turned up in 1970. Twenty-nine parts and up to volume 10 (2009) have been published, of which volume 3 covers ferns, and the rest covers seed plants.

Flora of Thailand [2]

Furthermore, Office of Natural Resources and Environmental Policy and Planning has made a check list of some non-vascular plants and vascular plants, for example, mosses, algae, ferns and orchids.

Bryophytes of Thailand , Orchids of Thailand , etc. [3]

1-2. http://web3.dnp.go.th/botany/Botany_Eng/FloraofThailand/flora_Eng_project.html

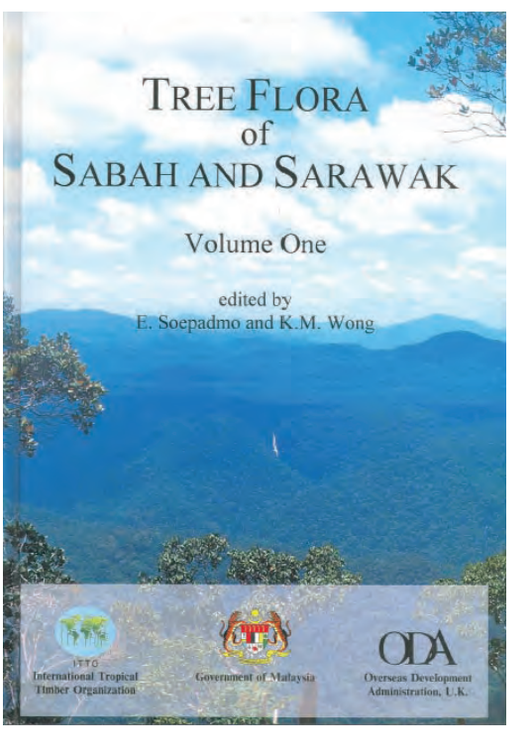
3. Thailand 4th national report on the implementation of convention on biological diversity

Case 3: Checklist and flora of Malaysia [4]

Malaysia is located in tropical Asia, owning unique floristic element. There are about 15,000 vascular plant species in Malaysia, of which 8,300 species are in Malay Peninsula, and 12,000 in Sabah and Sarawak of Kalimantan. The research on flora of Malay Peninsula is going deeper than the latter.

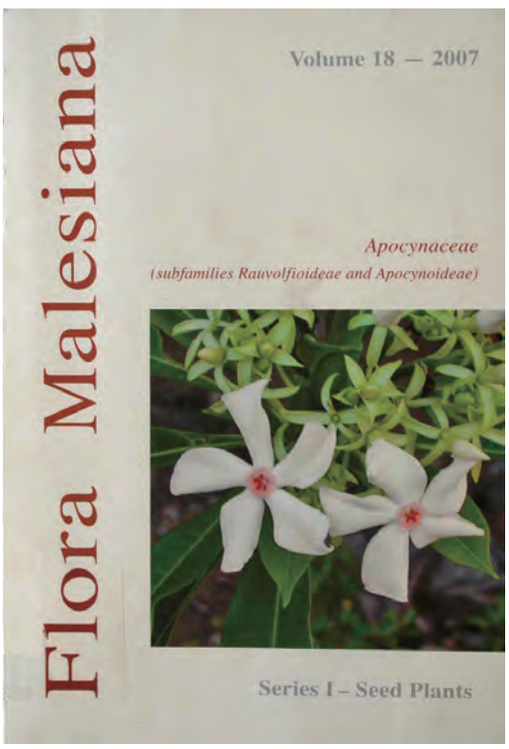
Malaysian botanists have made a checklist of vascular Plants of Malay Peninsula. The checklist for Borneo is currently under development. Once the Bornean checklist is ready the national plant checklist will be available on line.

Malaysia attaches more importance to studies of native woody plants, and several works have been published, e.g., *Endemic trees of the Malay Peninsula*, *Tree Flora of Sabah and Sarawak*. Malaysia is one of the diversity canters of Dipterocarpaceae. The Forest Research Institute Malaysia has lead many studies on taxa, distributions, and protective measures of native Dipterocarp.



Tree Flora of Sabah and Sarawak

In addition, Malaysia takes part in the project of Flora Malesiana, which is an international cooperation project, and is carried out by a voluntary network of circa 130 taxonomists all over the world. It aims at a critical, semi-monographic treatise of ca 41,500 species of flowering plants and ferns from Indonesia, Malaysia, Philippines, Papua New Guinea, Singapore and Brunei. At present, 18 volumes of seed plants and 5 volumes of ferns have been published[5].



Flora Malesiana

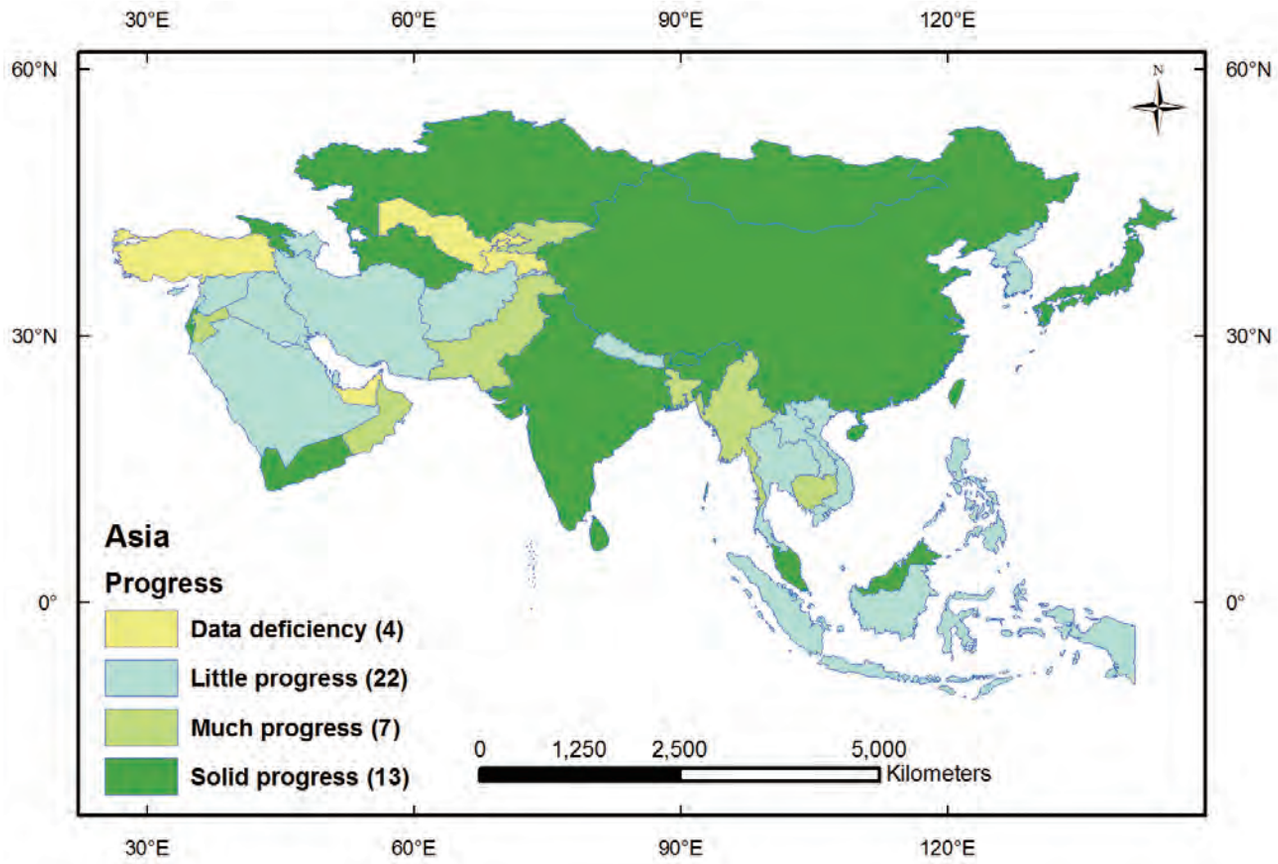
Future

Most of the countries in Asia are in developing stage, and comparatively late to start working on the native research of plant diversity. Most works of flora or checklist are dependent on aids of western countries. As a result, only several countries have completed flora works (e.g. China, Japan). Unfortunately, a few Asian countries even have not started studies on native flora yet, because of political instability. Therefore, many Asian countries need take further steps to study native flora and checklist of plants.

Euptelea pleiosperma (Eupteleaceae)
monotypic family, endemic to Asia [6]

4. http://www.chm.frim.gov.my
5. http://www.nationaalherbarium.nl/rhb/malesia.htm
6. Photo credit: Bing Liu

TARGET 2:
A preliminary assessment of the conservation status of all known plant species, at national, regional and international levels



Introduction

Plant conservation is highly valued in most of the Asian countries, and relevant laws and policies are in place to protect endangered plants, trade plants and plants of economic importance.

The dominant method for assessment is IUCN Red List Categories and Criteria. This system can be adapted to assess species groups of concern at the national and regional level. Many Asian countries have used IUCN Red List Categories and Criteria to assess their conservation status.

The conservation statuses of native known plants have partially been assessed in Asian countries. About half of the Asian countries have recorded the number and conservation status of native plants with different degrees. 12 countries have published plant Red Data Book, Plant Red List or relevant reports. For instance, Kazakhstan, Turkmenistan, China, the Republic of Korea, Japan, India and Singapore have published Red Data Book of native plants mostly following the IUCN standard. Georgia, Yemen and Sri Lanka made assessments for native endangered plants, and published Red List and relevant reports. Some countries have assessed a particular taxon, e.g., *Dipterocarp in Malay Peninsula*.

Progress

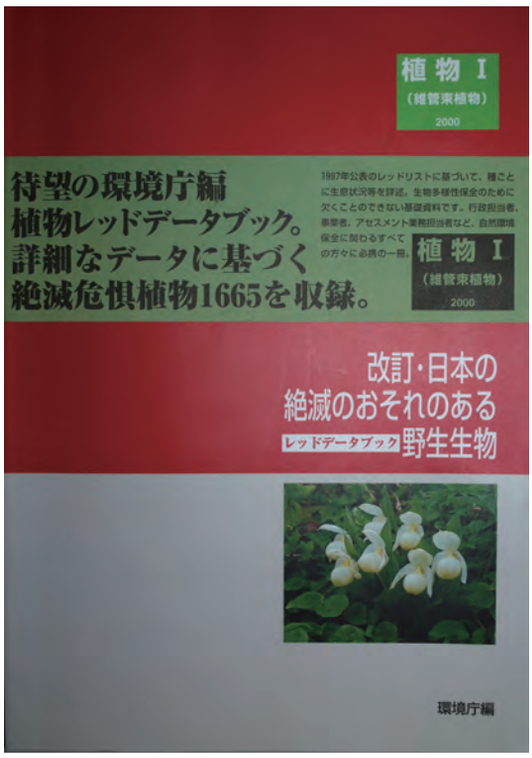
Case 1: Japan Plant Red Data Book

Japan published revised edition of plant Red Data Book in 2000. This book, with detailed assessment of endangered plants in Japan, was edited by Ministry of Environment, and cooperated by Japanese domestic research institutions, local governments and civil society organizations.

Containing 2,369 endangered plant species, the Red Data Book is divided into two parts: volume 1 covering vascular plants and volume 2 covering non-vascular plants (algae, lichens, fungi and mosses).

Algae	Fungi	Lichens	Mosses	Vascular Plants	Total
71	91	82	238	1887	2369

Plant groups in *Japan Plant Red Data Book*



Japan Plant Red Data Book

Each taxon in this book has detailed information on aspects as below: descriptions, habitat, distribution in Japan (accurate to County), Environmental Status in habitat, number of existing individuals (decreased or increased proportion compared to previous population) and threat factors (e.g., deforestation, road construction, development of grassland, coast or river, plant collection, etc.). Also, the book contains survey and analysis methods, criterion of assessment, and *in-situ* pictures of certain taxa.

Japanese government attaches high importance to the protection of endangered plants. The Ministry of Environment (MoE) is developing and promoting measures for plant conservation, expanding the assignment to local government and encourages developing protection measures for local plant diversity.

Helminthostachys zeylanica (Helminthostachyaceae) [1] (IUCN status: CR)

Magnolia tomentosa (Magnoliaceae) [2] (IUCN status: VU)

Case 2: Report of a Rapid Biodiversity Assessment - by Kadoorie Farm and Botanic Garden [3]

South China forest biodiversity report series was published by KFBG (Kadoorie Farm and Botanic Garden). Members of KFBG in Hong Kong and their cooperators investigated certain nature reserves in South China and reported their findings as part of KFBG's South China Biodiversity Conservation Program. The main aim of this program is to gather up-to-date information on the distribution and status of fauna and flora, and minimize the loss of forest biodiversity in the region.

The investigators followed three general steps: first recording the distribution localities of animals and plants in the field, then identifying and classifying them, and finally developing in a checklist of plants and animals, with locations, protection status and other related contents. Plant records were made by field observation, with some specimens collected.

The report focuses on three parts. Part 1: nature reserve location, natural conditions and vegetation. Part 2: checklist of plants and animals, including family name, scientific names, Chinese names, distribution localities, national protection level and IUCN status. Part 3: summary of investigation, proposing threats, problems and opportunities of

1. Photo credit: Rihong Jiang
2. Photo credit: Bing Liu
3. http://www.kfbg.org/kfb/introwithreport.xml?fid=167&sid=217&lang=en

Report of a Rapid Biodiversity Assessment

nature reserve.
The rapid biodiversity assessment method of KFBG proposes a convenient, simple and efficient system, and presents a new way of plant assessment for countries or areas.

Case 3: IUCN assessment of endemic plants in Yemen [4]

Yemen is a small country in West Asia, located in the south of the Arabian Peninsula, owning about 2,810 species of higher plants. Despite the existing problems, Yemen government has made a significant progress in plant conservation.
There are 416 plant species endemic to Yemen, accounting for 14.8% of the total number. All the native endemic plants have been assessed according to IUCN criteria.

Case 4: Assessment of dipterocarp in Malaysia [5]

Dipterocarp (plants of Dipterocarpaceae) is distributed mainly in tropical Southeast Asia. This family is the symbolic taxa of Asian rainforest, many species of which are famous as timber with important economic value, and listed in IUCN Red Data Book. Malaysia is rich in Dipterocarp.
Malaysia published *Malaysia Plant Red List - Peninsular Malaysian Dipterocarpaceae* in 2010. This book contains 155 species of Dipterocarpaceae, including 165 taxa, of which 34 taxa are endemic. This book made an assessment for particular plant taxa, which were recorded with distribution figure, habitat and IUCN status.

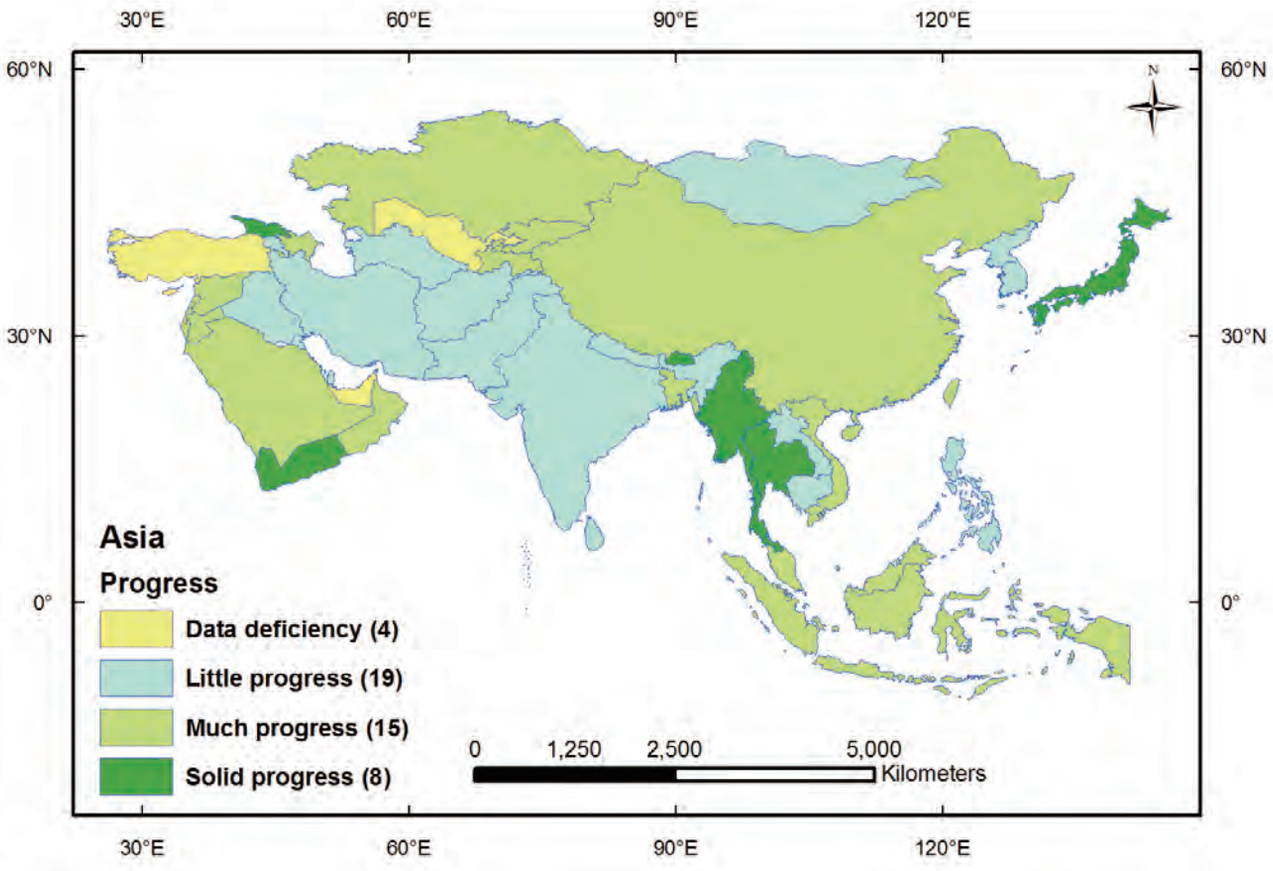
Shorea glauca (Dipterocarpaceae) [6]

Future

More than 10 Asian countries put high importance on plant conservation, finished detailed survey and assessment of native endangered plants, and published either plant Red List or assessment reports, which provided a wealth of fundamental information on endangered plants, and promoted the plant conservation in Asia.
However, more than half of the Asian countries are falling behind in effective plant conservation measures. The checklists of protective plants in these countries lack detailed information. In some cases, compilations of plant species have not been attempted. Further in-depth studies on Asian plant conservation status are mainly dependent on relevant progress to be made in these countries.

4. Yemen 4th national report on the implementation of convention on biological diversity
5. Malaysia Plant Red List - Peninsular Malaysia Dipterocarpaceae
6. Photo credit: Leng Guan Saw

TARGET 3:
Development of models with protocols for plant conservation and sustainable use, based on research and practical experience



Introduction

During the long development history of our human race, Asia has been exploited for thousands of years, consequently the Asian primary vegetation has seriously suffered. For centuries, most of the diverse habitats in Asia have been utilized, exploited and transformed into agricultural lands and living spaces. All human activities, such as farming, pasturing, urban construction and roads, massively impact the space of primary vegetation with various degrees of destruction and degradation of natural environment. Worryingly, the primary habitats in Asia, especially the virgin forests, are vanishing day by day.

However, destruction is not the single consequence. In the process of exploiting, taking advantage of the nature, the Asian people also found ways to coexist harmoniously with their surroundings. Some good practical examples worth mentioning: Satoyama – a widely used Japanese agriculture system of sustainable society that maximizes the use of ecosystem services, and the sustainable utilization of *Cassia siamea* firewood in Xishuang Banna. There are successful cases of utilization of endangered plants through modern technology. Thailand, for example, produces rare or endangered plants by using tissue culture.

In addition, there are many other sustainable models and restrictive utilization methods. For example, Bahrain produces Fiber plant *Phoenix dectylifera* by tissue culture; Georgia made regulations to restrict the cone harvesting in order to guarantee the natural regeneration of the coniferous forest, and restrict the collection of native symbolic species - *Galanthus woronowii* and *Cyclamen coum*; Lebanon cultivates the traditional medicinal and aromatic plants.

Progress

Case 1: Satoyama agriculture system in Japan

Recently, Satoyama system has attracted the worldwide attention and been widely reported by the media. "*Satoyama*" denotes mountains, woodlands,

Satoyama landscape of paddy field and *Cryptomeria* and *Chamaecyparis obtusa* forest [3]

and grasslands (*yama*) surrounding villages (*sato*) in Japan[1]. This special landscape is created through long-term interaction with the nature. It is a way of maximizing the benefits of ecosystems goods and services in a sustainable manner. Essentially it forms a socio-ecological production landscape encompassing forest areas, rice paddies, vegetable plots and fish-bearing streams.

Satoyama was the lifestyle for the ancient Japanese. It is still indispensable in connecting the local residents with the nature. Local residents deeply feel the power of natural cycle, perceive how the seasons change and realize their own value. Meanwhile, Satoyama is located in the transitional zone from city to the nature, providing a place to appreciating the natural environment.

Ministry of Environment of Japan and the United Nations University Institute of Advanced Studies (UNU-IAS) jointly initiated Satoyama Initiative to promote internationally maintaining and rebuilding Satoyama type landscapes. The Initiative follows a three pronged approach[2]:

• Consolidate wisdom on securing diverse ecosystem services and values.
• Integrate traditional ecological knowledge and modern science to promote innovations.
• Explore new forms of co-management systems or evolving frameworks of "commons" while respecting traditional communal land tenure.

Case 2: Sustainable utilization of *Cassia siamea* firewood

In Xishuang Banna (in Yunnan Province of China), *Cassia siamea* is an important tree for the native Dai people. *Cassia siamea* is native to South Asia and Indochina Peninsula, and well-known as fast growing tree in tropical Asia. Its hard wood texture is resistant to decay and insect, making it an excellent timber for architecture and sculpture. However, the native Dai people use it as firewood since it is easy to split, has high heat value and provides adequate combustion.

The Dai people raise *Cassia siamea* around the yards and stockades. They cut the terminal bud to force branching to form a shrub-like structure. The initiated branches are used for firewood. This tradition of self-sufficient and sustainable use has been practiced by the Dai people for hundreds of years.

Dai people are conscious of protecting forests through their customs and traditions. They get firewood only from the planted *Cassia siamea* instead of the native forest. The tradition plays a very important role in protecting the tropical rainforest in Xishuang Banna.

As living standard of the people is steadily growing, *Cassia siamea* is replaced by new forms of energy. Dai people found new uses of *Cassia siamea*. For

Satoyama landscape in Inagi, Tokyo, Japan [4]

Cassia siamea (Leguminosae) [5]

1-2. http://satoyama-initiative.org/en/about
3-4. http://en.wikipedia.org/wiki/Satoyama
5. Photo credit: Jinlong Zhang

example, they raise commercial plants under the forest of *Cassia siamea*. The harmonious relationship between the *Cassia siamea* and Dai people will continue.

Case 3: Flower production in Thailand by using tissue culture technique [6]

Thailand is rich in wild flower resources, such as Orchidaceae, Zingiberaceae and ornamental herbs and trees. However, because of the limited population and excessive collection, wild plants, especially some species of the Orchids, are on the edge of extinction. Thailand government supports researches on tissue culture technique, which is used for *in-situ* and *ex-situ* conservation of rare and vulnerable plants, i.e., *Zingiber zerumbet*, *Kaempferia* spp., *Paphiopedilum* spp., *Grammatophylum speciosum*,

Paphiopedilum spp. (Orchidaceae) [7]

Cinnamomum porrectum, and *Bauhinia variegata*. Successful application of tissue culture technique is protecting the wild plants from over-exploitation. It is also bringing economic benefits by industrial production and export of flower.

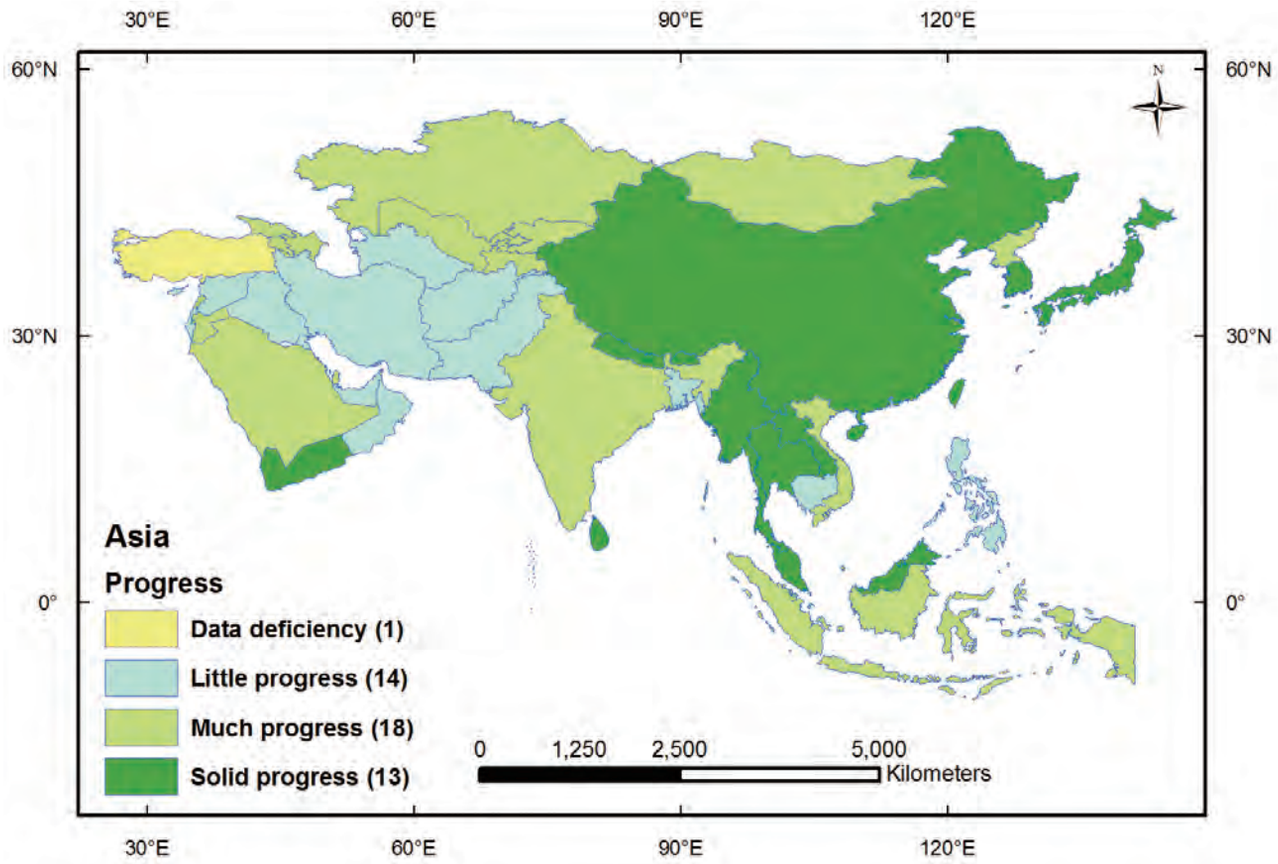
Zingiber zerumbet (Zingiberaceae) [8]

Future

Most of the countries in Asia are in developing stage, and comparatively late to start working on the native research of plant diversity. Most works of flora or checklist are dependent on aids of western countries. As a result, only several countries have completed flora works (e.g. China, Japan). Unfortunately, a few Asian countries even have not started studies on native flora yet, because of political instability. Therefore, many Asian countries need take further steps to study native flora and checklist of plants.

6. Thailand 4th national report on the implementation of convention on biological diversity
7. Photo credit: Bing Liu
8. Photo credit: Yihua Tong

TARGET 4:
At least 10% of each of the world's ecological regions effectively conserved



Introduction

Protecting the ecological regions is one of the powerful methods for biodiversity conservation. This target is concerned with plant conservation within the context of plant community and not individual habitats, sites or species.

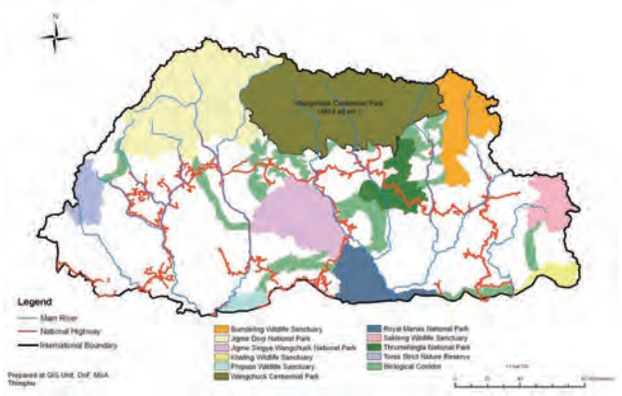
Ecological regions in Asia are vast and diverse: from tundra, coniferous forest and deciduous broad-leaved forest in the north to evergreen broad-leaved forest, monsoon forest and rainforest in the south; from the mangrove on the coast to the inland grassland and desert; from the forest in the valley to the meadow on the mountaintop, even the alpine talus. The diversity of Asian ecological regions is unique in the world.

Every Asian country has at least one or more different ecological regions, and many of them now are under some degree of protection. All Asian countries have established protected area in the form of nature reserves or national parks to protect different ecological regions, and many of them now are under some degree of protection. All Asian countries have established protected area in the form of nature reserves or national parks to protect different ecological regions. The protected areas in Malaysia, Bhutan, Laos, Thailand and Myanmar comprise more than 20 percent of the total land area. Most of the Asian countries focus on forest community. For example, countries in the Southeast Asia focus on rainforest; countries in the west Asia focus on their characteristic forests, such as coniferous forests in Lebanon and Georgia. Some coastal countries have taken the wetland and mangrove into protection, such as Vietnam, Sri Lanka, Maldives. Some other countries like Singapore still pay attention to *in-situ* conservation during urbanization.

Progress

Case 1: Ecological protection in Bhutan

Bhutan is located on the south side of the eastern Himalayas. The country has much diversified ecological



National protected areas and biological corridors of Bhutan [1]

regions - tropical and subtropical valley forests at the low altitude, alpine meadow and talus at the high altitude.

Government of Bhutan has published *Flora of Bhutan* with the help of British scientific organizations. *Flora of Bhutan* covers more than 5,500 vascular plant species in Bhutan and adjacent areas (Sikkim and Darjeeling).

▲ Low altitude area of Bhutan [2]

← *Thunbergia coccinea* (Acanthaceae) [4]

High altitude area of Bhutan [3] ▼

Cirsium eriophoroides (Compositae) [5] →

Although Bhutan is a small country, the government has established nearly half of its territory as protected area, including nature reserves, wildlife refuges and national parks.

The effective conservation of plants and ecological regions in Bhutan provides refuges for the flora in the Himalayas, making Bhutan a model country for other Asian countries in their conservation efforts.

Case 2: Cedar forest conversation in Lebanon

Lebanon is located in Western Asia on the eastern shore of the Mediterranean Sea. Most of its territory is covered by mountains with a large area of coniferous forest. The government has set out policies to protect the coniferous forest, such as fir forest, pine forest, and especially the cedar forest.

The cedar forest is dominated by *Cedrus lebani*, which is famous for its ornamental and timber value. It is also a symbol of Lebanon. This endangered species is distributed in Lebanon, Syria and southern Turkey with higher elevation. Lebanon Government devotes efforts to protect the cedar and recover its population.

Joining with neighboring countries, Lebanon controls the international trade of *Cedrus lebani*, and forbids the export of seedlings and seeds. Domestically, the government restricts deforestation, encourages reforestation and undertakes researches on pests control methods.

Cedrus lebani [6]

1. http://www.bhutantrustfund.bt
2-3. http://www.bhutansiam.com
4-5. Photo credit: Bing Liu
6. http://www.treesofjoy.com/cedar.htm

Case 3: Rainforest in Singapore Botanical Gardens [7]

Singapore is located at the southern tip of the Malay Peninsula. It was once covered by dense native rainforests. The natural ecological regions in Singapore diminished with the process of rapid industrialization and urbanization.

Fortunately, a small patch of tropical rainforest remains in Singapore Botanical Gardens with an area of 6 hectares.

The botanical gardens' rainforest and their bigger cousin at Bukit Timah Nature Reserve are located well within the Singapore's city limits. Threatened species in Singapore are conserved in regional and neighborhood parks in which both recreation and conservation are priority uses.

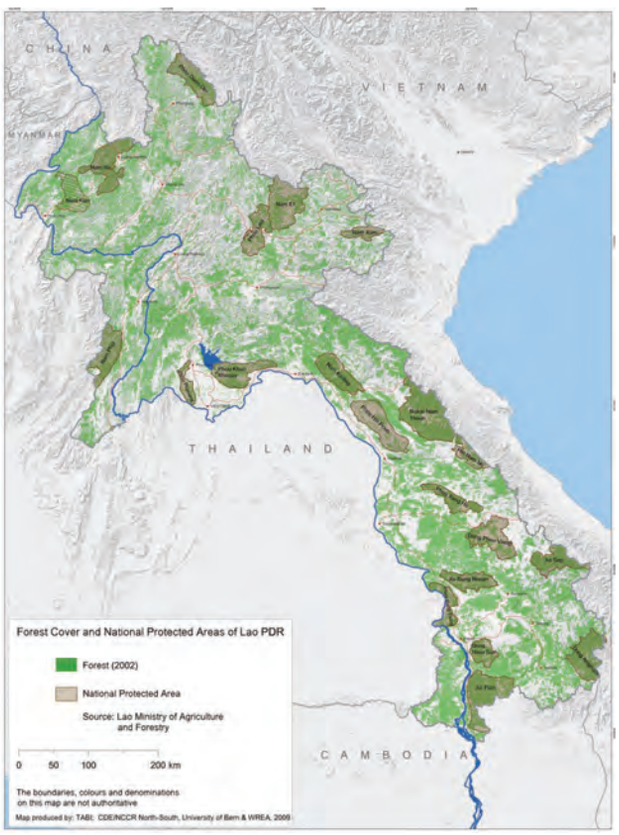
The harmony among cities, rainforest and botanical gardens defuses the conflicts between nature destruction and nature conservation, and proves that human beings are able to conserve the significant ecological regions effectively.

Rainforest in Singapore Botanical Gardens [8]

Case 4: Protected areas in Laos

Laos is a mountainous country in Southeast Asia, densely covered with forest. Currently including dipterocarp forest, evergreen forest, mixed deciduous forest, etc., the forest accounts for 41.5 percent of the nation territory[9].

Laos Government established a national system for protected areas, which occupys more than 21 percent of the whole country area. Various types of forests in the mountains, and wetlands along the Mekong River, have been both effectively protected[10].



Forest cover and national protected areas of Laos [11]

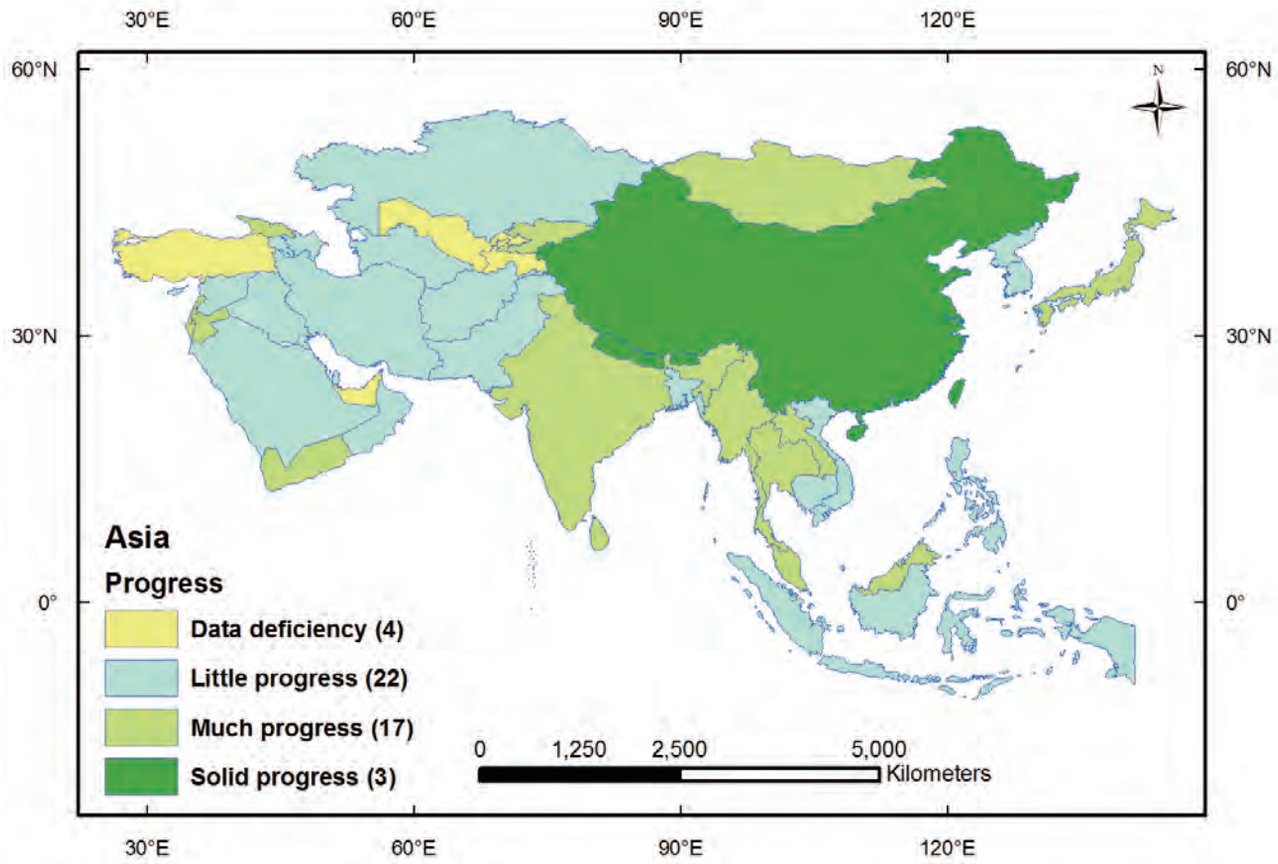
Future

Generally, Asian countries act well in conservation of ecological regions, and many of them have designated protected areas with relative policies and regulations. This suggests that, most of the Asian countries attach quite a bit of importance to native ecological regions, especially the charismatic ones.

However, there are still about one third of the Asian countries which still need to catch up with the rest to introduce relevant regulations and specific program to conserve their native ecological regions. Achievement of Target 4 in Asia will require more efforts from these countries and planning at the ecological scale.

7. Plant Conservation Report 2009
8. Photo credit: Keping Ma
9. Chanhsamone Phongoudome *et al.*, Current status of forest cover in Lao PDR
10. Lao PDR National Report on Protected Areas and Development
11. Data source: Lao Ministry of Agriculture and Forestry

TARGET 5:
Protection of 50% of the most important areas for plant diversity assured



Introduction

Important Plant Areas (IPAs) are internationally significant sites for wild plants and threatened habitats. IPA is a widely used approach to achieve this target by providing improved site-based protection. An IPA site has greater diversity, more endemic species or rare species. To achieve Target 5, IPA teams from 66 countries of the world are engaged in IPA projects, of which 27 are Asian countries. Bhutan, China, India, Nepal and Pakistan have provided detailed information of IPAs in the Himalayas, mainly focusing on medicinal plants. In addition, 13 more countries are preparing for designating IPAs.

The Arabian Peninsula, the Himalayas, and the Indochina Peninsula are of importance for Target 5 in Asia.

Progress

Case 1: IPAs in Yemen

IPAs in Yemen mainly distribute in the mountain areas with dense forest, e.g. Jabel Bura'a, Jabal Eraf forest, KetFah, Hawf, and Jebel Lawz. Yemen Government established nature reserves to protect these areas.

Forest in Jabel Bura'a [1]

1. Materials are provided by Matthew Hall

Jabel Bura'a is home to the closed canopy valley forest with the largest remaining area in the Arabian Peninsula. This valley forest is the major habitat for 12 regionally threatened tree species in Arabian Peninsula.

Jabal Al Arays has exceptionally high levels of endemism for the Arabian region, with 12 site endemics, 9 Yemeni endemics and 14 Arabian endemics.

Vegetation in Jabal Al Arays [2]

Case 2: Conservation of the IPAs for medicinal plants in the Himalayas [3]

In 2006, 53 IPAs for medicinal plants (sites of international significance for conservation recognized at national level) were identified across the Himalayas by organizations in Bhutan, China, India, Nepal, and Pakistan in a regional project with Plantlife International.

The project focuses on the areas with rich plants diversity, and gives priority conservation to medicinal plants, threatened species and threatened habitats.

According to the criteria of this project, larger IPAs were identified with a significant number of smaller sites at local level, often nested within them. IPAs were found to be useful for landscape planning and conservation monitoring, based on the gross geography of the Himalayan IPA network.

Medicinal plant cultivation in the Himalayas [4]

Case 3: IPAs in Indochina Peninsula [5]

The analysis of IPAs in the Indochina floristic region is being conducted as part of a project supported by CEPF (the Critical Ecosystem Partnership Fund). The project began in 2009, and will end in 2012.

By using IUCN criteria, the project will identify the most valuable sites of plant diversity in the Indochina region as the basis of prioritizing conservation actions.

Plant diversity information in Indochina region is fragmented and difficult to unify. Therefore, the project will build capacity of local scientists to assemble and assess the botanical database.

Future

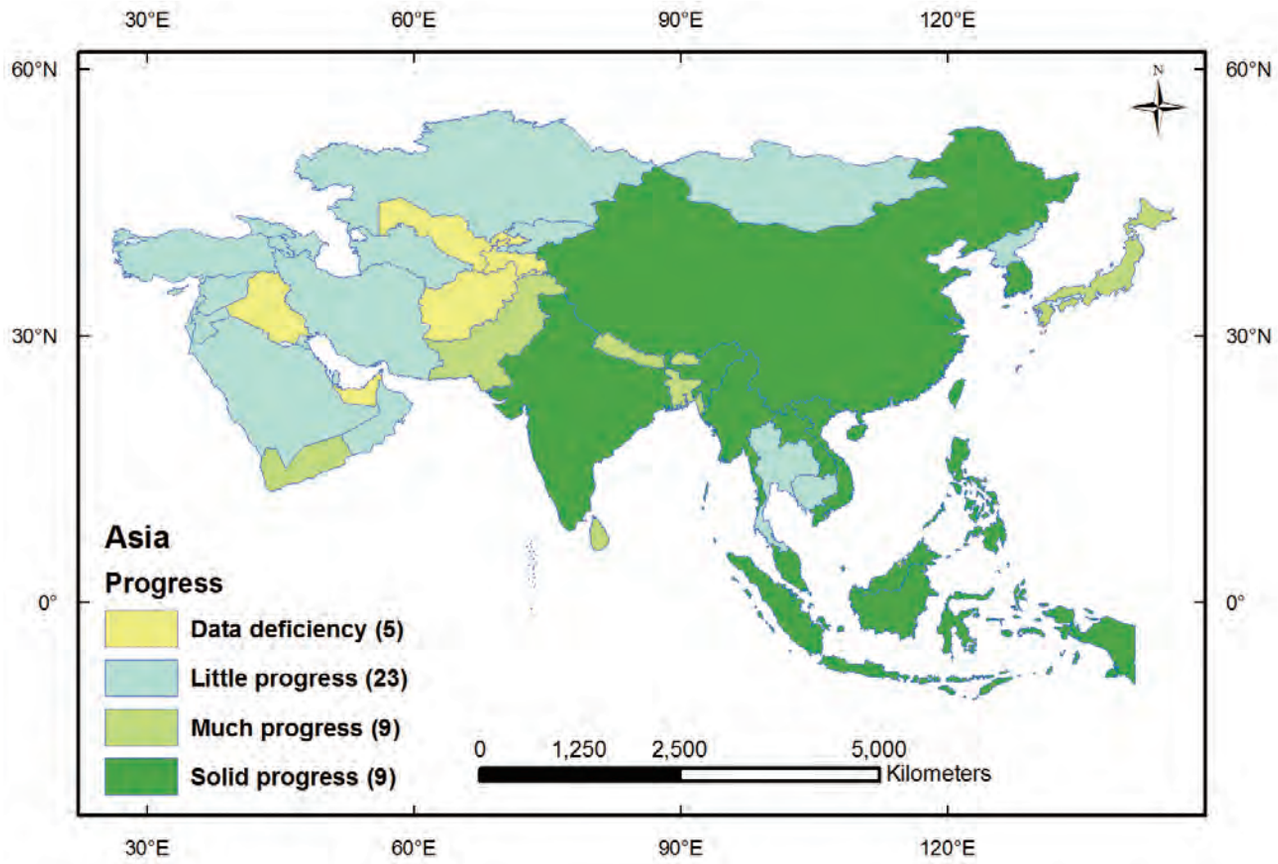
A large number of sites in Asia are worst designating as IPAs due to their high diversity and importance to global biodiversity. It will take a long time to do full assessment and develop detailed recording of the plant diversity. As a priority, IPAs assessment should be carried out in Central Asian region and Malay region immediately.

2. Materials are provided by Matthew Hall

3-4. Plant Conservation Report 2009

5. International IPA brochure 2010

TARGET 6:
At least 30% of production lands managed consistent with the conservation of plant diversity



Introduction

Production land refers to areas where the primary purpose is agriculture, timber production and grazing. Comparing to natural habitats, these areas posses relatively low in biodiversity. They, however, can provide refuge to crop wild relatives, medicinal plants, under utilized crop varieties, land races and birds and smaller animals.

Conservation of plant diversity within a production landscape can contribute to the stability of ecosystem, and guarantee sustainability of the production land. The ways a production land being managed can also affect biodiversity conservation vastly. Organic farming, for example, usually increases biodiversity of different taxa. Plants in organic farming often have higher species richness and abundance than conventional farming systems[1].

As for the efficient management of these production lands at the national level, the success lies in implementing ecosystem approach in sustainable farming systems, good forestry and grazing practices.

Progress

Case 1: Genetically diversified rice plantation in Yunnan province of China

Rice blast is one of the major diseases of rice. Resistant varieties of rice can be obtained through genetic diversification. Evidence shows that blast-susceptible rice varieties in mixture planting with resistant rice varieties had 89% greater yield and 94% less blast than planting in monoculture[2]. Fungicidal sprays – erecting blast – were also no longer needed for disease-susceptible rice. This innovative planting method can control disease in an ecological manner and contributes to both crop production and biodiversity conservation.

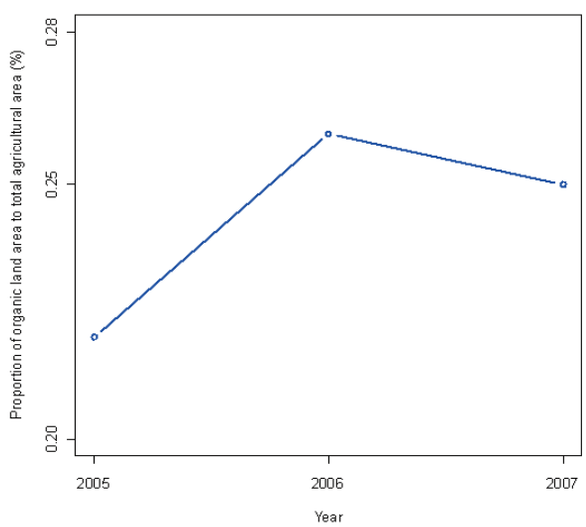
1. Bengtsson, J. *et al.*, The effects of organic agriculture on biodiversity and abundance: a meta-analysis. *Journal of Applied Ecology* 42, 261-269 (2005).
2. Zhu, Y.Y. *et al.*, Genetic diversity and disease control in rice. *Nature* 406, 718-722 (2000).

Blast-susceptible varieties of rice are planting in mixture with blast-resistant rice varieties [3]

Case 2: Organic agriculture in Asia

Organic agriculture does not depend on the routine use of inorganic fertilizer, herbicides and pesticides. Evidence shows that organic farming can increase diversity of beetles, vascular plants and birds in the agricultural landscape, while conventional agriculture acts differently.

Organic agriculture in Asia is now under development. This advanced farming system can play an increasingly important role in biodiversity conservation in Asia given the fact that more and more countries implement organic farming practice, thus is beneficial to achieving Target 6 of GSPC in Asia.



The proportion of organic farm land area to total agricultural area [4]

Case 3: Agroforestry and biodiversity conservation

Agroforestry is a kind of ecosystem management that combines both the ecological effect and the economy effects together[5]. This type of management can efficiently utilize both the aboveground community and the belowground community, thereby strengthen stability of ecosystem[6]. Agroforestry systems can provide materials that can meet the needs of local people, and reduce pressure on natural ecosystems. *Cassia siamea* and *Coffea* sp. in Mayanmar is one of many examples of agroforestry in Asia. It provides local people with firewood, while increases income of local people from the cash crop grown. Another example is orange (*Citrus reticulata*) and sugarcane (*Saccharum sinensis*) in India.

Agroforestry system of *Cassia siamea* and *Coffea* sp. in northern area of Mayanmar [7]

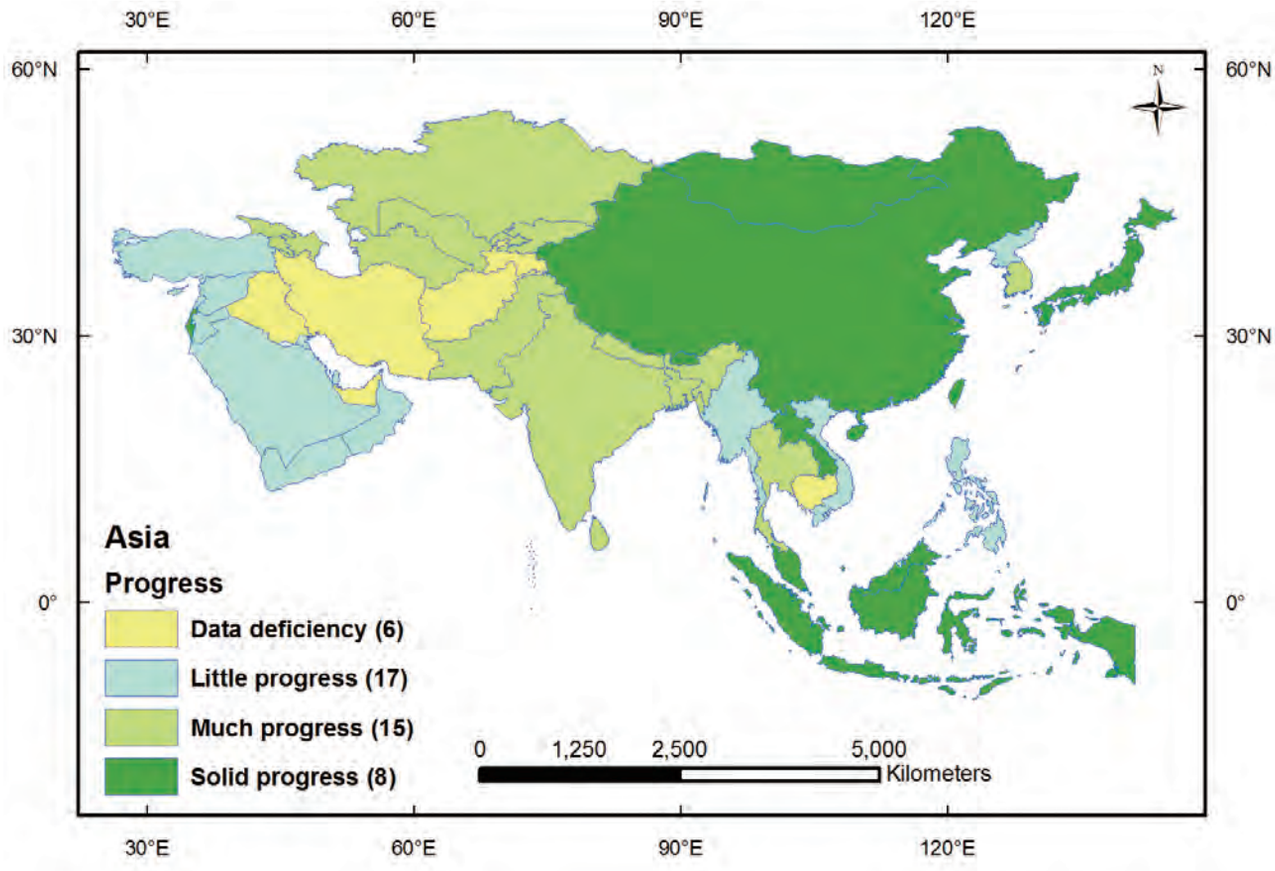
Agroforestry system of orange (*Citrus reticulata*) and sugarcane (*Saccharum sinensis*) in Demaji, India [8]

Future

For the sustainable development of agriculture, forestry and grazing, many innovative management practices emphasize biodiversity conservation within these production lands. We do not know, however, to what extent plant diversity has been conserved. The primary challenge of achieving Target 6 is thus to specify management practice, that is, choosing good management methods to benefit both production needs and biodiversity conservation. Further, monitoring networks should be established to measure trends of biodiversity within these production lands, that enables us to assess whether we have achieved this target.

3. Photo credit: Youyong Zhu
4. http://earthtrends.wri.org/searchable_db/index.php?theme=8
5. http://www.worldagroforestry.org/
6. www.brim.ac.cn/book/dbook.asp?id=92
7-8. Photo credit: Chunlin Long

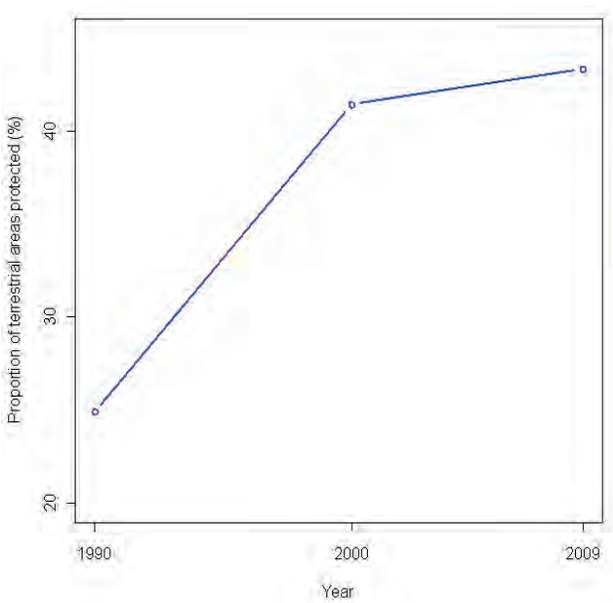
TARGET 7:
60% of the world's threatened species conserved *in-situ*



Introduction

Setting priority for conservation of threatened species is a strategy of biodiversity management. Assessment of number of threatened species in a country or a region through achieving the Target 2 is the first step to fulfil the Target 7. This target is concerned to conserve the threatened species in their natural habitat.

Protected Area system plays a major role in *in-situ* conservation of the threatened species. But it is not without challenges. Evidence shows that natural oscillation of ecosystem can result in small scale temporal variation of populations. Thus, for some extremely endangered species, *in-situ* conservation alone cannot guarantee its survival, unless certain management and interventions are imposed on the populations or the ecosystems. Putting legislative framework in place is also important to conserve threatened species. Setting up monitoring system with indicator, i.e., Red List Index, is essential to measure the trends in status of threatened species.



Increase of proportion of terrestrial areas protected over the last 20 years in Asia [1]

1. http://www.wdpa.org/Statistics.aspx

Progress

Case 1: Transboundary biodiversity conservation

According to the definition of IUCN, transboundary protected area is an area of land and/or sea that straddles one or more borders between states, sub-national units[2]. It aims to protect biodiversity, natural resources and cultural resources within these areas through cooperation between different states or different administrative units within a country. The cross-border protection area in Borneo, for example, covers more than one million ha among the border area between Malaysia and Indonesia. This continuous area is extraordinarily rich in biodiversity, and is the only protected area in Borneo[3]. Through preserving natural forests in this area, the protected area maintains a lot of critically important habitats, thus contributes to *in-situ* conservation of threatened plants in this region.

Cross-border protection in Borneo: Sarawak (Malaysia) and Kalimantan (Indonesia) [4]

Case 2: *In-situ* conservation of *Cycas panzhihuaensis*

Cycas panzhihuaensis is the oldest vascular plant within Hengduan Mountain range that survived the Quaternary glacier. In order to achieve efficient *in-situ* conservation of this plant, Chinese government established a national nature reserve in its area of origin, within Panzhihua County that is located at the transboundary area between Sichuan Province and Yunnan Province.

The nature reserve covers an area of 1358.3 ha, with about 230,000 individuals of *Cycas panzhihuaensis*. The mean height of these individuals is about 0.5 m, and the maximum height is 3.2 m. The nature reserve also harbours another 490 plant species and 87 animals and birds.

Cycas panzhihuaensis (Cycadaceae) in nature reserve [5]

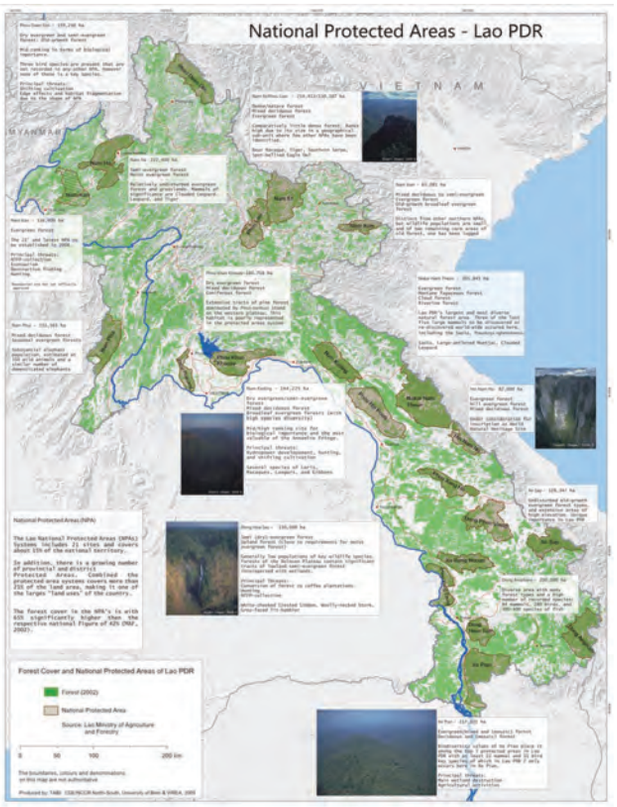
Seeds of *Cycas panzhihuaensis* [6]

The national nature reserve of *Cycas panzhihuaensis* in China [7]

2. http://www.tbpa.net
3. http://www.tbpa.net/case_02.htm
4. Photo credit: Leng Guan Saw
5-6. Photo credit: Zhixiang Yu
7. Photo credit: Bing Liu

Case 3: The system of National Protected Areas (NPAs) in the Lao People's Democratic Republic

The system of National Protected Areas is established in one of the world's "Least Developed Countries",



The system of National Protected Areas in the Lao People's Democratic Republic [9]

but is famous in the world. It contains now 20 protected areas and covers about 21% of Lao's land area[8]. Recent research of flora and faunal lists has been undertaken in NPAs. Ecotousism revenue in these areas benefits local communities and assist local government in efficient management of biodiversity. Specially, the NPAs were designed to protect the origin habitats of plants and animals. These protected areas will play an important role in the *in-situ* conservation of threatened plant species in this country.

Future

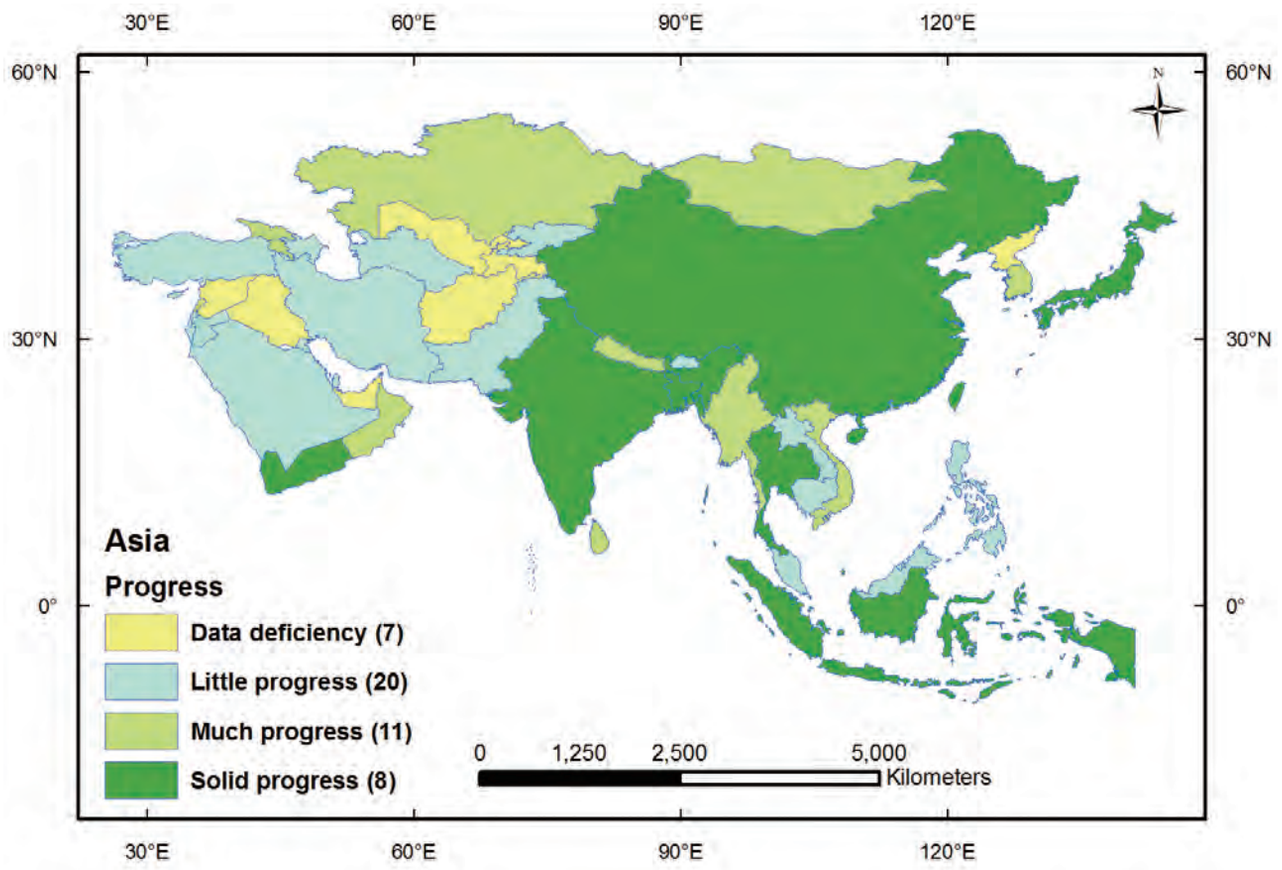
Achievement of Target 7 is closely related to that of Target 2, that is, a list of threatened species is necessarily needed for a country to set conservation strategy. It is important to have specific management interventions for achieving the conservation of most of the threatened species in Asia countries.

For those species that have gradually declining populations, some methods of rescue and recovery might be necessary to protect them. There are, however, very scarce successful cases in Asia. Further, *in-situ* conservation programs for crop wild relatives, grazing plant species and medicine plants are also very limited. Further research is needed for Asia countries on *in-situ* conservation methods of and also assessing efficiency of these methods in light of future threats like climate change.

Dracaena cochinchinensis (Agavaceae), endangered species in China and Indochina Peninsula [10]

8. Lao PDR National Report on Protected Areas and Development
9. Data source: Lao Ministry of Agriculture and Forestry
10. Photo credit: Bing Liu

TARGET 8:
60% of threatened plant species in accessible *ex-situ* collections, preferably in the country of origin, and 10% of them included in recovery and restoration programs



Introduction

Ex-situ conservation plays a very important role in biodiversity conservation globally. It means conserving species outside its natural habitats with a view to safeguarding populations or individuals from threats of extinction. Plants, compared to other life forms, are naturally fit to *ex-situ* conservation as different life stage of plants - seeds, spores or pollen - can maintain its viability for a long time[1]. For a small portion of critically threatened species, Target 8 also emphasizes that it is necessary to include them in recovery and restoration programs.

Ex-situ conservation tools and techniques complements *in-situ* conservation, where *in-situ* conservation alone can not guarantee survival of individuals or limited populations. Socio-economically valuable species may face selective extraction in well preserved natural habitat. In the advent of climate change and its possible impact on plant distributions, *ex-situ* techniques will play a crucial role in supporting adaptation of species and ecosystems with the changing environment in the wild. This target also encourages to undertake recovery programs.

Botanical garden, field gene bank, seed bank, gene bank, tissue and cell culture are some of well know approaches for *ex-situ* conservation. Botanical gardens play a very important role in the *ex-situ* conservation of plants all over the world, and the proportion of threatened species collected increased gradually over the past decades in Asia. The number of germplasm bank also increases gradually in this region.

1. Heywood, V. H. & Iriondo, J. M. Plant conservation: old problems, new perspectives. *Biological Conservation*, 113, 321-335. (2003).

Progress

Case 1: Bogor Botanical Gardens in Indonesia

The Bogor Botanical Gardens officially opened in 1817, located 60 km south of Jakarta, capital of Indonesia. The garden now the most famous and the largest tropical garden in the world, covering about 80 hectares of area.

To date, there are more than 15,000 tropical plants collected from around the world[2]. For a well illustration of Indonesia flora, a large number of plants native to Indonesia, such as the palm collection are also collected in the gardens[3]. The collection of tropical plants in these gardens, contributes to the achievement of Target 8 for Asia countries.

Gate of the Bogor Botanical Gardens [4]

A glance at the Bogor Botanical Gardens [5]

Case 2: The Germplasm Bank of Wild Species in Southwest China [6]

The Germplasm Bank of Wild Species in Southwest China (GBOWS) is the first national germplasm bank for wild plant, animal and microbial species. The GBOWS is of great significance for development of biological science in China and plays an important role for the conservation of genetic diversity of wildlife in China. It also offers excellent opportunity to the scientists to conduct research related to germplasm resources.

The building of GBOWS [7]

2. http://en.wikipedia.org/wiki/Bogor_Botanicalal_Gardens
3. http://www.bogor.indo.net.id/kri/a.htm
4-5. Photo credit: Ahmad Jauhar Arief
6. Materials are provided by Dr. Xiangyun Yang and Dr. Ting Zhang in the Germplasm Bank of Wild Species in Southwest China.
7. Photo credit: Jie Cai

The above figure: seeds are dried, sealed in air-tight containers and then stored at -20℃ in seed bank [8]

The construction of the building of GBOWS started on 22 March 2005, and was completed on 8 February 2007. GBOWS was officially put into operation on 29 October 2008 and 74,641 accessions of germplasm materials were preserved by the end of 2009. These materials cover a total of 8,444 species of wild plants, animals and microorganisms. GBOWS has a target to preserve and make 66,500 more accessions of 6,450 species by 2010, and 190,000 accessions of 19,000 species by 2020.

The collecting network of the Germplasm bank and its partners' distribution area [9]

Future

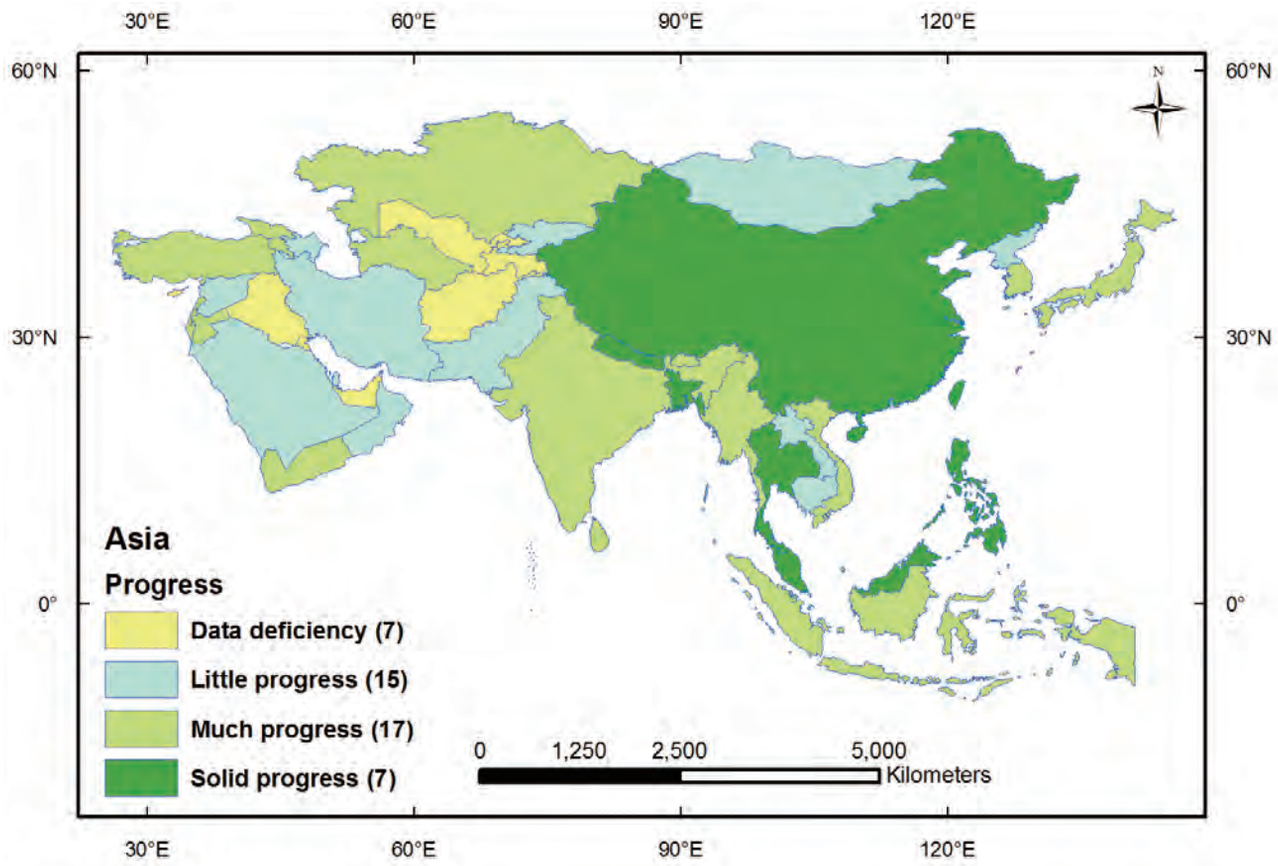
The role of Botanical gardens in *ex-situ* conservation sometimes might be limited since plant distribution always shows obvious spatial pattern. For a country or a region with large spatial extent, one or two Botanical gardens cannot conserve threatened plant species very well. It is necessary to establish a network of Botanical gardens in Asia to protect more threatened species.

Among all germplasm facilities, seed bank is the most valid and widespread method. In order to improve conservation efficiency of seed banks, it is necessary to strengthen research on innovation in seed storage methods. Capacity building in *ex-situ* conservation should be a priority in the countries showing limited progress in achieving this target. Proper resource allocation to the institutions involved in *ex-situ* conservation in these countries is a challenge to make solid progress towards achieving Target 8 in Asia.

8. Photo credit: Jie Cai

9. Information provided by Xiangyun Yang

TARGET 9:
70% of the genetic diversity of crops and other major socioeconomically valuable plant species conserved, and associated indigenous and local knowledge maintained



Introduction

This target highlights the necessity of conserving the genetic diversity of crops and other major socio-economically valuable plant species and the associated indigenous and local knowledge. It is estimated that 70 percent of the genetic diversity of 200 to 300 crops over the world has been preserved in gene banks. Besides seed banks and gene banks, genetic diversity, and associated indigenous and local knowledge can also be preserved through on farm cultivation and management involving local communities. Besides the crops, this target addresses important forage, agroforestry and forestry species and medicinal, ornamental and crop wild relatives.

This target has a direct implication on world food security[1]. Conserving wild relatives of crops is essential for future improvement of existing crop verities by conventional breeding methods or modern biotechnologies. Crop wild relatives are increasingly threatened by habitat loss. Similar to Target 8, Target 9 also conducts *ex-situ* conservation through such methods as botanical gardens, seed banks, gene banks and tissue and cell cultivation methods.

Progress

Case 1: International Rice Research Institute [2]

The International Rice Research Institute (IRRI) is the largest rice research institute in Asia. Its headquarter is located at Manila, the capital of Philippines. Since its establishment in 1960, through improved rice varieties and cultivation techniques, scientists in IRRI have helped farmers in Asia to increase the rice production many folds. Success of IRRI contributed heavily in averting famine, lifting farmers out of poverty, and preventing large areas of

1. Esquinas-Alcazar, J. Protecting crop genetic diversity for food security: political, ethical and technical challenges. *Nature Reviews Genetics*, 6:946-953. (2005).
2. http://irri.org/

The administrative building of IRRI [3]

The International Rice Gene Bank (IRG) [4]

natural ecosystems from being transformed into farmland.

Further, IRRI has made solid progress in conservation of rice genetic diversity. To date, about 110,000 accessions of germplasm materials of domesticated and wild rice have been preserved at the International Rice Gene bank (IRG). Recently, IRRI has also made great achievements in such aspects as delivering rice varieties to withstand climate change induced stresses, building local capacity, promoting smarter nutrient use, breeding healthier rice, boosting irrigated rice yields and discovering new genes. IRRI through its multi-pronged activities helps achieving the Target 9 in Asia.

Field of rice cultivation in IRRI, which has the longest generations of cultivation in the world [5]

In IRRI, collections of wild rice from all over the world [6]

Case 2: Dipterocarp arboretum in Malaysia

Dipterocarpaceae, a pantropical family, is a plant family with about 520 species. Tropical rain forest in Southeast Asia is now the major distribution area, with a total of 472 species found in this region[7]. Species of this family have great socio-economic importance since they are traded for their high timber value. Many of them are now endangered species as the result of over harvesting and degradation of rain forests.

Rain forest in Malaysia is now the dominant distribution area of this family in Asia. According the

The dipterocarp arboretum in Forest Research Institute Malaysia [8]

3-6. Photo credit: Baorong Lu

7. Zhu, H., Wang, H. Notes on the two species of family Dipterocarpaceae found in Xishuang Banna, *Acta Botanica Yunnanica*, 1992: 14(1):21-26. (1992).

8. Photo credit: Leng Guan Saw

IUCN Red List categories 92 of the 164 assessed, are threatened species, which account for 56.1 per cent of the total assessed species[9]. The dipterocarp arboretum in Forest Research Institute Malaysia has a long history, and the collection of living trees of Dipterocarpaceae plays an important role in genetic diversity conservation of these socio-economically valuable plant species.

Case 3: China National Crop Gene Bank

China National Crop Gene Bank was established in 1986. Since that time it has been the long-term

Building of the China National Crop Gene Bank [11]

Seed bank in the China National Crop Gene Bank [12]

Laboratory in the China National Crop Gene Bank [13]

preservation and research center for crop germplasm resources in China. Seeds of crops and their wild relatives are preserved in the germplasm bank. Up to date, about 390,000 accessions of crop germplasm and those of crop wild relatives have been preserved[10]. The Gene Bank plays an important role in conservation and utilization of crop genetic diversity in China. In addition, it helps China to take a leading role in achieving the Target 9.

Future

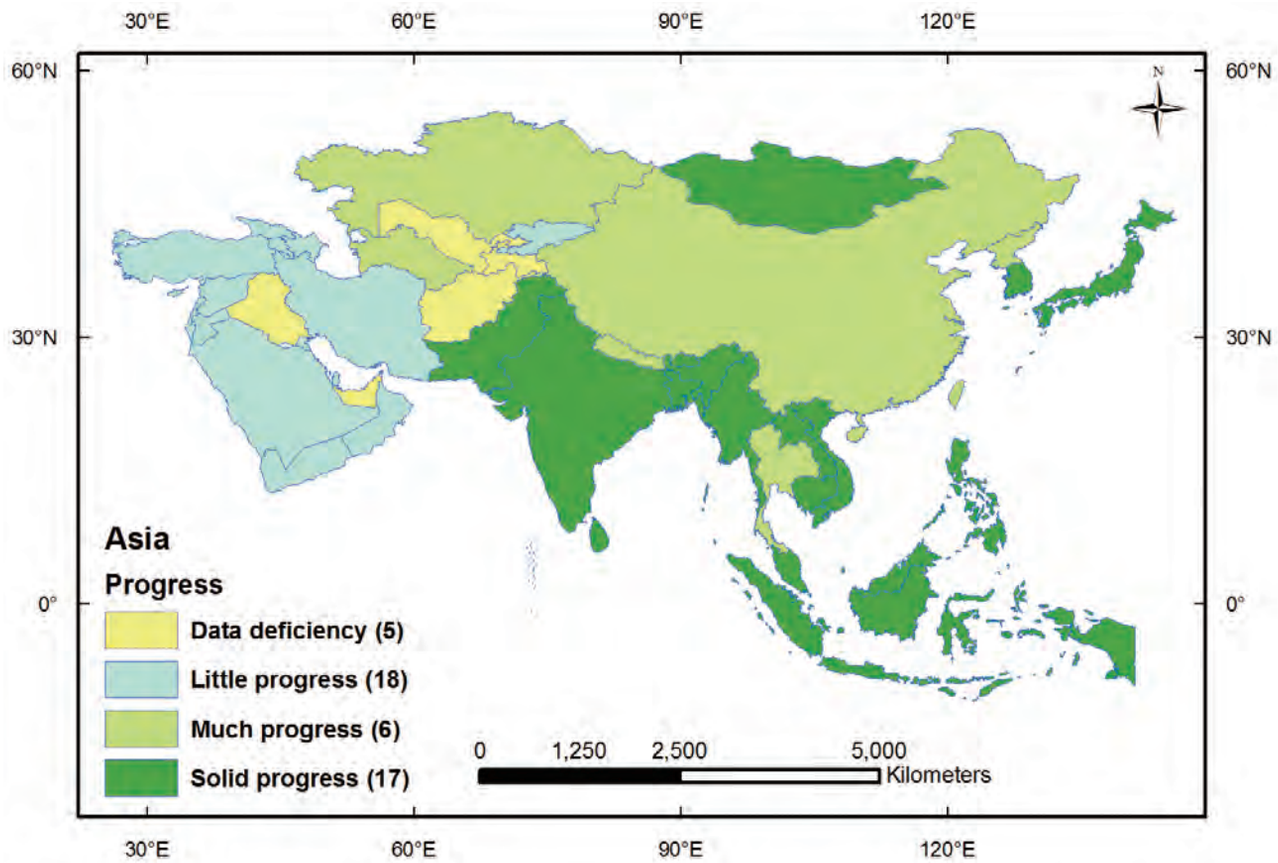
While significant progress is demonstrated in germplasm preservation in gene banks across Asia, maintenance of associated indigenous and local knowledge presents significant challenge. Increasing gap in inter-generational transfer of knowledge is seriously eroding the traditional knowledge base. Bringing ecosystem approach in conserving the plant genetic resources in the agro-ecosystem can assist implementation of this target. This target is closely related to the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). Process related to ITPGRFA can contribute in developing data and tools for measuring progress of Target 9.

9. Chua, L.S.L. *et al.*, Malaysia Plant Red list - Peninsular Malaysian Dipterocarpaceae. (2010).

10. Cao, Y.S., Fang W., Establishment and application of National Crop Germplasm Resources Infrastructure in China. *Biodiversity Science.*18(5):454-460. (2010).

11-13. Photo credit: Keping Ma

TARGET 10:
Management plans in place for at least 100 major alien species that threaten plants, plant communities and associated habitats and ecosystems



Introduction

Invasive Alien Species (IAS) of plants and animals threaten and destroy ecosystems. Spread of invasive species is closely related to accelerating tourism, trade, and transport over the world. Deliberate introduction of crops and horticulture species is the main cause of invasion of alien plants. *Eichhornia crassipes*, for example, native to South America, was introduced as an ornamental plant to China in the early of 20 century[1]. *Solidago canadensis*, native to North America, was also introduced as an ornamental plant to China in 1935[2]. These two species have already escaped into wild habitats. They are now two major invasive plant species in China. They have seriously threatened and damaged ecosystems in the east part and south part of China, and they have also caused damages to social economy. Another example is *Lantana camera*, a plant introduced to Sri Lanka in 1926, is now a major invasive weed in this country[3]. *Leucaena leucocephala*, introduced to Myanmar as fuel plants around 1978, is currently a threat to local ecosystems[3].

There are generally four strategies to manage the IAS in the invaded area[4]. Eradication of IAS is the most difficult approach, but it is also the most desirable. Then containment and control can be employed to the populations of IAS that cannot be eradicated. The extent of control is often more stricter than that of containment. Mitigation is the last option when the above three strategies cannot be employed successfully, that is, to find the best way to minimize the impact of IAS on local ecosystems.

1. Li, B. *et al.*, *Journal of Fudan University (Natural Science)* 43:267-274. (2004).
2. Dong, M. *et al.*, *Acta Phytotaxonomica Sinica* 44 (1):72-85. (2006).
3. http://www.apfisn.net
4. Wittenberg, R., Cock, M.J.W. (eds.) Invasive Alien Species: A Toolkit of Best Prevention and Management Practices. xvii-228. (2001).

Progress

Case 1: Invasive Alien Species Act in Japan [5]

The Invasive Alien Species Act in Japan is now in force since June 2005. Through regulating actions such as importing, transporting, storing, raising and planting, besides mitigating impact of invasive alien species, the Act aims to prevent damages caused by invasive species on ecosystems, human health, agriculture, forestry and fishes.

According to the Act, alien species are classified into three categories: Invasive Alien Species, Uncategorized Alien Species and Living Organisms Required to have a Certificate Attached. To date, alien plant species in Japan belong to 12 genuses of 9 families. Among these species, 12 species are Invasive Alien Species, and 2 species are Uncategorized Alien Species.

Rudbeckia laciniata (Compositae) [6]

Eradication of *Rudbeckia laciniata* in Japan [7]

Pistia stratiotes (Araceae) [8]

Eradication of *Pistia stratiotes* in Amami Island, Japan [9]

Case 2: Asia-Pacific Forest Invasive Species Network (APFISN)

The Asia-Pacific Forest Invasive Species Network (APFISN) is a cooperative organization of 33 countries in the Asia-Pacific region. It belongs to the Food and Agriculture Organization of the United Nations (FAO). Until present, 20 Asia countries are among the membership of the APFISN[10]. The network aims to detect, monitor and control forest invasive species in this region. APFISN publish newsletter for raising awareness on regular basis. It outlines the major forest invasive species in this region, and also reports both the news of the APFISN and the academy symposia.

Ulex europeus, for example, native to Central and Western Europe, is now included in the global

5 http://www.env.go.jp/en/nature/as.html
6. Photo credit: Bing Liu
7. Photo credit: Japan Wildlife Research Center
8. Photo credit: Bing Liu
9. Photo credit: Japan Wildlife Research Center
10. http://www.apfisn.net

Gorse infestation [11]

invasive species database as the 100 "world's worst" invaders. This species is currently distributed in China, Japan, India, Indonesia and Sri Lanka.

Gorse (*Ulex europeus*, Leguminosae) [12]

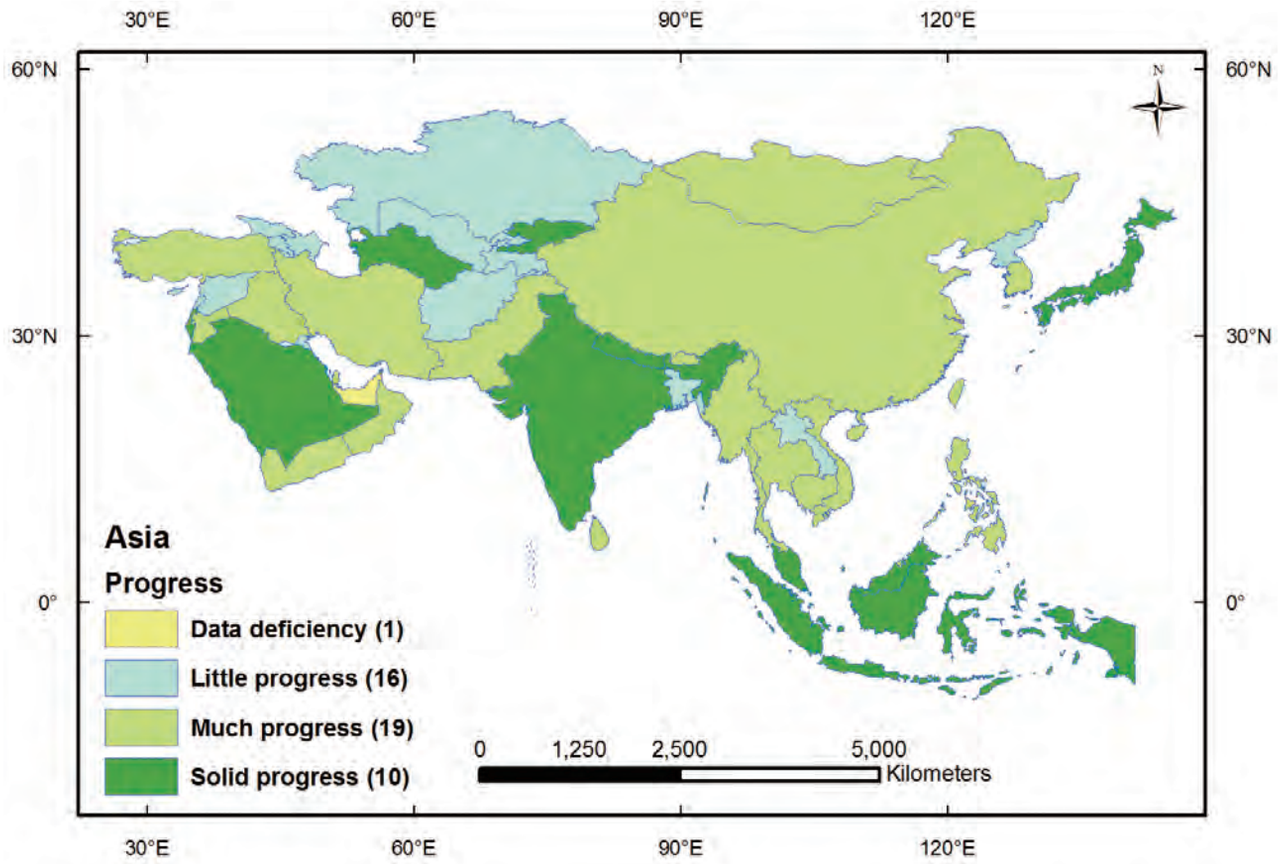
Future

Climate change may have a profound impact on the invasiveness of many of the significant IAS in Asia. It may put additional stress on the livelihoods and heath of millions of people in Asia who are dependent on ecosystems goods and services. Asian countries should put high importance to the preparedness and management of possible present and future impacts of IAS. Early detection and prevention are needed in possible invasive areas. Damage caused by invasive alien species should be assessed, and each country should design management plan based on the assessment.

Eichhornia crassipes (Pontederiaceae), one of the worst IAS, native to Brazil, occurs in tropical and subtropical Asia [13]

11-12. Newsletter of the APFISN, Volume 24. (2009).
13. Photo credit: Bing Liu

TARGET 11:
No species of wild flora endangered by international trade

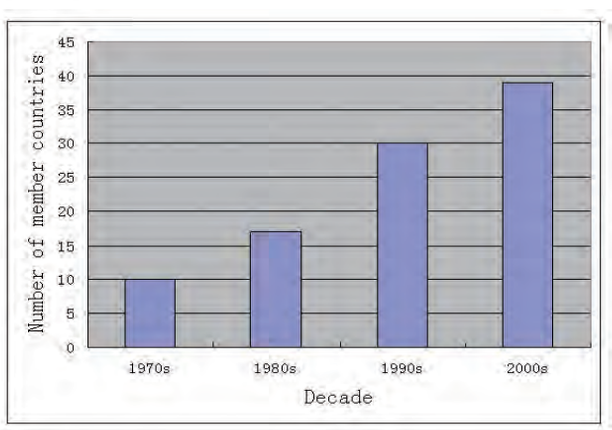


Introduction

International trade is an important threat to plants species, especially those with high medical, ornamental or timber value are exposed to the risk of extinction under the pressure of selective over-harvest. For example, after the discovery of taxol, its source plants *Taxus* spp. wild populations are threatened all over the world; international timber trade leads to deforestations and local extinctions of species. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was signed by representatives of 80 countries on 3 March 1973, and on 1 July 1975 CITES entered in force. There are other international mechanisms regulating the international trade in Asia, including ITTO (eight member countries in Asia[1]), ASEAN-WEN and ASEAN WTI. Based on the agreements and Appendices of CITES, most of the countries regulate the activities concerning international trade by legislations, state administrations and conducting protection projects.

Progress

Case 1: The increasing of Asian countries in CITES



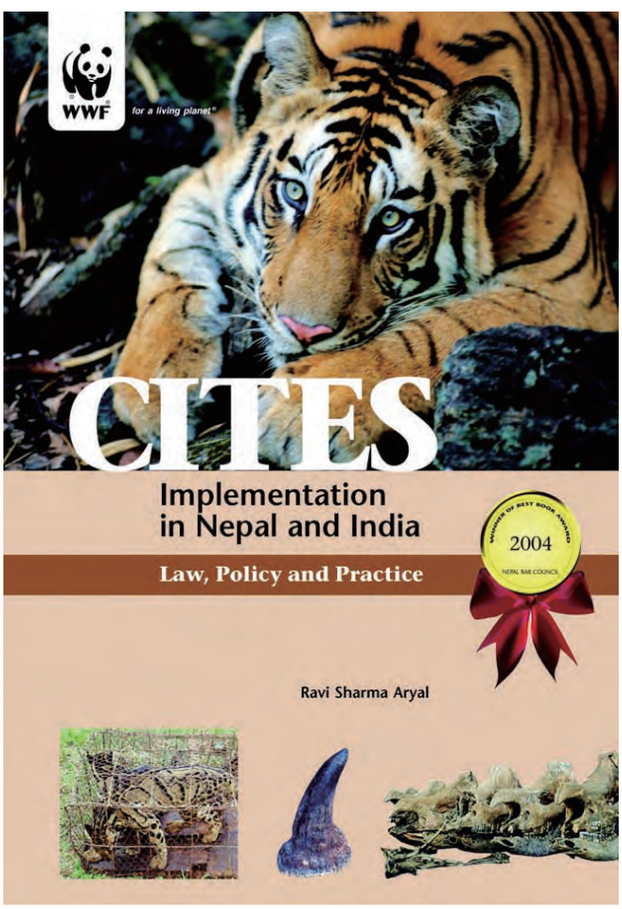
Increasing of CITES Asian member countries

1. http://www.itto.int/en/itto_members

From 1974 to 2008, there are 39 Asian countries are parties of CITES[2], seven of which joined after 2002 when GSPC was entry into force.

Case 2: Implementation of CITES in Nepal and India

The implementation of CITES in national level always relates to legislations and policy makings in areas of environment and biodiversity protection, but the efficiency always determined by the economy and culture of the nations. The benefits from international trade seduce people to smuggle endangered species at the edge of official regulation. There are much legislation aimed to control the illegal trade in wild flora in Nepal and India. Although the enormity of the task, the deep-rooted nature of the trade make target of CITES were not fully realized3, but the progress is obvious[3].



CITES: Implementation in Nepal and India

Case 3: The management of snowdrop in Georgia

Georgia has only one CITES listed species that is currently subject to commercial trade: the snowdrop (*Galanthus woronowii*). Supported by the Dutch government and the CITES secretariat, Georgia scientist evaluated wild and farmed populations, developed extraction quotas and schemes for population monitoring, put in place controls for extraction and made recommendations for the artificial cultivation of this species. The project has already demonstrated positive impacts.

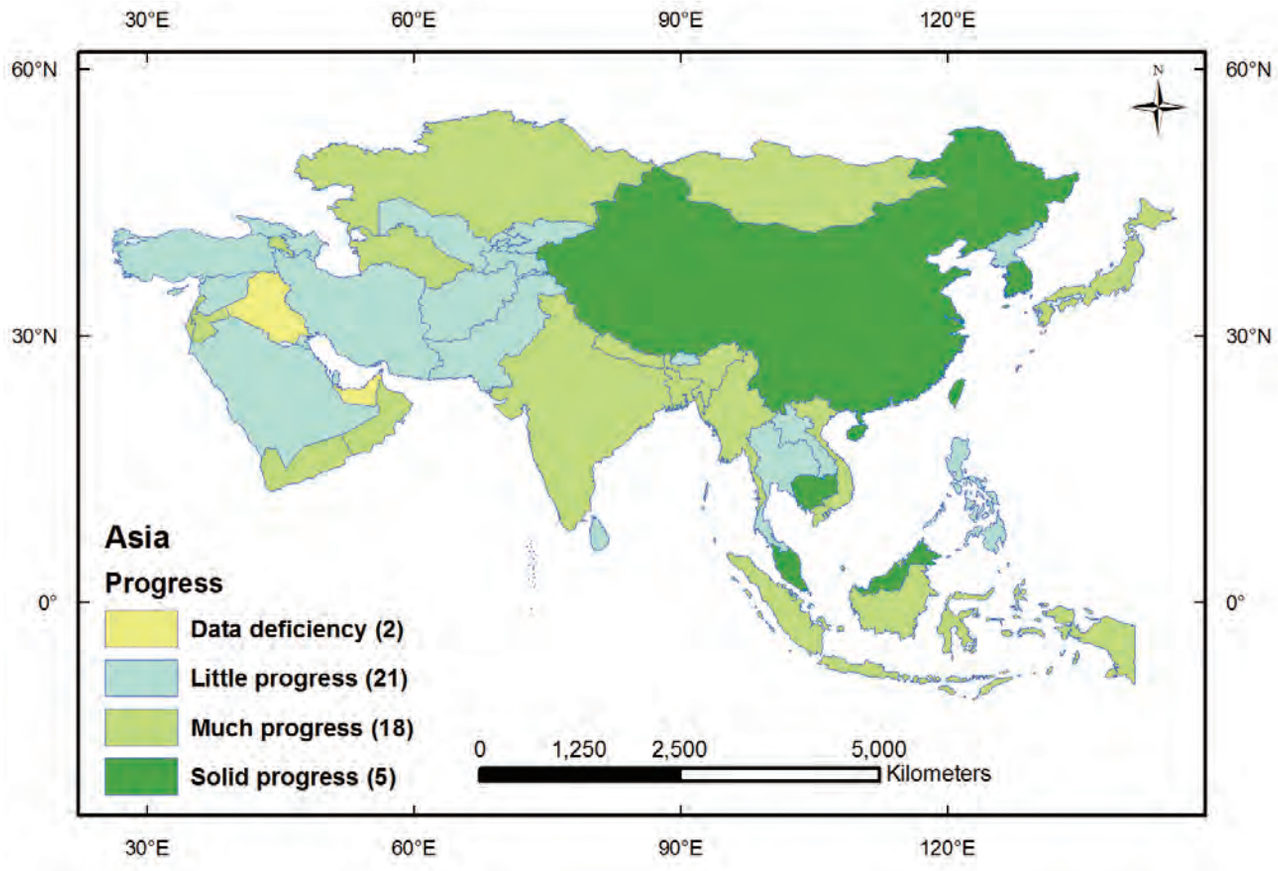
Galanthus woronowii (Amaryllidaceae) [4]

Future

Although Asian countries have made obvious progresses to stop the illegal international trade of wild species, the situations are still serious. The details of the resources and international trades of wild plants are universally not very clear. In future more projects are needed to improve the capacities of plant identification in regulation systems, to better monitor the species and quantity in wild plants international trade, to assess the wild resources and to address the threats, finally get better implementations in the legislations, law enforcements and regulations. More cooperation among the customs of CITES party countries and International Criminal Police Organization are needed to strictly restrict the smugglings of wild plants.

2. http://www.cites.org/eng/disc/parties/alphabet.shtml
3. http://assets.panda.org/downloads/final_cites_book.pdf
4. Photo credit: DigPeter

TARGET 12:
30% of plant-based products derived from sources that are sustainably managed



Introduction

The products derived from plants include food, fodder, fiber, medicine, timber, firewood and other derivates. The increasing needs for more products put high pressures on natural resources. Overuse of farm chemicals and irrational farming methods are eroding the sustainability of natural resources. This target aims to promote sustainable managements based on local conditions, according ecological principles to conduct organic farming, sustainable forest management and harvest from wild plant resources. It requires coordinated approach that applies across all sectors of international, national and local production and trade of plant products. In case of plant material collected from wild or semi-natural ecosystems, harvesting must be below replacement rates to be sustainable, and the process of harvesting should not cause significant damage to other component of the ecosystems. Sustainable management of plants and their products relates to environmental and social issues, including fair trade, equitable sharing of benefits and participations of indigenous and local communities.

Progress

Case 1: The implementation of ISSC-MAP in Cambodia [1]

The target of International Standard of Sustainable Collection of Medical and Aromatic Plants (ISSC-MAP) is to help the activities in collection, management, production, trade and marketing

Medical and aromatic plant products in Cambodia

of medical and aromatic plants that are sustainably managed. In Cambodia, medical and aromatic plants are important in local economy and health care, but are threatened by over-harvest, urgently in the need of sustainable management like ISSC-MAP.

Cambodia ISSC-MAP Implementation Project area was Prek Thnoat Community Protected Area, including two target species. This project will help the stakeholders to get the capacities to sustainably manage wild plant resources.

The target species in the project: Tepirou (*Cinnamomum cambodianum*) and Krakao (*Amomum ovoideum*)

Field works of ISSC-MAP implementation in Cambodia

Case 2: The organic food certification in Korea

Organic food is produced from organic farming system, having no pollution, always get higher price than not-organic food in markets.

The Korean government has developed an organic certification and labeling program. The regulations for fresh organic products and grains are implemented by the Ministry of Agriculture and Forestry (MAF) and the regulations for processed organic products are implemented by the Korean Food and Drug Administration (KFDA). An applicant should get an acceptable organic certificate issued by one of the government accredited organic certification bodies before the approval from MAF or KFDA to use the organic food labels. The labeling mechanism has had an ancillary positive effect of increasing consumer awareness about the heavy use of agri-cultural chemicals in Korea. Though the recent Korean market for organic products is still very small, but local industry sources project a growth rate of 30-40 % per year.

The organic food labels in Korea [2]

Case 3: Timber certification in Malaysia

The Malaysian Timber Certification Council (MTCC) is an independent organization established in 1998 to develop and operate the Malaysian Timber Certification Scheme (MTCS) in order to provide assessments of forest management practices in Malaysia as well as to meet the demand for certified timber products. MYCS contains nine principles, 47 criteria and 96 indicators. The certified forest or timber products would be labeled, which give the products advantages in markets, then promote the sus-tainable management of forests.

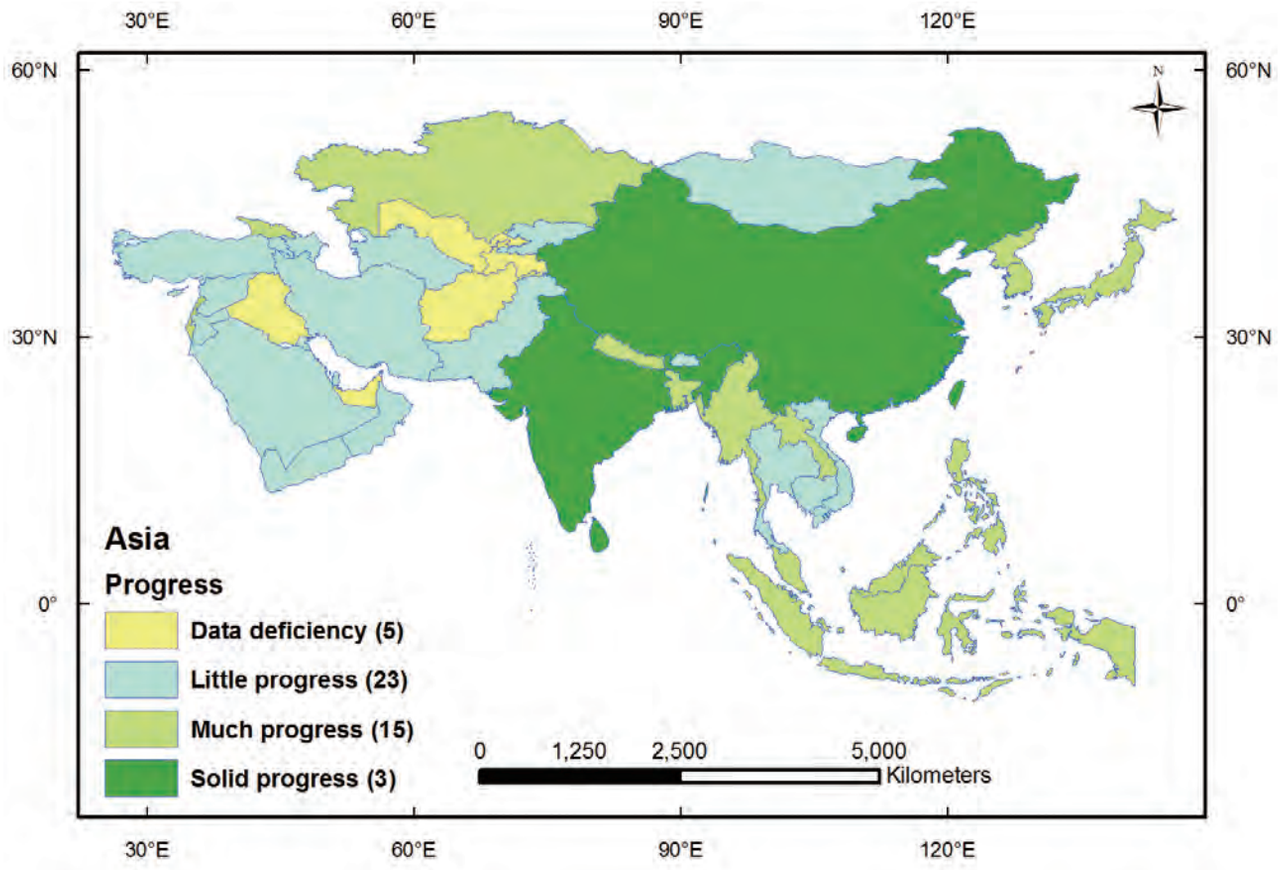
Timber products certified by MTCC [3]

Future

Achievement of this target depends on more supports from trade policies, better consumer awareness and higher incentives for sustainable products. At the same time, the successful cases in wild plant sustainable harvest, organic certification and timber certification should be disseminated among countries to provide framework for improvement and innovation of good practices. New partnership between conservation organization and private sector is necessary to realize this target.

1. Materials are provided by Dr. Wei Shen, WWF China Program Office
2. http://www.ota.com/pics/documents/koreanmarketoverview.pdf
3. http://www.mtcc.com.my

TARGET 13:
The decline of plant resources and associated indigenous and local knowledge, innovations and practices that support sustainable livelihoods, local food security and health care halted



Introduction

Plant diversity supports the life of people, offering products and services for diets, health and livelihoods, and people developed much useful traditional knowledge in long history. These resources are essential for a sustainable future of human from local to global level. Asia has highly diverse plant diversity and great amount of local knowledge, many of which are harmonious between local community and natural plant resources, having characters of sustainability, such as terrace culture in China and Satoyama in Japan. Asia has numerous medical plants and associated traditional knowledge on their use. There are more than 12,000 kinds of traditional medical plants in China and more than 7,000 in India. Such knowledge, together with modern science, can unlock innovations in food, fiber and medicine to combat future development challenges. Living in harmony with nature will shape the future sustainability of the world.

Progress

Case 1: The conservation of Hani Ethnic terraces in Yuanyang County, China

The landscape of the Hani Ethnic terraces in Yuanyang County, Yunnan Province, China, is a unique man-made ecosystem itself. Dense forests in the upper slope are considered as sacred forests. It regulates water flow downhill, and supplies timber and firewood to villagers. Lower in the slope, Hani people produce food in the step terraces. The villages are in the middle of the landscape with houses of Hani people. These landscapes with elements of forests, villages, terraces and rivers from

top to foot of the mountains have been in existence for more than one thousand years. It is a virtuous circulation of the ecological system, harmonious with nature and sustainable, belonging to a highly rational Hani culture that include perfect water harvesting and reasonable cropping systems, keeping good health even in serious drought.

Landscape of Hani terraces
in Yuanyang County, Yunnan, China [1]

Hani terraces in four seasons [2]

To better protect the plant resources and unique culture, works to declare the region as World Cultural Heritage site is ongoing.

Case 2: People's Biodiversity Register

The National Biodiversity Authority (NBA) of India has issued guidelines as of May 2010 for preparing people's biodiversity registers and identifying and declaring biodiversity heritage sites. The Biodiversity Management Committees at the local level have been given the responsibility of preparing, maintaining and validating people's biodiversity register (PBR) in consultation with local people. The PBRs contain comprehensive information on the availability and knowledge of local biodiversity resources, and the use of these biological resources and associated traditional knowledge. The preparation of PBRs is done through a consultative and participatory process involving intensive and extensive consultations with local people. There have been recent experiences of preparing PBRs for 50 villages across seven states of India where people have been readily able to identify more than 200-300 species[3]. The intent is to digitize this information once it is collated by the Biodiversity Management Committees to be available for use and analysis.
Similar initiative is taken in Nepal. However, continuation of such effort has been stalled due to delay in putting necessary legal instruments related to access and benefit sharing provision of CBD.

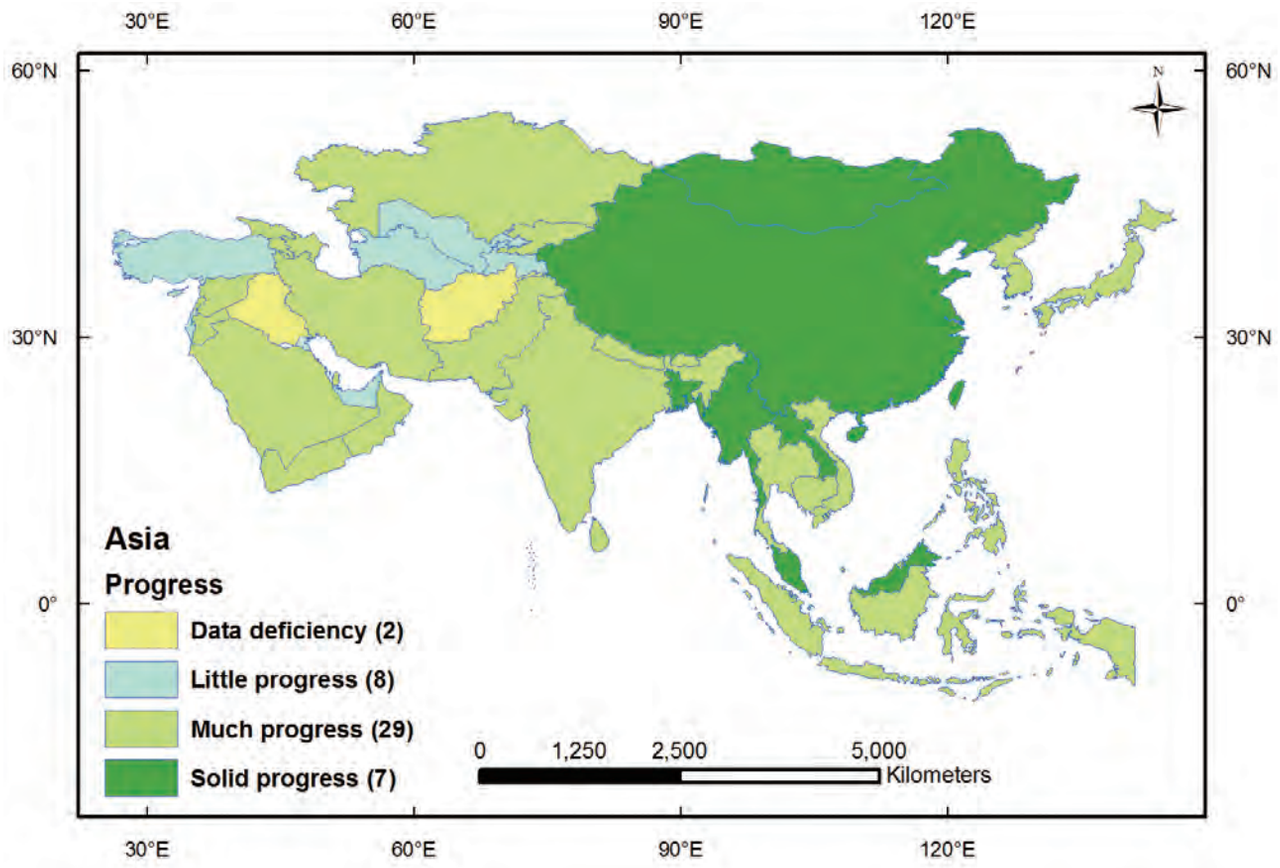
Crop genetic resources in an exhibition
in Hyderabad Pradesh of India, June, 2009 [4]

Future

Asian traditional societies are fast eroding with the pace of economy and globalization. With this change, the unique knowledge of intricate interactions with nature and its resources is eroding as well. Halting the decline and preserving the indigenous and local knowledge has legal and institutional challenges. The right of such knowledge holder must be established respecting the three major objectives of the CBD- conservation, sustainable use and benefit sharing.

1. Photo credit: Lingdian 568
2. Photo credit: Yang Liu, Lengyuqinyan, Yuanjie Wang
3. http://www.ces.iisc.ernet.in/biodiversity/sahyadri_enews/newsletter/issue15/index.htm
4. Photo credit: Dayuan Xue

TARGET 14:
The importance of plant diversity and the need for its conservation incorporated into communication, educational and public-awareness programs



Introduction

Plants are less charismatic in drawing public attention. Compare with animals, there is little interest among citizens to know about the important of plants in the welfare of human society. The urban youths are the unfortunate ones who are facing growing disconnect between people and nature. To achieve this target, different levels in society from policy maker to general citizen are to be aware of the importance of plant conservation. Communication, education and public awareness programs are key to the successful implementation of the Strategy.

This target encourages the infusions of plant biodiversity and conservation into all level of formal education from primary school to university, pursues the progress in recognition of plant diversity and conservation in people by strengthening vital institutions like botanical gardens, and promotes the popularization of knowledge and organizing citizen organizing citizen sciences. In this course, cross-sectoral engagement of government bodies, such as Ministry Education with Ministry of Environment, and the utilization of latest information technologies, especially the internet are essentially important.

Progress

Case 1: Environmental educations in Malaysia

Malaysian government bodies, environmental NGOs and multinational companies carry out many activities to raise awareness on the important of nature and also of biodiversity for the well-being of the people. The activities include ecotourism, tree identification training, lecture on natural and so on.

Environmental curricula are being included in the broader areas of mainstream education. In the primary and secondary school level, the Education Ministry is implementing the sustainable school program, a program to support and enhance the National Policy on the Environment. At the tertiary level, many universities offer Master of Science program in conservation biology.

Tree identification course [1]

Case 2: The greening and botanical gardens in Singapore

Singapore government set the target to be a garden country at the very beginning when the nation was established, although the area was limited, having 8 m^2 green area for every people. To implement this strategy, detailed planning was set; legislations were well adopted and implemented. Decades of efforts in greening Singapore paid off - it improves the environment quality, promotes the tourism and increases the environmental awareness of citizens.

Singapore Botanical Gardens have an area more than 54 hectare, having more than 20,000 plant species. National Orchid Garden is highly featured in the gardens. [2]

The image of a big tree *Fagraea fragrans* (Loganiaceae) in the Singapore Botanic Garden is printed at the back of 5 dollar cash, increase the awareness of the importance of plants. [3]

Case 3: Chinese Field Herbarium

Compared with one century ago, today high developed technologies including Global Positioning System, digital multimedia and information technologies make the access and share of information highly convenient. Many people use digital cameras and GPS devices to record the plant diversity they encountering with and share the information online. Thus, the idea to treat the whole Earth as a living museum is reasonable, in which all people can involve in collecting the morphologic and geographic information about the plants in field, sharing online and preserve plant populations *in-situ*. Based on this idea, the Institute of Botany, the Chinese Academic of Science has developed a biodiversity information system named Chinese Field Herbarium (http://www.cfh.ac.cn), conducting a citizen science to investigate and monitor the plant diversity all over the country.

Screenshot of the website of CFH [4]

Albums of CFH [5]

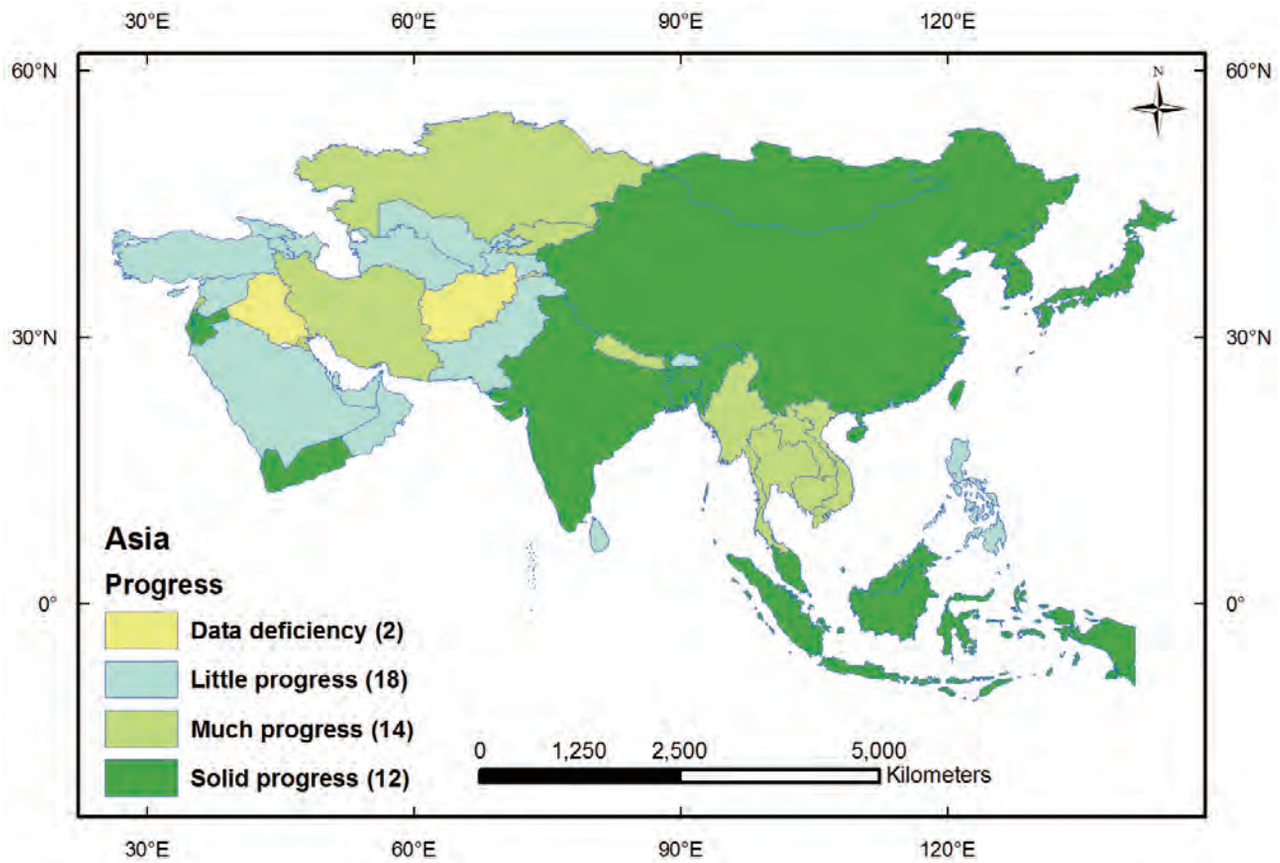
CFH now has more than 2,000 user accounts, more than 1,360,000 photos uploaded by volunteer, among which 17,000 species have been identified. Albums are units to organize data; each one contains the result of one field work.

Future

Asian countries should continue investing in public awareness about the importance of plant diversity. Besides the formal education, other channels of mass awareness and avenues for engaging citizens in new and innovative means of plant conservation, such as citizen science project and the internet based plant biodiversity information services should be better adopted. Active involvement of educational organizations, en-vironmental organizations and biodiversity professionals is essential in this respect. More investments in botanical gardens, museums and other public recreation and scientific education facilities will require in future. It not only serves this target, but can also promote the economy, support achieving all other GSPC targets.

1. Photo credit: Leng Guan Saw
2. Photo credit: Keping Ma
3. Photo credit: Genleorus
4-5. Materials from Chinese Field Herbarium

TARGET 15:
The number of trained people working with appropriate facilities in plant conservation increased, according to national needs, to achieve the targets of this Strategy



Introduction

To achieve overall goal of plant conservation, increasing capacity at the individual, institutional and systemic level is essential- at the individual level, for example, good taxonomists with proper training is a must for knowing plant diversity in a country; taxonomists should have proper institutional support with sufficient technologies, equipments, and financial resources; the institutions again can only function properly if proper policies are in place. Though the target has indicated number of trained people only, capacity building should be seen more holistically.

In most of the Asian developing countries, more people are needed in plant diversity conservation and plant taxonomy. It requires investment in capacity building and improving facilities, offering more training projects to increase the number of trained work staff in organizations and other stakeholders in local community level.

Progress

Case 1: The training activities of ESABII

Asia has relatively high plant diversity, but not sufficient in plant taxonomy ability. The East and Southeast Asia Biodiversity Information Initiative (ESABII) was launched to achieve goals of the Convention on Biological Diversity

Intergovernmental meeting on the strategy for ESABII and work plan in Tokyo, Dec., 2009 [1]

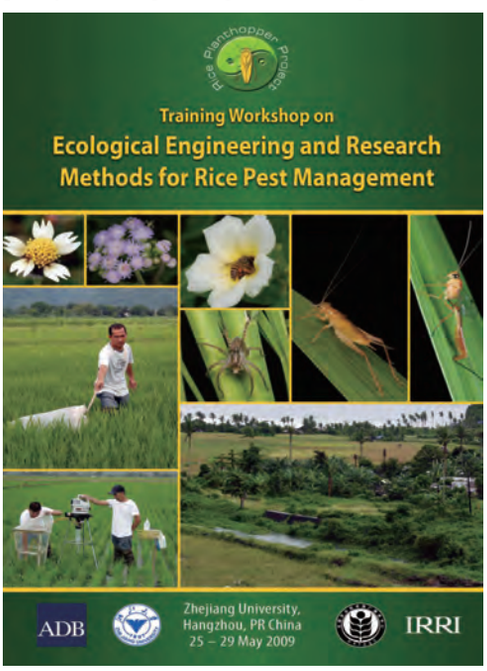
1. Photo credit: ESABII

(CBD), participated by 14 countries in this region and relevant organizations. The activities of ESABII in taxonomy capacity building include training courses for taxonomic abilities with assistance of expert group, development and dissemination of products for taxonomic capacity building such as guides for species identifications, facilitating the infrastructures needed in capacity building including information systems and collection institutions.

Taxonomic capacity building training course of ESABII [2]

Case 2: Rice Planthopper Project

Rice Planthopper is one of the most important pests in rice paddy, causing great amount of the use of farm chemicals. Rice Planthopper Project is a collaborative research network with national scientists in Asia. It aims to provide a platform for knowledge sharing on issues and develop sustainable ways to manage rice planthopper problems. Its training workshops include planthopper diversity and control, paddy biodiversity and ecological engineering, and capacity building on organic farming.



The poster of a training workshop in May, 2009 [3]

Case 3: The serial training courses of PFS-TropAsia

The Program for Field Studies in Tropical Asia (PFS-TropAsia) is a non-profit affiliation of researchers and educationalists from across the Asia-Pacific region. The program runs training activities, including workshops and field courses aiming at strengthening education and research in tropical biology and conservation. PFS-TropAsia conducts two series of workshops and courses for young scientists. The first one is indoor workshops on Experimental Design & Data Analysis and Scientific Paper Writing emphasizing on practical training. The second series are field courses. These provide participants with advance-level training in field-orientated studies with a strong emphasis on student-led research projects. The courses are taught by an international team of resource staff, all of whom are experts in their discipline, and participants are commonly drawn from ten or more countries.

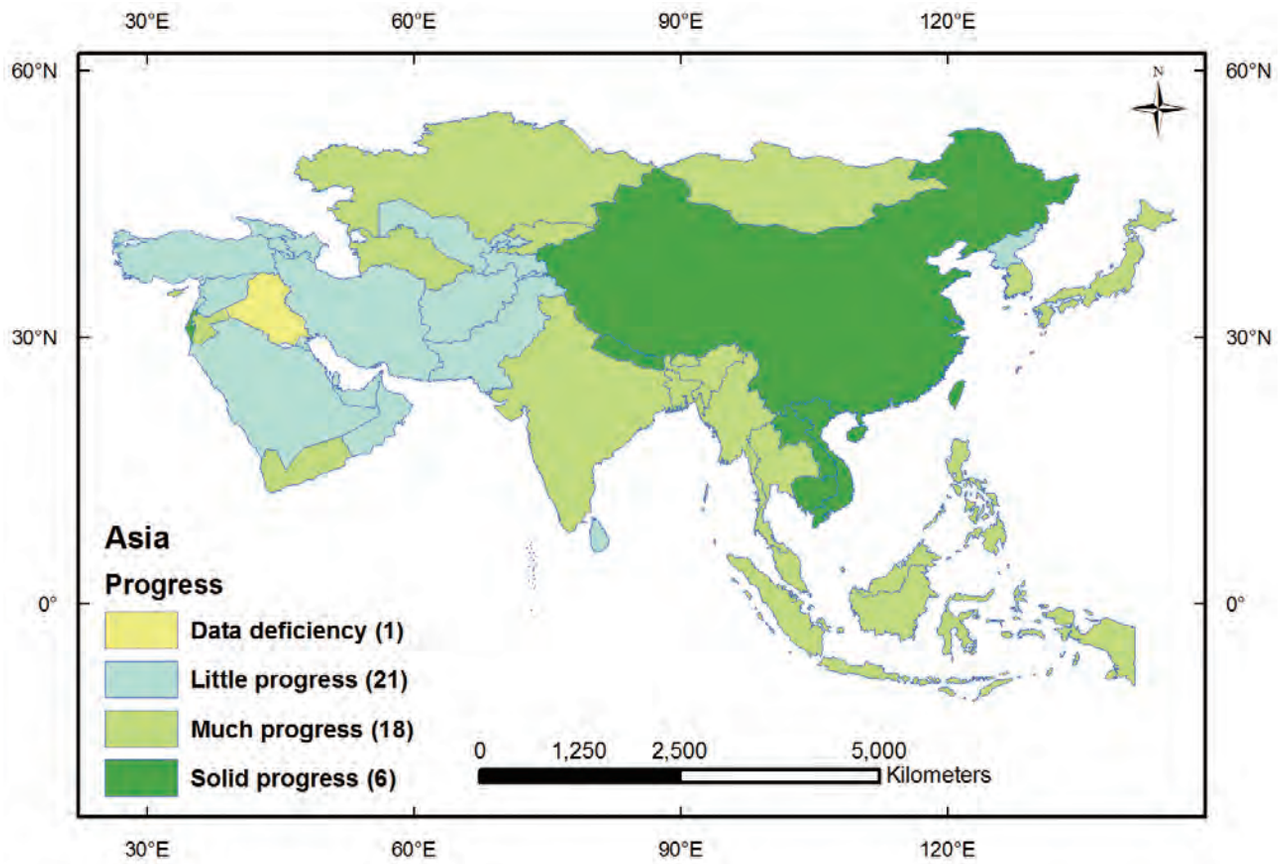
Field course from Jul. to Aug. 2009, in Malaysia [4]

Future

The capacity building in plant taxonomy and plant biodiversity con-servation are crucial to the implementation of the plant conservation strategies in Asia. Basing on the practical requirements from plant resources exploitation and conservation, there should be more training projects and investments in future, making the knowledge about taxonomy and latest technologies more available. The capacity building in botanical gardens and nature reserves should be the focus for contracting parties to work with. Government administrative authorities should pay more attention to and support the capacity buildings by organizing more training projects for themselves to increase their abilities in plant conservation and administrative expertise. The developed countries from and outside Asia should provide more supports both in human and financial resources, helping to improve the ability in capacity building in those developing countries with rich biodiversity.

2. Photo credit: ESABII
3. http://ricehoppers.net
4. Photo credit: Yanjun Du

TARGET 16:
Networks for plant conservation activities established or strengthened at national, regional and international levels



Introduction

Network gives the ways to share standards, exchange data, and encourage the career development of conservationists and capacity building. The participants of network can be government bodies, research institutes, NGOs, botanical gardens, nature reserves, amateurs and any other kinds of units that care about plant conservation. These networks have no fixed form and no limitation; always exceed the confine of politics or professions, efficient to integrate different resources for specific purposes. Being a partner of networks would be direct way for small organizations to involve in bigger projects, making benefits from capacity building and the share of professional knowledge. Networks are efficient channels to find more human resources to cooperate in larger projects, and are the platforms to integrate and to coordinate with many partners for large organizations and government bodies. The achievement of other 15 targets in the Strategies all depend on the development of existing and new networks for collaboration among different countries by share information and resources.

Progress

Case 1: East Asia Botanical Gardens Network

Botanical gardens are important for *ex-situ* plant conservations. East Asia Botanical Gardens Network (EABGN) is coordinating with all member countries to facing the challenges of plant conservations, promoting the implementation of the Strategy, improving the works of botanical gardens in scientific popularity, scientific research and conservations of plant biodiversity.

At 19th and 20th of August in 2006, the 1st EABGN meeting was held in Kunming, the representatives coming from China (including Mainland China, Macao, Hong Kong and Taiwan), Japan, Republic of

Korea, Democratic People's Republic of Korea and Mongolia participated in the meeting.

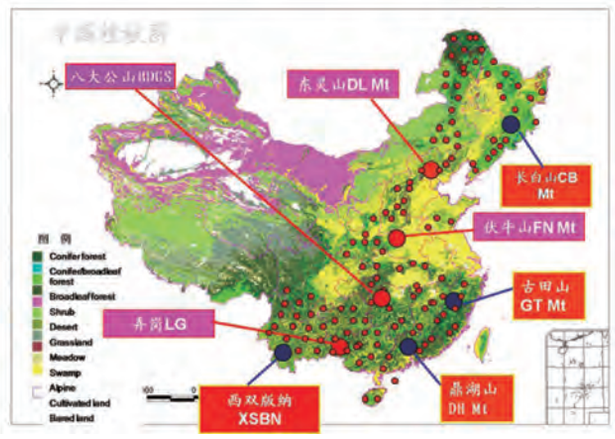
The 1st EABGN meeting [1]

South China Botanical Garden (SCBG) of Chinese Academy of Sciences (CAS) has a group of green houses that is the largest in China, where the *ex-situ* conserved plants consisting of different ecosystems

Green houses of South China Botanical Garden [2]

Case 2: The network of permanent research plots in forest ecosystem of Asia

Forests have the most diverse plant biodiversity. To survey and monitor on forest plant diversity and to research in the mechanisms of species co-existence are important to increase the abilities and efficiency of conservation. Smithsonian Tropical Research Institute, Center for Tropical Forest Science (CTFS) is leading the research networks of permanent plots in forest ecosystem. Eight Asian countries have set 22 plots that are larger than 20 hectares with the standards of CTFS. The relating research institutes and scientists become an active network in the share of technologies, exchange of data, research projects cooperation and capacity building.



Chinese Forest Biodiversity Monitoring Network (CForBio) [3]

Chinese Forest Biodiversity Monitoring Network includes four established plots (blue dots) and four establishing plots (red dots) with area larger than 16 hectare.

A permanent plot of mixed coniferous and broad-leaved forest located in Changbai Mountain, Jilin Province, China [4]

Case 3: The ASEAN Center of Biodiversity

A European Commission-funded project, the ASEAN Regional Centre for Biodiversity Conservation, started in 1999, worked well at promoting knowledge sharing about best practices and common efforts in the biodiversity, turned into a new institution: the ASEAN Centre for Biodiversity (ACB) in 2004. The ACB has conduct specific activities including a number of actions in the field of policy coordination and capacity building. ACB has established partnerships with strategic international institutions, becoming an important network for plant conservation in Asia.

1. Photo credit: Keping Ma
2. Photo credit: South China Botanical Garden
3. Photo credit: Keping Ma
4. Photo credit: Lei Chen

To raise awareness on wetlands, Cambodia's Department of Wetlands and Coastal Zones, in cooperation with the ACB, hosted a lecture dubbed "UPSTREAM, DOWNSTREAM" on 7 February 2009. Hundreds of primary school students, university students, and officers from Cambodia's Ministry of Environment and other government institutions attended.

Lecture dubbed "UPSTREAM, DOWNSTREAM" on 7 February 2009 [5]

A sub-regional capacity development workshop for ASEAN Countries on Communication, Education and Public Awareness (CEPA) and Media Relations was held in Indonesia from 30th November to 3rd December 2009.

A sub-regional capacity development workshop [6]

Case 4: The Regional Action Plan for Protected Areas in East Asia [7]

The *Regional Action Plan for Protected Areas* in East Asia, published by IUCN in 1996, aimed to improve management and legal framework for protected in East Asia. This plan emphasizes the importance of regional network in conserving biodiversity. In 2008, countries in this region assessed their progress of implementing this plan, and published the report in the following four languages: Chinese, English, Japanese and Korean. One important part of this report outlines details of the assessment of the PA System of East Asia. The other important part of this report illustrates in detail the action plan in 2006-2010.

Regional Action Plan for the Protected Areas of East Asia

Future

In future, Asia should have more cooperation at national, international and continent levels that are organized with the awareness of network building, better collaborate with existing global networks that are working with the Strategy, aiming to make composite forces from micro to macro levels. More attentions should be paid to solidify local conservationists into networks of information sharing and capacity building. Comprehensive cooperation is needed among different networks, upon which Asia will better achieve in the plant conservation strategies.

5-6. Materials are provided by ACB

7. http://www.iucn.org/about/union/secretariat/offices/asia/regional_activities/elg/pap

Outlook for future strategies of plant conservation in Asia

Asia is very diverse in all aspects. It has the most diverse climate among the all continents. Its heterogeneous habitats support more than half the world's population and biodiversity. On economic scale of development, Asia also has the extreme examples. It has the second largest economy of the world (Japan) along with some of the poorest ones (e.g. Nepal). It also harbors very fast growing economies, like China, India, Vietnam etc. Despite this growth, Asia still has the majority of the world's poorest people; partly because it holds a majority of the world's population.

Achieving plant conservation in Asia, in such diverse settings, possesses many challenges as well as opportunities. The GSPC aims to contribute to poverty alleviation and sustainable development together its ultimate aim of halting the current and continuing loss of plant diversity. It is probably intuitively correct in Asia that poverty reduction and plant diversity conservation are linked problems, and we can achieve targets of sustainable development only when poverty-conservation nexus can be tackled judiciously.

Conservation, sustainable development and poverty alleviation should be the three-pronged approach of future strategies for plant conservation in Asia. The GSPC, in fact, is a framework approach and provides enough flexibility to integrate existing conservation initiatives, coordinate across the sectors and initiate new activities within national and regional priorities. The future strategies for plant conservation in Asia, should take into account the following aspects:

• It should take note of the national priorities in developing activities and milestones to achieve. Asia countries are at different stage of development, the relations between conservation and poverty reduction thus may be diversified. [1] National priorities may have already been identified under the Biodiversity Strategy and Action Plan and other relevant sectoral and cross-sectoral plans, programs and policies. Plant conservation strategies should benefit from the existing national level actions.

• The future strategies should pay much attention to sustainable use of plant diversity in Asia. Of all the GSPC targets, implementations of **Targets 3**, **6**, **9**, **11**, **12**, and **13**, are closely related to use of plant diversity, especially in a sustainable manner. For sustainable use of plant diversity and future strategies for plant conservation in Asia, scope of national activities and sub-targets should be defined within these global targets. National parties should provide necessary attention to report incorporation of target in their national policies, programs and plans and real achievements made on the ground.

• Future strategies must consider the global climate change. Due attention should be given to establish monitoring programs that can cover the whole Asia continent to assess impacts of climate change on plant diversity. It will help implementation of strategies in an adaptive manner.

• Future conservation strategies must set priority on technological innovation to enable plant diversity and human population to adapt to global climate change. The work of IRRI on developing climate change-ready rice is one such example. Similar innovations at the national level should also be reported. Local and traditional knowledge can also provide cost-effective adaptation options. Future strategies in Asia must recognize the rights of the holder of such knowledge and contribute to the implementation of Article 8 (j).

• Countries in Asia should develop sub-regional or regional cooperation in plant conservation. Regional program can be developed among countries within similar biogeographical region. Some countries in Asia have demonstrated significant individual, institutional and systemic capacity on plant conservation. Asia can benefit in plant conservation by transfer of knowledge and technology, and building of individual, institutional and systemic capacity through regional cooperation.

1. Adams, W. M. *et al.*, *Science* 306, 1146 (2004).

ANNEX 1:
Focal points for GSPC in Asia [1]

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1. Materials mainly from http://www.cbd.int

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ANNEX 2:
A brief introduction to websites related to GSPC

1. http://www.cbd.int/gspc/
This is the official website of the Global Strategy for Plant Conversation (**GSPC**). GSPC is a program of the UN's Convention on Biological Diversity. The GSPC seeks to slow the pace of plant extinction around the world by 2010. The latest information on GSPC is reported on the website.

2. http://www.cbd.int/
Convention on Biological Diversity (**CBD**) is an international legally binding treaty with three objectives, the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources. Related information is posted on the website.

3. http://www.bgci.org/
Botanic Gardens Conservation International (**BGCI**) is the world's strong force for plant conservation with an off site focus and also a key contributor to the implementation of GSPC. The activities that BGCI launched to promote GSPC are reported on the website.

4. http://www.aseanbiodiversity.org/
ASEAN Centre for Biodiversity (**ACB**) is a permanent institution to strengthen the capacity of ASEAN Member States to formulate and coordinate biodiversity-related policy, strategy and action. The information on the activities related to biodiversity conservation in Southeast Asia, in particular to ASEAN countries is reported on the website.

5. http://www.gbif.org/
Global Biodiversity Information Facility (**GBIF**) is an infrastructure for biodiversity informatics. The information associated with plant specimens and distribution is available on the website.

6. http://www.cites.org/
International Trade in Endangered Species of Wild Fauna and Flora (**CITES**) is an international agreement between governments. It aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

7. http://www.biodiversityhotspots.org/
It is the official website of **HOTSPOTS**. Hotspots are the richest and most threatened reservoirs of plant and animals life on earth. Hotspots around the world can be searched on the website.

8. http://www.conservation.org/
Conservation International (**CI**) aims to build upon a strong foundation of science, partnership and field demonstration, CI empowers societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity.

9. http://www.diversitas-international.org/
DIVERSITAS is an international programme of biodiversity science. By linking biology, ecology and social sciences, DIVERSITAS produces socially relevant new knowledge to support sustainable use of biodiversity.

10. http://www.wwf.org/
The mission for World Wildlife Fund (**WWF**) is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable and promoting the reduction of pollution and wasteful consumption.

11. http://www.nature.org/
The Nature Conservancy (**TNC**) is the leading conservation organization working around the world to protect ecologically important lands and waters for nature and people. Its mission is to preserve the plants, animals and natural communities that represent the diversity of life on earth by protecting the lands and waters they need to survive.

12. http://www.bioversityinternational.org/
Bioversity International is the world's leading organization dedicated to researching agricultural biodiversity to improve people's lives. Much newest information on the activities, meetings and programmes of the organization is reported on the website.

13. http://www.itto.int/
International Tropical Timber Organization (**ITTO**) is an intergovernmental organization promoting the conservation and sustainable management, use and trade of tropical forest resources. Its members represent about 80% of the world's tropical forests and 90% of the global tropical timber trade.

14. http://www.cifor.cgiar.org/
The Center for International Forestry Research (**CIFOR**) is a nonprofit, global facility dedicated to advancing human wellbeing, environmental conservation and equity. It conducts research that enables more informed and equitable decision making about the use and management of forests in less-developed countries.

15. http://www.traffic.org/
TRAFFIC is a wildlife trade monitoring network. It works to ensure that trade in wild plants and animals is not a threat to the conservation of nature.

16. http://www.fauna-flora.org/
The Fauna & Flora International (**FFI**) is the world's first international conservation organization. FFI acts to conserve threatened species and ecosystems worldwide, choosing solutions that are sustainable based on sound science.

17. http://www.plantlife.org.uk/
Plantlife is the organization speaking up for United Kindom's wild plants and beyond. Its mission is to protect wild plants on the ground and to build understanding of the vital role they play in everyone's lives.

18. http://www.forest-trends.org/
The mission for **Forest Trends** is four-fold: to expand the value of forests to society; to promote sustainable forest management and conservation by creating and capturing market values for ecosystem services; to support innovative projects and companies that are developing these markets; and to enhance the livelihoods of local communities living in and around those forests.

19. http://www.catalogueoflife.org/
The Catalogue of Life (**CoL**) is an index system established by Species 2000 and Integrated Taxonomic Information System (ITIS) in 2001. It plans to become a comprehensive catalogue of all known species of organisms on Earth by the year 2011.

20. http://www.eol.org/
The Encyclopedia of Life (**EoL**) is a free, online collaborative encyclopedia intended to document all of the 1.8 million living species known to science. It aims to build one "infinitely expandable" page for each species, including video, sound, images, graphics, as well as text.

21. http://gpi.myspecies.info/
Global Plants Initiative (**GPI**) is the resources for the digitization of herbarium specimens. It is an international undertaking by leading herbaria to digitize and make available plant type specimens and other holdings used by botanists and others working in plant science every day. Partners include more than 52 countries.

22. http://www.ctfs.si.edu/
The Center for Tropical Forest Science (**CTFS**) is a global network of forest research plots committed to the study of tropical and temperate forest function and diversity. The multi-institutional network comprises more than thirty forest research plots across the Americas, Africa, Asia, and Europe, with a strong focus on tropical regions. CTFS monitors the growth and survival of about 3.5 million trees of approximately 7,500 species.

23. http://ibol.org/
iBOL is short for the International Barcode of Life. It uses sequence diversity in short, standardized gene regions -- DNA barcodes -- as a tool for identifying known species and discovering new ones. By reinforcing traditional taxonomy, DNA barcoding is revolutionizing our capacity to know and monitor biodiversity.

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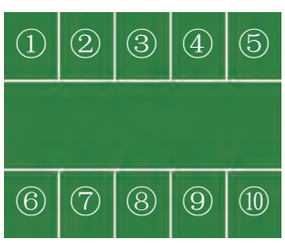
IUCN, International Union for Conservation of Nature, helps the world find pragmatic solutions to our most pressing environment and development challenges. It supports scientific research, manages field projects all over the world and brings governments, non-government organizations, United Nations agencies, companies and local communities together to develop and implement policy, laws and best practice. IUCN is the world's oldest and largest global environmental network - a democratic membership union with more than 1,000 government and NGO member organizations, and almost 11,000 volunteer scientists in more than 160 countries. Website: http://www.iucn.org/.

Chinese National Committee for DIVERSITAS (an international program of biodiversity science) was founded in 2004 and is an academic organization for coordinating and conducting local activities of DIVERSITAS in China. The Chinese Academy of Sciences chairs the CNC-DIVERSITAS, with members from related ministries and universities. IUCN China Working Group is attached to CNC-Diversitas at the moment. For more information, please visit the website http://www.cncdiversitas.org/.

Biodiversity Committee, the Chinese Academy of Sciences was founded in 1992 and is the major organization for developing and implementing biodiversity research guide for the Chinese Academy of Sciences, with the foci on biodiversity informatics and forest biodiversity monitoring, organizing scientific team to prepare biodiversity monographs and proceedings of national symposia on biodiversity conservation and sustainable use. More information is on the website http://www.brim.ac.cn/.

Institute of Botany, the Chinese Academy of Sciences was founded in 1928 and is an integrative research center of basic plant sciences in China at the moment, with the priority of promoting integrative plant biology. It is mainly engaged in the research in the fields of ecological conservation and environmental protection, modern agriculture, sustainable utilization of plant resources and systematic evolution. More information is on the website http://www.ibcas.ac.cn/.



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