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AsiaFlux Newsletter

National report from TC2006 participants

Contents

Preface

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Asian terrestrial ecosystems - the richest in the world – are distributed continuously from tundra and boreal forests through temperate to subtropical and tropical forests latitudinally and from monsoonal rainforests through semi-arid grassland to desert longitudinally (Fig. 1). The magnitude of carbon sequestration in Asian terrestrial ecosystems has been predicted to play a key role in global carbon cycle and therefore has been known as an indispensable part to understand global climate changes caused by the greenhouse gas emission. Moreover, the temporal and spatial variations of carbon sequestration caused by the distinctive climate conditions in the region such as Monsoon impose an additional scientific challenge.

AsiaFlux was established in September 1999, as a regional research network that brings together scientists from the Asian countries working on the exchanges of carbon, water, and energy between terrestrial ecosystems and the atmosphere at daily to inter-annual time scales. Over the past eight years, AsiaFlux has grown from about 20 affiliated sites to over 100 sites

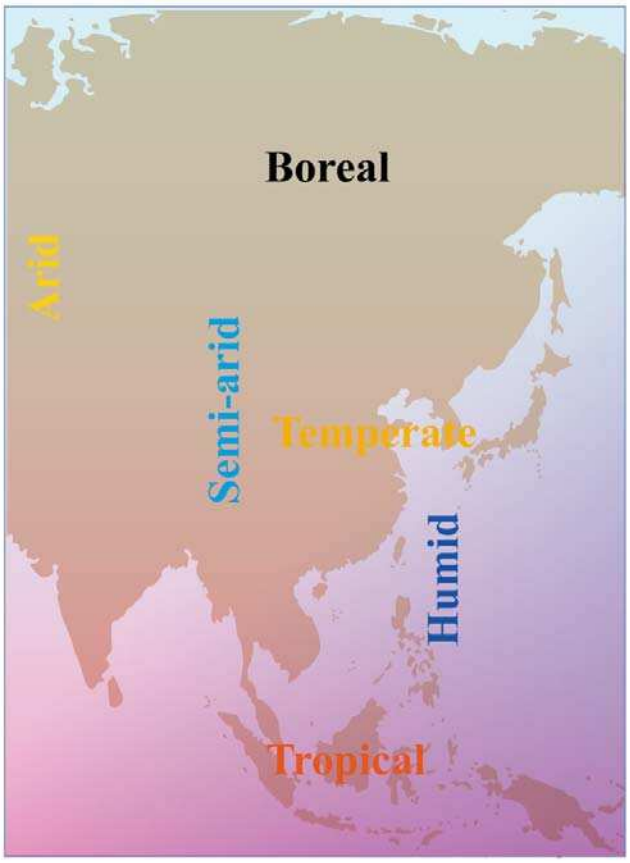

Fig 1 Distribution of the Asian terrestrial biomes.

that are distributed in various terrestrial ecosystems throughout the East Asian region. The first AsiaFlux workshop was held in September 2000 (WS2000) in Sapporo, Japan and the WS2002, WS2003, WS2005, and WS2006 were held in Jeju (Korea), Beijing (China), Fujiyoshida (Japan), and Chiang Mai (Thailand), respectively.

To date, most AsiaFlux sites have been operated by JapanFlux, KoFlux and Chinese flux communities. Exchanges of information and experiences with other Asian countries have been the urgent issue to build up a strong collaboration among researchers in Asian region. Therefore, to share the basic theory and observational and data processing techniques, AsiaFlux Short Training Course Sub-workgroup organized the first AsiaFlux summer school (TC2006) on 21-30 August 2006 in Tsukuba, Japan. Twenty participants from nine nations and regions, including Bangladesh, Mainland China, India, Indonesia, Malaysia, Philippines, Taiwan, Thailand and Viet Nam attended the short course. One of the remarkable outcomes is that many participants voluntarily submitted reviews regarding the carbon cycle researches in their own countries and the primary flux data obtained from their sites to the AsiaFlux Newsletter. After a review by the AsiaFlux Editorial Sub-Workgroup, the selected twelve articles are published on the AsiaFlux Newsletter as a Special Issue. The first part of the issue – Emerging Flux Studies in Asian Countries – focuses on the initial and potential flux researches in many Asian nations. The second part –Flux Studies in China – introduces the preliminary results and the scientific plan of the Chinese flux research communities which are becoming one of the largest flux research groups in the world. This special issue will provide a valuable opportunity to understand the current status and the future of the flux studies in Asian region.

Can Gio Biosphere Reserve, Ho Chi Minh City, Vietnam

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Can Gio (formerly Duyen Hai) is located south of Ho Chi Minh City in its suburban district. During the Indochina War, the mangroves here were damaged by herbicides. After the war, the forest was destroyed by locals felling trees for such needs as fuel wood and house construction. A Mangrove rehabilitation programme was begun in 1978 with vast tracks of mangroves planted. Some 20,000 ha of *Rhizophora apiculata* were planted and accompanied by 10,000 ha of natural regeneration. Between 1978 and 1991, the mangroves were classified as economic forest, between 1991 and 2000, the forest became protected forest and since 2000, the forest has been deemed a mangrove natural reserve.

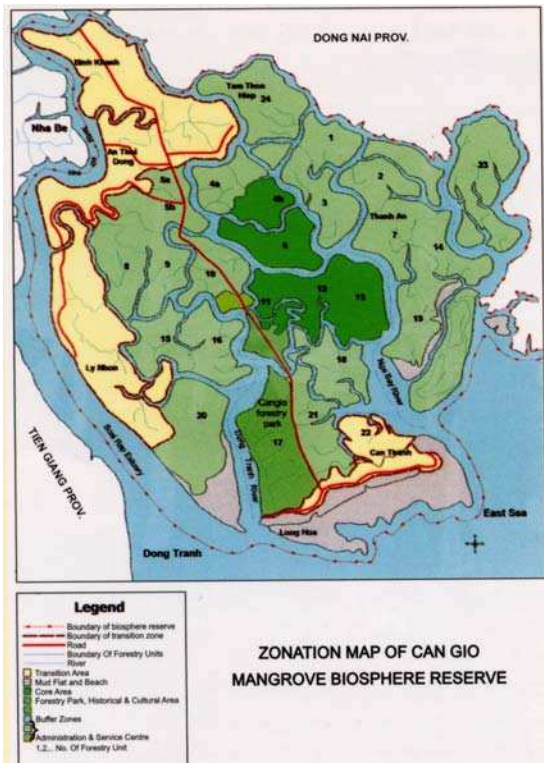
Designated as the Biosphere Reserve by UNESCO, it is the first for Vietnam. The management of the mangrove forest changed hands several times as its classification varied. The successes and failures in mangrove forest management during the course of this period are presented in this report.

1. Introduction of Can Gio Mangrove Biosphere Reserve

Ho Chi Minh City (formerly Saigon) is located about 1,300 km south of Hanoi and includes a mangrove in Can Gio, a suburban district and covers an area of 71,361 ha. It is the poorest district of the city with the population of 62,000. A network of rivers and channels traverses the delta and the main waterways leading to the port of Ho Chi Minh City.

From 1964 - 1970, Can Gio mangrove forest (formerly Rung Sat) was sprayed heavily with herbicides: 665,666 gallons of Agent Orange; 343,385 gallons of Agent White and 49,200 gallons of Agent Blue. As a result, 57% of mangrove forest in the district was destroyed (Ross, 1975). In some areas, large trees of *Rhizophora*, *Sonneratia*, and *Bruguiera* were killed by the herbicide spraying and in many areas the vegetation was completely destroyed. Only *Avicennia* and *Nypa* palm were able to survive and regenerated after the application of herbicide. Some species such as *Phoenix paludosa* and *Acrostichum aureum*, a fern that dominated on elevated land, have expanded. After many years of chemical spraying, the degraded land still has only scattered small trees.

Since 1978, a vast programme of reforestation has been undertaken by Ho Chi Minh Forestry Department. Up to now, the reforestation effort has brought vast ecological improvements to the environment such as biodiversity, i.e., wild animals such as monkeys, otters, pythons, wild boars, crocodiles and various kinds of birds have returned to the artificially regenerated mangrove forests. In 1991, Can Gio mangrove forest has been declared an "Environmental Protection Forest" by the Council of Minister and Can Gio has become one of the most beautiful and extensive



site of rehabilitated mangrove in the world. It was also approved as Mangrove Biosphere Reserve by UNESCO in 2000.

After 28 years, more than 19,000 hectares of mangrove forest have been planted, mainly with *Rhizophora apiculata* species following massive wartime destruction. This process has served to meet the demand for wood fuels and construction materials in HCMC, as well as to re-establish suitable conditions for the development of various activities such as fishery, aquaculture, research, education, ecotourism and others. But in last few years, the mangrove has faced with the degraded forests by management policy, human impacts and natural disasters.

The area of Can Gio Mangrove Biosphere Reserve

The forest resource of Can Gio Biosphere Reserve covers an area of 31,111 ha or 43.06 % of the total area. About 10,982 ha of natural mangrove forests and 19,096 ha are artificial forest occupied 38.61% and 61.39% of the forest respectively.

Table 1: Extent of Can Gio Mangrove Biosphere

Category	Area (ha)	Percent (%)
1. Forested area	**31,111**	**43.60**
a. Forest plantation	19,096	26.76
b. Natural mangrove	10,982	15.39
c. Wasteland	1,033	1.45
2. Non forested area	**37,250**	**56.40**
a. Waterways	22,091	30.96
b. Utilized land	15,059	21.10
c. Others	3,100	4.34
Total	**71,361**	**100.00**

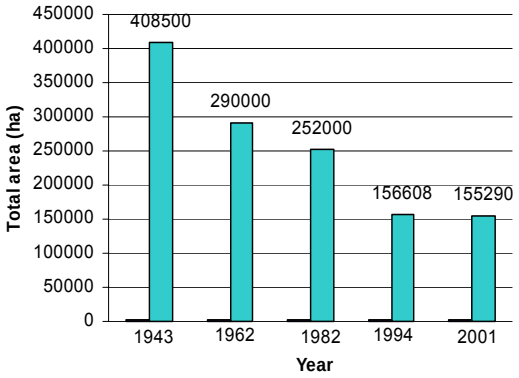
2. Introduction of Mangrove in Viet Nam

Geographical distribution

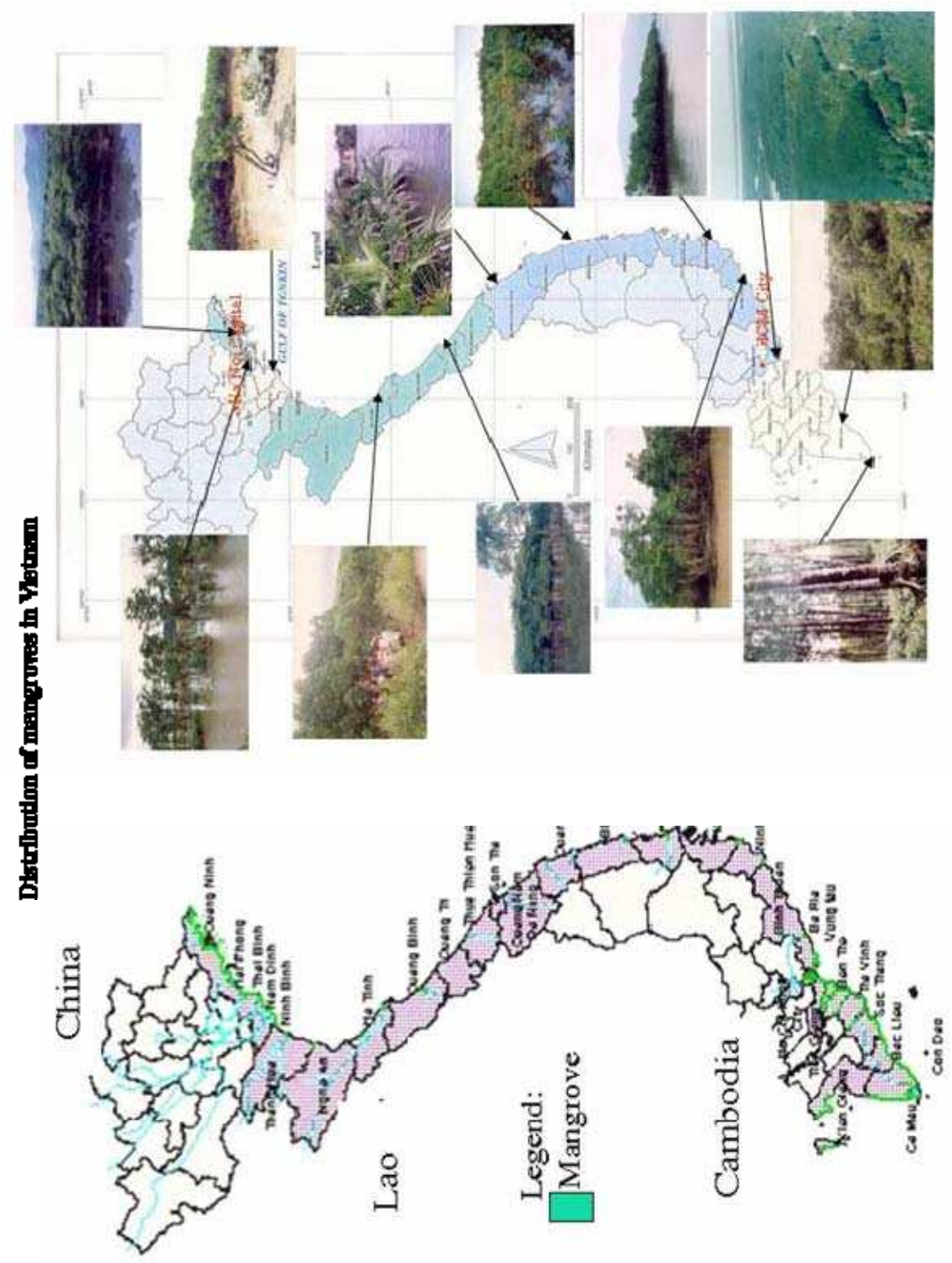
Phan Nguyen Hong (1991) divided Vietnam mangrove into 4 zones:

- Zone 1: Northeast coast
- Zone 2: Northern delta
- Zone 3: Central coast
- Zone 4: Southern delta

Mangrove area in Vietnam



No	Province/City	Mangrove area (ha)
Total area		**155,290**
1	Quang Ninh	22,969
2	Hai Phong	11,000
3	Thai Binh	6,297
4	Nam Dinh	3,012
5	Ninh Binh	533
6	Thanh Hoa	1,000
7	Nghe An	800
8	Ha Tinh	500
9-19	10 provinces and cities of Northern	700
20	Ba Ria-Vung Tau	1,500
21	**Ho Chi Minh City**	**24,592**
22	Long An	400
23	Ben Tre	7,153
24	Tien Giang	560
25	Tra Vinh	8,582
26	Soc Trang	2,943
27	Bac Lieu	4,142
28	Ca Mau	5,285
29	Kien Giang	322


Distribution of mangroves in Vietnam
China
Lao
Cambodia
Legend:
Mangrove

3. Introduction of Mangroves of the world

Mangroves are distributed circum-tropically, occurring in about 112 countries, with total area coverage of about 18 million hectares. Of the total, 41.4% exist in south and Southeast Asia. The Mangroves occupy about one quarter of the world's coastline, but they form just about 0.45% of the world forests (world Resource Institute, 1996 – 97).

Region	Areas in sq km	% of total
South and Southeast Asia	75,170	41.4
The Americas	49,096	27.1
West Africa	27,995	15.4
Australasia	18,788	10.4
East Africa and Middle	10,348	5.7
Total	**181,397**	**100**

Mangroves are largely restricted to latitudes between 300 N and 300 S. Northern extensions of this limit occur in Japan (31022' N) and Bermuda (32020' N); southern extension are in New Zealand (380 03' S), Australia (380 45' S) and on the east coast of the South Africa (320 59' S) (Spalding, 1997)

REFERENCES

Chan Hung Tuck. (1990). Proposed Establishment and Management of Mangrove

Plantations in Duyen Hai District, South Viet Nam. Field Document No I, VIE/86/027. FAO/ UNDP.

NAS. (1974). The effects of herbicides in South Viet Nam, Summary and conclusion 5: 7 -10.

K. Kathiresen – S. Z. Qasim (2005). Biodiversity of Mangrove ecosystems.

Vien Ngoc Nam. (1991). Rehabilitation and development mangrove forest in Can Gio District, HCMC. Forestry Review 12/1991. (In Vietnamese).

Vien Ngoc Nam. (1990). A management plan for mangrove in Can Gio District (Period 1990 - 1995), HCMC Forestry Department (in Vietnamese).

Ross, P. (1976). The mangrove of South Viet Nam. The Impact of military use of herbicide. In Proct. Int. Sym. Biol and Man of Mangrove. Vol. 2 : 695 - 701.

Progress in ChinaFLUX

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An accurate evaluation of carbon flux between vegetation and atmosphere is critical for quantifying the spatial pattern of carbon budget in terrestrial ecosystems (Baldocchi, 2003). As a member of FLUXNET, ChinaFLUX plays an important role in exploring the interaction of soil-plant-atmosphere, evaluating the role of terrestrial ecosystem in global carbon cycle, and investigating the response of terrestrial ecosystem carbon exchange to global environmental changes. The objectives of this paper are to: (1) briefly overview the development of ChinaFLUX; (2) summarize main achievements of ChinaFLUX in flux measurement techniques, in understanding of the controlling mechanism of environmental factors on terrestrial ecosystem carbon balance and in modeling of carbon and water fluxes in terrestrial ecosystem and (3) discuss the future directions of ChinaFLUX.

1. Introduction of ChinaFLUX

Chinese Terrestrial Ecosystem Flux Research Network (ChinaFLUX) relies on Chinese Ecosystem Research Network (CERN) and was established in 2002. It has four scientific objectives: (1) To develop the standard methodology for long-term measurement of terrestrial ecosystem CO_2, H_2O and heat fluxes in China; (2) To obtain data on the net ecosystem exchanges of CO_2, H_2O and heat in a variety of vegetation communities, and data on CO_2, CH_4 and N_2O emission from and/or uptake by the soil in these communities; (3) To obtain data on ecological patterns and processes that are relevant to carbon cycle in the terrestrial environment; (4) To develop process-based models of water and carbon cycles for typical Chinese ecosystems.

At present, ChinaFLUX has four forest sites (Changbaishan (CBS), Qianyanzhou (QYZ), Dinghushan (DHS) and Xishuangbanna