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Zhao, Yuhong

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The War Against Biotic Invasion— A New Challenge of Biodiversity Conservation for China

*Yuhong Zhao**

INTRODUCTION

“According to the latest statistics from the Ministry of Agriculture, there are already three hundred and eighty invasive plants, forty invasive animals and twenty-three invasive microorganisms in China. . . . Alien invasive species are causing direct and indirect loss in the amount of RMB119.88 billion *yuan* each year, accounting for 1.36 per cent of the GDP.”¹

Now more than ever, China’s biodiversity is threatened by the invasion of alien species, due to the expansion of global trade and international transport and tourism. This is especially true since China’s integration into the world economy, with its implementation of the open-door policy of the 1980s and the accession to the World Trade Organization in 2001. According to the Ministry of Agriculture, there are more than 400 harmful alien species found in China. At least twenty alien species have invaded China in the last ten years.² Alien invasive species are now found in all of the thirty-one provinces, autonomous regions and municipalities under direct control of the central government on the Mainland. By May 2002 alien species had invaded almost all of the 1,500 nature reserves nationwide, and all types of ecosystems including forests, farmlands, inland waters, wetlands, grasslands and urban residential areas.³ More than half of the world’s worst

* Assistant Professor, School of Law, The Chinese University of Hong Kong.

1. Zhang Yinghua and Wang Shuli, *Source: No Specific Law for Prevention*, LEGAL DAILY, June 9, 2005, at 5. RMB refers to Chinese currency. USD 1 equals roughly to RMB 8 *yuan*.

2. Yao Runfeng, *More than 400 Alien Species Invading China*, 22 THE WEED SCIENCE 51 (2005).

3. CHINA COMMISSION ON INTERNATIONAL COOPERATION IN ENVIRONMENT AND DEVELOPMENT, ANNUAL REPORT OF THE BIOSAFETY RESEARCH PROJECT (Oct. 2002), available at www.chinabiodiversity.com.

alien invasive species, as listed by the World Conservation Union (IUCN) are now found in China.⁴ Of the total annual economic loss of RMB119.88 billion *yuan* caused by species invasion, more than RMB50 billion *yuan* of loss is suffered by the agriculture and forestry sectors alone.⁵

The international community is aware of the serious threat posed by alien invasive species to the ecosystem, biodiversity, human health and socio-economic well being. Studies show that, among the causes of biodiversity loss, the introduction of non-indigenous species is only second to direct habitat destruction.⁶ The *Convention on Biological Diversity* ("CBD") reflects the international consensus in response to the potential irreversible harm created by biological invasion.⁷ Under article 8(h), Contracting Parties should, as far as possible and as appropriate, "prevent the introduction of, control or eradicate those alien species which threaten ecosystem, habitats and species." Agenda 21 contains a number of proposals for conserving biodiversity.⁸ It urges States to take action to address the loss of biological diversity in a wide range of sectors, such as combating deforestation, managing fragile ecosystems, protecting the oceans, seas and coastal areas, and conserving freshwater resources.⁹

As a party to the CBD, China is under the international obligation to take proper measures to prevent and control the invasion of alien species. This article examines the issue of alien invasive species as a growing threat to biodiversity loss and socio-economic well-being in China. It reviews and critiques the cur-

4. STATE ENVIRONMENTAL PROTECTION ADMINISTRATION, NOTICE ON STRENGTHENING THE PREVENTION AND CONTROL OF ALIEN INVASIVE SPECIES (2003, no.6). See also IUCN, 100 OF THE WORLD'S WORST INVASIVE ALIEN SPECIES, available at <http://www.issg.org/database/species/search.asp?st=100ss&fr=1&sts=#SpeciesList>.

5. Cai Yanhong, *Speeding up Relevant Law Making to Prevent Alien Biological Invasion*, LEGAL DAILY, June 28, 2005, at 5; see also Zhang Yinghua and Wang Shuli, *supra* note 1.

6. CLARE SHINE, ET AL., A GUIDE TO DESIGNING LEGAL AND INSTITUTIONAL FRAMEWORKS ON ALIEN INVASIVE SPECIES 10 (IUCN, 2000).

7. Convention on Biological Diversity, June 5, 1992, 31 I.L.M. 818, available at <http://www.biodiv.org/convention/articles.asp>. The Convention on Biological Diversity was signed at the United Nations Conference on Environment and Development (UNCED) in Rio De Janeiro, June 3-14, 1992.

8. Agenda 21, June 14, 1992, available at <http://www.un.org/esa/sustdev/documents/agenda21/index.htm>. Agenda 21 is a non-binding blueprint and action plan for a global partnership for sustainable development. It was adopted at the UN Conference on Environment and Development (UNCED) held in Rio de Janeiro June 3-14, 1992.

9. *Id.* at chapter 15.

rent legal and policy responses that address the problem of biological invasion in a piecemeal and fragmented manner. In order to develop more effective mechanisms to prevent and control species invasion, this article explores a more integrated approach to legal reform and institution building that incorporates fundamental principles of environmental law and effective legal mechanisms. Part I introduces China's experience of the biological invasion, highlighting a few particularly harmful invasive plant and animal species that have attracted the public attention. Part II examines economic, ecological and health impacts of species invasion. Part III reviews the current legal and administrative frameworks pertaining to quarantine control and wildlife protection that China has relied upon to address the issue of invasive species, and the more recent government initiatives to tackle the problem in a more direct manner. Part IV critically evaluates the existing control and management regimes and, based on identification of flaws and gaps in the current regulatory scheme, explores how to strengthen China's socio-legal mechanisms in a more integrated manner to build a comprehensive legal and institutional framework capable of fighting a war against the biotic invasion more effectively and efficiently.

I.

THE INVASION OF ALIEN SPECIES IN CHINA

A species is considered native in its past or present natural range¹⁰ or within its natural dispersal potential.¹¹ The CBD uses the term "alien species" without defining it.¹² The *Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species that Threaten Ecosystems, Habitats or Species*¹³ ("Guiding Principles") gives a possible definition: a species, subspecies or lower taxon introduced outside its natural past or present distribution, including any part, gametes, seeds, eggs, or

10. The habitats and ecosystems where the species lives or lived.

11. The area the species can reach using its own legs, wings or wind/water-borne dispersal systems.

12. Convention on Biological Diversity, *supra* note 7, art. 8(h).

13. It was developed under the framework of the CBD Subsidiary Body on Scientific, Technical and Technological Advice, and submitted for consideration to the fifth meeting of the Conference of Parties in Nairobi in May 2000 as an "Interim Guiding Principles". It was adopted at the sixth meeting of the Conference of Parties in The Hague in April 2002 as the GUIDING PRINCIPLES FOR THE PREVENTION, INTRODUCTION AND MITIGATION OF IMPACTS OF ALIEN SPECIES THAT THREATEN ECOSYSTEMS, HABITATS OR SPECIES (UNEP/CBD/COP/6/20, Decision V/23).

propagules of such species that might survive and subsequently reproduce. The term "invasive" is often related to the concept of adverse impact in the form of damage inflicted on the receiving species, habitats or ecosystem. The CBD defines "alien invasive species" as an alien species which threatens ecosystems, habitats or species.¹⁴ Many introduced alien species may not become invasive, although there is always the possibility, and there is much debate about the point at which an alien species may be termed as "invasive".

An introduced alien species that spreads beyond human control may die out after a certain period of time, or remain in the area without disrupting local biota or ecosystem. However, invasion occurs when an alien species not only persists, but proliferates and becomes a threat to native species, local habitats and the ecosystem. This happens because an alien species living within a new ecosystem may not have the same natural restraints, such as predation, competition for food, and disease, which exist in their original habitat. Absent nature's checks on an alien species' growth and reproduction, its population can grow exponentially in the new ecosystem. Prolific alien species typically transform unprotected ecosystems by predation, competition, altering landscapes, or a combination of these effects.¹⁵ For example, crofton weed, which originated in Latin America, spread into *Yunnan* province in the 1940s. It now grows commonly in the southwestern region including *Yunnan*, *Guizhou*, *Tibet*, *Guangxi* and part of *Sichuan* provinces and autonomous regions. The plant is aggressive and powerful, and grows at an impressive speed.¹⁶ It occupies large areas of farmlands, orchards, forests, grasslands and roadside areas. Ragweed (bitterweed), which originated in North America, was transmitted into China in the 1930s. It has expanded into *Shanghai* and many big cities in *Liaoning*, *Heilongjiang*, *Jilin*, *Shandong*, *Hunan*, *Zhejiang*, *Anhui* and *Jiangxi* provinces. With strong reproductive and competitive capacity, it excludes other plants and grasses, causing significant economic and aesthetic damage.¹⁷

14. Convention on Biological Diversity, *supra* note 7, art. 2.

15. Elizabeth Culcotta, *Biological Immigrants Under Fire*, SCIENCE 1444 (1991).

16. Crofton weed covered 110,000 square kilometers in 1985 and expanded to 247,000 square kilometers in 1995. It is now expanding into Eastern and Northern parts of China at a speed of 60 kilometers per year. SEPA SUBMISSION OF CASE STUDIES ON ALIEN SPECIES TO THE CBD SECRETARIAT (Oct. 8, 1999) [hereinafter SEPA SUBMISSION OF CASE STUDIES].

17. *Id.*

The primary problem with species introduction is the extreme difficulty in accurately predicting which alien species will have benign effects and which may become invasive in a new habitat. To make things more complicated, invasiveness may be triggered by diverse events such as habitat alteration or the arrival of another alien species and interactions with it.

Alien species invade China as a result of two types of activities that have legitimate economic or other objectives. One is intentional introduction, which occurs for a variety of purposes. Species are introduced for use in biological production systems of agriculture, forestry and fishery; and in landscaping for recreational and ornamental purposes. Sometimes species are introduced for use in containment or captivity such as zoos, aquaria and the pet trade, from which there is always risk of escape or release into the wild. The other category of activity is the unintentional introduction of species, organisms or pathogens, that occurs through pathways involving trade, transport, travel and tourism.

According to a preliminary investigation by the State Environmental Protection Administration ("SEPA"), China has 107 species of alien invasive weeds. The presence of 58 percent of these plants are the result of intentional introduction for the purposes of pasture, foodstuff, vegetables, ornamental plants, medicinal herbs and etc.¹⁸ Alligator weeds and water hyacinth were first introduced for use as animal foodstuff. Smooth cord grass was introduced by coastal regions to protect the shoal. Their growth is now completely beyond human control and it has started to cause serious harm to both the economy and the ecosystem.¹⁹ The weeds are aggressively wiping out species indigenous to China, leading to homogenization of the ecosystem. Intentional introduction remains one of the most dangerous programs affecting China's biodiversity and economy. China's farmlands are being planted with introduced species such as eucalyptus, pine

18. THE STATE ENVIRONMENTAL PROTECTION ADMINISTRATION, CHINA'S SECOND NATIONAL REPORT ON THE IMPLEMENTATION OF THE CONVENTION ON BIOLOGICAL DIVERSITY, at 37-38 (2001) [hereinafter CHINA'S SECOND NATIONAL REPORT ON THE IMPLEMENTATION OF THE CBD]. See also, Cai Lei, et al., *Control Alien Invasive Species to Conserve Biodiversity*, ENVIRONMENTAL PROTECTION 27-34, 27 (vol. 8, 2003).

19. Yao Wenguo and Chen Hongjun, *Prevention of Alien Biological Invasion – A New Task for Quarantine Work*, CHINA INSPECTION AND QUARANTINE 13 (vol. 2, 2002). See also Zhang Jianguo, *Alien Biological Invasion – The Plants*, JOURNAL OF FOREST AND MANKIND 4-5 (vol. 5, 2003).

trees, larch and etc. for the purpose of timber production. Instead of cultivating and using local grass species, imported grasses from foreign countries are used for erosion control and forage. Other projects likely to introduce alien species include nature reserve restoration and scenic site development.²⁰ Some species, such as the giant African snail, was imported for other purposes, such as cuisine. Improper management led to the snail's accidental release into farmlands. The African snail has now become a serious threat to the growth of vegetables.²¹

Forty-two percent of China's 107 alien invasive weed species were introduced by unintentional means. They entered China with imported goods, passenger luggage, and by other means of transportation. There are 32 major species of alien invasive pests and 23 alien pathogens. These pests and pathogens primarily entered China with imported plants and other goods.²² Unintentional introduction occurs often, especially in light of ever-increasing international trade, transport, travel and tourism. For example, the North American Pinewood Nematode, a major forest pest, is suspected of being introduced into China with the wood packaging and imported lumber from the United States, Japan and some other countries.²³

II.

THE IMPACTS OF SPECIES INVASION

From 2001 to 2003, SEPA carried out a nationwide investigation of the origins and pathways, ecological and economic impacts of two hundred and eighty-three alien invasive species.²⁴ These species have caused significant harm to China's ecosystem, biodiversity and socio-economic well being.

20. Xie Yan, *Alien Invasive Species in China*, CHINA DAILY, May 29, 2004, at 3.

21. See Yao Wenguo & Chen Hongjun, *supra* note 19. See also Zhang Jianguo, *supra* note 19.

22. See CHINA'S SECOND NATIONAL REPORT ON THE IMPLEMENTATION OF THE CBD, *supra* note 18. See also, Cai Lei, et al, *supra* note 18, at 27.

23. Bao Liming and Zhao Peizhi, *Biological Invaders – Illegal Immigrants in the Ecosystem*, CHINA INSPECTION AND QUARANTINE 23 (vol. 6, 2000).

24. *China Has Established Detailed Information on Alien Species*, CHINA ENVIRONMENT NEWS, May 24, 2004. According to the report, such alien invasive species include 19 micro-organisms, 18 aquatic plant and 170 terrestrial plant species, 25 aquatic invertebrate and 33 terrestrial invertebrate species, 3 amphibian species, 10 fish species and 5 mammal species.

A. *The Economic Impacts*

The invasion of alien species has caused heavy economic loss to China. Conservative estimates of annual losses to the agricultural and forestry industries amount to RMB57.4 billion *yuan* each year. These losses are caused by the invasion of pests such as Loblolly Pine Mealybug (*Oracella acuta*), American white moth and giant African snails; and weeds like crofton weed, mile-a-minute weed, alligator weed, ragweed, smooth cord-grass, siam weed and water hyacinth.²⁵ Another study has put the figure on total annual losses caused by invasive species at RMB119.88 billion *yuan*. This includes both direct economic losses of RMB19.86 billion *yuan* in sectors such as agriculture, forestry and fishery; and indirect economic losses in the amount of RMB100.02 billion *yuan*, resulting from harm done to the ecosystem, species and genetic resources. .²⁶

For example, crofton weed can occupy more than 90 per cent of grassland within three years of invasion. The plant invaded *Sichuan* province and, in 1996 alone, effectively turned over eight million *mu*²⁷ of grassland into a “kingdom of weed”, causing a reduction of over 60,000 sheep and losses of more than RMB20 million *yuan*. The seeds and pollens of the weed can induce asthma in horses and sheep, causing tissue damage and even death of livestock.²⁸ Further, the weed can cause infertility and poisoning if eaten by cows and sheep.²⁹ Alligator weed, another extremely harmful plant, originated in South America and was first spotted near *Shanghai* in 1892. It was planted widely as pig feedstuff in the 1950s. Growth of alligator weed went unchecked, and it invaded orchards and farmlands, affecting the growth of

25. CHINA COMMISSION ON INTERNATIONAL COOPERATION IN ENVIRONMENT AND DEVELOPMENT, *supra* note 3. According to preliminary investigation, invasive pests cause RMB7 to 8 billion *yuan* of economic loss and alien weeds cause as high as RMB900 million *yuan* of loss to China's agriculture. See CHINA'S SECOND NATIONAL REPORT ON THE IMPLEMENTATION OF THE CBD, *supra* note 18, at 38.

26. BIODIVERSITY CLEARING-HOUSE MECHANISM OF CHINA, ALIEN INVASIVE SPECIES, available at www.biodiv.org.cn, an official website managed by the Bureau of Nature and Ecological Protection of SEPA [hereinafter BIODIVERSITY CLEARING-HOUSE MECHANISM OF CHINA]. The survey was jointly conducted by the SEPA, the Ministry, and the SFA. See Qin Chuan, *Exotic Animals, Plants Pose Threat*, CHINA DAILY, May 22, 2004, at 1.

27. “*Mu*” is a Chinese unit for measuring the size of area. One *mu* equals to one fifteenth of a hectare.

28. Cai Yanhong, *supra* note 5. See also Ye Donghui, *Guarding against Biological Invasion*, CHINA CUSTOMS JOURNAL 29 (vol. 10, 2002).

29. Zhang Jianguo, *supra* note 19.

indigenous fruits, rice, beans, corns and cotton. It now extensively occupies land in *Hebei, Shaanxi, Henan, Anhui, Jiangsu, Zhejiang, Jiangxi, Hubei, Hunan, Taiwan, Sichuan, Guizhou* and *Yunnan* provinces. The weed reproduces easily, grows rapidly and is hard to eradicate. With a density as high as 300 stalks per square meter, the weed causes great damage to fruit trees and agricultural farms, resulting in direct economic losses of approximately RMB600 million *yuan* per year.³⁰

Invasive animal species are just as dangerous. When the one-millimeter-long North American pinewood nematode (*Bursaphelenchus xylophilus*) was first spotted on pine trees in 1982, in a scenic site in *Nanjing*, people chose to ignore them. Now this pest is present in *Jiangsu, Anhui, Guangdong, Shandong* and *Zhejiang* provinces. The nematode is known as "pine cancer" for its highly destructive nature. It takes only forty days for infested trees to wither and die, and infestation by the North American pinewood nematode can destroy an entire forest in three to five years. They are expanding at the rate of 15 to 30 kilometers per year towards the world famous Yellow Mountain scenic site, and threaten the few species of pine trees on the list of the World Natural and Cultural Heritage.³¹ Nationwide, more than 86,000 hectares of pine forest in *Guangdong, Shandong, Jiangsu, Zhejiang* and *Anhui* provinces are infested, with damage totaling to RMB2.5 billion *yuan*. The disease has become an increasing menace to more than 33 million hectares of pine forest throughout China, with a potential of RMB25 billion *yuan* in damage.³² The outbreak of nematodiasis in Guangdong province in 2004 killed more than 10,000 pine trees at the South China Botanical Garden. This invasion caused an economic loss of more than RMB50 million *yuan* to the city of Guangzhou alone. The Province has lost between RMB5 to 10 billion *yuan* from nematodiasis.³³

30. SEPA SUBMISSION OF CASE STUDIES, *supra* note 16. For an in-depth case study on the invasion and harm of alligator weed and control measures, see XU RUMEI AND YE WANHUI, EDS., *BIOLOGICAL INVASION - THEORY AND PRACTICE* 219-235 (Science Publishing House, 2003).

31. Bao Liming and Zhao Peizhi, *supra* note 21. For an in-depth case study on the invasion and harm of pinewood nematode and control measures, see XU RUMEI AND YE WANHUI, *supra* note 30.

32. Liang Chao, *Fight Against Alien Forest Pests Intensifies*, CHINA DAILY, June 4, 2002.

33. Zheng Caixiong, *Disease Destroying Pine Forests in Guangdong*, CHINA DAILY, Nov. 17, 2004.

Despite great effort made to quantify the economic loss caused by the invasion of alien species, current figures can by no means be viewed as exhaustive. It is notoriously difficult to value components of native biodiversity or the benefits freely provided by ecosystem services, such as clean and abundant water, clean air, and sediment control, that may be degraded through invasions.³⁴ The death of pine trees in the Guangdong disaster resulted in serious soil erosion and contamination of the Liuxi River, which provides drinking water for more than ten million residents.³⁵

B. *The Ecological Impacts*

Apart from extensive damage caused by alien pests and weeds to forestry, agriculture, and other economic interests, alien species are the most overlooked threat to native biodiversity. Introduced species frequently act jointly with habitat loss and other factors in an “extinction drive” that eliminates native species locally, regionally, or altogether. Aside from causing or contributing to the extinction of native species, the invasion of exotics results in biological homogeneity. This effect, the opposite of biological diversity, occurs as pests and weeds achieve global ranges.

There have been case studies documenting the ecological harm caused by invasive plants in China. For example, crofton weed, now widely found in Southwest China, has caused the disappearance and extinction of the indigenous plantation. The invasion of smooth cord-grass into the shallow coastal marine and estuarine environment has severely affected water quality and induced “red tide”, causing the disappearance of local mangroves.³⁶ Shellfish, crabs and fish normally found in coastal shallow waters have been choked to death, and kelp and laver have decreased as a result of the grass’ overgrowth.³⁷

34. According to the IUCN guideline, elements for assessment must include items such as: reduction in the value of agricultural land; increased operating costs and loss of income; collapse of buildings and power failures; inefficient irrigation and lowered water tables; seed contamination, spread of disease and incremental pest control costs; loss of sport, game, endangered species and biodiversity; ecosystem disturbance and protection, monitoring and recovery costs; loss of scientific value; loss of opportunity and ecosystem services for future generations; and loss of equitable access to resources. SHINE, *supra* note 6, at 9.

35. Zheng Caixiong, *supra* note 33. The upper Liuxi River winds through one of the major pine forests in Guangzhou.

36. Cai Lei, et al, *supra* note 18. For more, see Li Mingyang and Xu Haigen, *Economic Assessment of the Impact of Invasive Species on Wetland Ecosystem*, 24 JOURNAL OF CENTRAL SOUTH FORESTRY UNIVERSITY 53-56 (2004, no.5).

37. Zhang Jianguo, *supra* note 19.

Water hyacinth (*Eichhornia crassipes*) was introduced from South America in the 1950s as pig feedstuff for Chinese farmers. It has spread all over China and invaded the inland waters (rivers, lakes and ponds) of most provinces and cities in North, East, Central and South China. It is incredibly destructive to many aquatic habitats, covering the surface of water, expelling other water plants and organisms and damaging local ecosystems. The 1,000-hectare *Dianchi* Lake in *Yunnan* province is seriously affected. Water hyacinth covers its surface, critically destructing the structure and function of the water ecosystem, and reducing the indigenous plants and animals from over 200 species to a mere twenty species or so. The excessive growth of the water hyacinth has forced the suspension of a famous tourist cruise line as the navigation is literally blocked by the plants.³⁸

Jinzhong Teng (*Merremia boissiana*), a vine with bell-shape yellow flowers, has been identified by the *Guangzhou* Municipal Forestry Bureau as the most aggressive plant species yet to invade *Guangdong* province. The plant entered the province in the 1980s and rapidly spread over hills and farms. The vine can climb and smother ten-metre-tall trees, giving rise to a green and dense canopy that suffocates native trees and shrubs. Jinzhong teng is present in at least 66 hectares of forests, and seriously threatens the survival of trees and the balance of the local ecosystem.³⁹

Invasive animal species can produce devastating ecological impacts as well. The red turpentine beetle first entered China from the U.S. with the import of timber products in the 1980s. During 1999, this beetle was responsible for killing one third of all pine trees in *Shanxi* province within months.⁴⁰ The coconut leaf beetle (also known as coconut hispid or palm leaf beetle), an alien species that was first discovered in *Hainan* province in June 2002, is posing an unprecedented threat to trees of the palm family. By January 2005, the species affected an area of 390,000 hectares in the province that support nearly 8.2 million trees in the palm

38. Li Mingyang and Xu Haigen, *supra* note 36. For an in-depth case study on the invasion and harm of water hyacinth and control measures, see XU RUMEI AND YE WANHUI, *supra* note 30. See also Wu Dan et al, *The Harm of Over-Reproduction of Water Hyacinth and Control Measures*, 24 ENVIRONMENTAL SCIENCE AND TECHNOLOGY 35-37 (2001), and Zhang Jianguo, *supra* note 19, at 4.

39. He Sheng, *Pretty Plant with Deadly Legacy*, CHINA DAILY, Dec. 23, 2004, at 13. See also *Warning System to Guard Against Alien Species in South China City*, XINHUA ECONOMIC NEWS, June 6, 2005.

40. Chen Sai, *Invasion of Alien Species and Principles for Environmental Legal Control*, 24 XINJIANG ENVIRONMENTAL PROTECTION 31-33 (2002, issue no.4).

family. According to *Hainan* Provincial Forestry Bureau, more than 1.8 million trees in the province are currently infected with the pest.⁴¹ There is danger that all of the coconut palms on the island could be destroyed if the pest is not brought under effective control.

Alien fish species are a primary cause of the extinction of native fish in *Yunnan* province.⁴² The introduction of alien fish species into the aquatic environment in *Yunnan* has significantly reduced and extirpated indigenous varieties. Among the 432 native fish species, around 130 have not been seen in the last five years, and approximately 150 species considered abundant in the 1960s are now rare. The remaining 152 species have experienced significant drops in numbers as compared with the 1960s.⁴³

Although it is difficult to place a price tag on the ecosystem, scientists estimate economic losses resulting from the destruction of ecosystem, loss of biodiversity and genetic resources at approximately RMB100 billion *yuan*.⁴⁴ In ecosystems protected from habitat destruction, alien invasive species are the primary cause of ecological degradation and loss of biodiversity. The invasion of alien species is the primary threat to inland waters and tropical and subtropical ecosystems in China.

C. *The Health Impacts*

The introduction of alien species presents opportunities for the transmission of micro-organisms that affect the health of humans and animals. Transmission occurs through vectors such as mosquitoes, domestic animals and ballast water. Alien invasive species can also serve as hosts of diseases that affect human and animal health. For example, the West Nile virus is carried by mosquitoes. This disease currently affects New York City.⁴⁵ In China, alien species seriously affects human health at a cost of RMB2.9 billion *yuan* per year.⁴⁶ Ragweed (also known as bitterweed), present in fifteen provinces and cities in Northeast, North, East and Central China, is found to be the main cause of a pollen allergy that causes “dry weed fever” syndrome. According to

41. ‘Aliens’ Hit ‘Coconut Island’, CHINA DAILY (Feb. 19, 2005).

42. CHINA COMMISSION ON INTERNATIONAL COOPERATION IN ENVIRONMENT AND DEVELOPMENT, *supra* note 3.

43. Su Ronghui, et al., *On Research and Response to Biological Invasion*, JOURNAL OF CHINESE ACADEMY OF SCIENCE 335 (2002, no.5).

44. BIODIVERSITY CLEARING-HOUSE MECHANISM OF CHINA, *supra* note 26.

45. SHINE, *supra* note 6.

46. BIODIVERSITY CLEARING-HOUSE MECHANISM OF CHINA, *supra* note 26.

preliminary statistics, about 1% of the contact population is affected to various degrees by ragweed pollen, and each year at least 1 million people seek medical treatment for dry weed fever.⁴⁷

III.

THE LEGAL AND ADMINISTRATIVE CONTROL REGIME

China's current legal and administrative regime dealing with alien invasive species is best described as piecemeal and fragmented. There is a huge gap between the regime that exists, and that which is expected by international instruments. Although China's laws and regulations contain provisions pertaining to intentionally introduced alien species, quarantine control and wildlife protection, the focus has historically centered on the prevention and control of unintentional introduction of harmful pests, weeds and diseases.⁴⁸ Nevertheless, recent administrative initiatives taken by the SFA, the Ministry of Agriculture and SEPA demonstrate a growing awareness of the severity of biological invasion, and a commitment by policy makers and state administrators to tackle the problem.

A. *Quarantine Control*

China has generally relied upon quarantine measures to control unintentional introductions of alien species and diseases. The targets of quarantine control are those species found to be particularly dangerous and harmful to agriculture, forestry, animal husbandry and fishery. The most relevant laws and regulations include the *Frontier Health and Quarantine Law*⁴⁹ and its *Imple-*

47. SEPA SUBMISSION OF CASE STUDIES, *supra* note 16.

48. Unintentional introduction occurs through diverse pathways of trade, travel and transport. The risk of traded commodities being contaminated with alien animals, plants or micro-organisms is real for large trading nations like China. Live-stock can carry seeds in their guts, timbers can bring in pests, soil on roots can harbor diseases for native plants and seed consignments may be contaminated with weeds. Contamination problems can be detected and managed by strict border and quarantine controls, combined with improved cleaning, packaging and transport methods and techniques, and more stringent international sanitary and phytosanitary measures.

49. The Frontier Health and Quarantine Law of the People's Republic of China was adopted at the 18th Meeting of the Standing Committee of the Sixth National People's Congress, promulgated by Order No.46 of the People's Republic of China on 2 December 1986. The Law became effective on 1 May 1987.

mentation Rules⁵⁰, the *Law on Entry and Exit Quarantine of Animals and Plants*⁵¹ and its *Implementation Rules*⁵², and the *Law on Animal Epidemic Prevention*⁵³.

The primary concern of the *Frontier Health and Quarantine Law* is the protection of human health. It was enacted to institutionalize quarantine inspection to better prevent infectious diseases from spreading into or out of China.⁵⁴ Although the act does not aim to control invasive species, some provisions could be relied upon to prevent the entry of certain species that carry disease or are harmful to human health. Transportation vehicles subject to entry quarantine inspection are required to carry out pest and rat control, be disinfected or treated with other sanitation measures if rodents or other disease-carrying pests are present.⁵⁵ Similar measures are carried out upon baggage, goods and postal parcels subject to entry quarantine inspection.⁵⁶

To further strengthen the prevention, control and elimination of animal epidemics, the *Law on Animal Epidemic Prevention* was enacted.⁵⁷ Its focus was also the protection of human health. The main targets of control are infectious animal diseases and parasitic animal diseases.⁵⁸

In comparison with the above two statutes, the *Law on Entry and Exit Quarantine of Animals and Plants* ("The Quarantine

50. The Implementation Rules of the Frontier Health and Quarantine Law was issued by the State Council on 6 March 1989 and became effective on the same date.

51. The Law of the People's Republic of China on the Entry and Exit Quarantine of Animals and Plants was adopted at the 22nd Meeting of the Standing Committee of the Seventh National People's Congress and promulgated by Order No.53 of the President of the People's Republic of China. The Law enters into force on 1 April 1992.

52. The Implementation Rules of the Law on Entry and Exit Quarantine of Animals and Plants was promulgated by the State Council on 2 December 1996 and became effective on 1 January 1997.

53. The Law of the People's Republic of China on Animal Epidemic Prevention was adopted at the 26th Meeting of the Standing Committee of the Eighth National People's Congress and issued by Order No.87 of the President of the People's Republic of China. It enters into force on 1 January 1998.

54. Frontier Health and Quarantine Law of the People's Republic of China, *supra* note 49, art. 1.

55. Frontier Health and Quarantine Law of the People's Republic of China, *supra* note 49, art. 13.

56. Frontier Health and Quarantine Law of the People's Republic of China, *supra* note 49, art. 14.

57. The Law of the People's Republic of China on Animal Epidemic Prevention, *supra* note 53, art. 1.

58. The Law of the People's Republic of China on Animal Epidemic Prevention, *supra* note 53, art. 3.

Law”) controls alien species in a more direct manner, as it goes beyond the control of infectious or parasitic diseases affecting human health. The Quarantine Law also aims at barring pests and weeds dangerous to plants, and other harmful organisms, from entry into and exit out of China for the protection of agriculture, forestry, animal husbandry, fishery production and human health.⁵⁹ Five years after the enactment of the Quarantine Law, the State Council promulgated the *Implementation Rules*, providing more detailed and concrete provisions in this regard. Under the National Administration of Quarantine for Animals and Plants (“NAQAP”), over 200 port quarantine departments have been established, forming a relatively comprehensive network of supervision and monitoring pests and weeds harmful and dangerous to agriculture, forestry and fishery.⁶⁰

The Quarantine Law prohibits the entry of pathogenic microorganisms of animals and plants (including seed cultures of bacteria and viruses), pests and other harmful organisms into China.⁶¹ It also prohibits the entry of any animals, plants, or derived products that originate from countries or regions with prevalent epidemic animal or plant diseases.⁶² Although the primary purpose of the Quarantine Law is disease control, the law’s strict entry quarantine measures contribute to controlling alien species. For example, prior approval is mandatory for the import of animals, animal products, plant seeds, seedlings or other propagating materials.⁶³ Imported animals, plants and their products are subject to quarantine inspection at the port of entry. Where necessary, they may be quarantined in isolation as required by the port animal and plant quarantine office (“quarantine office”).⁶⁴ They are allowed to enter China only if they can pass the quarantine inspection.⁶⁵

59. The Law of the People’s Republic of China on the Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 1.

60. CHINA’S SECOND NATIONAL REPORT ON THE IMPLEMENTATION OF THE CBD, *supra* note 18, at 38.

61. The Law on Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 5(1).

62. The Law on Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 5(2).

63. The Law on Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 10. Relevant parties must submit an application in advance and go through the procedures for examination and approval of quarantine inspection.

64. The Law on Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 14.

65. The Law on Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 15.

Where imported animals fail to pass the quarantine inspection, the quarantine office will issue a quarantine treatment notice to the owner or its agent, asking them to return or slaughter all the animals if Class A infectious or parasitic diseases are found, or asking them to return or slaughter animals affected by Class B infectious or parasitic diseases and to keep the un-infected animals isolated at a designated observation area.⁶⁶ The Class A and Class B infectious or parasitic diseases are designated by the Ministry of Agriculture.⁶⁷ Where imported plants and plant products are found to be contaminated with “diseases, pests or weeds dangerous to plants” upon quarantine inspection, the quarantine office will issue a quarantine treatment notice to the owner or its agent, asking them to conduct such treatment as disinfection and pest control, returning to the place of origin or destruction. Those that pass the quarantine inspection after such treatment are allowed to enter China.⁶⁸ The “diseases, pests and weeds dangerous to plants” are also designated by the Ministry of Agriculture.⁶⁹ Some animals, plants and their products are found to be contaminated with diseases, pests or harmful organisms not listed in the inventories. Where the contamination is still considered extremely harmful to agriculture, forestry, animal husbandry and fishery, the quarantine office will notify the owner or its agent to carry out treatment measures including disinfection and pest control, return of the animals and plants to the place of origin, and destruction. Those that pass the quarantine inspection after the treatment are allowed to enter China.⁷⁰

66. The Law on Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 16.

67. The Law on Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 18. According to this delegation provision, the Ministry of Agriculture promulgated the *Inventory of Class A and Class B Infectious and Parasitic Diseases for the Animals Imported from other Countries into the People's Republic of China* on 8 June 1992, with immediate implementation. The Inventory lists 97 targeted diseases for quarantine control of imported animals. 15 of them are Class A disease and 82 of them are Class B disease.

68. The Law on Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 17.

69. The Law on Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 18. According to this delegation provision, the Ministry of Agriculture promulgated the *Inventory of Dangerous Diseases, Pests and Weeds for Imported Plant Quarantine* on 25 July 1992. It was put into implementation on 1 October 1992. The Inventory lists 84 diseases, pests and weeds for quarantine control of imported plants.

70. The Law on Entry and Exit Quarantine of Animals and Plants, *supra* note 51, art. 19.

Fairly speaking, the quarantine control measures implemented and enforced by the over 580 inspection and quarantine offices at the national borders have played an effective role in preventing harmful and injurious pests, weeds and diseases on the "black list" from entering China.⁷¹ The target of these measures, however, centers upon unintentional introduction of invasive species.

B. *Wildlife Protection*

In contrast with quarantine measures, China's wildlife protection law deals more directly with the intentional introduction of alien species. China has established separate legal schemes for the protection of wild animals and wild plants. The *Wild Animal Protection Law*⁷² was passed to protect and rescue precious and endangered wild animals, to preserve, develop and rationally utilize wild animal resources and to maintain ecological balance.⁷³ Under this law, the State Forestry Administration ("SFA") and the Fishery Administrative Authority ("FAA") are responsible for the management of terrestrial and aquatic animals respectively.⁷⁴ As a result, the SFA promulgated the *Regulation for the Protection of Terrestrial Wild Animals* with the approval of the State Council on 1 March 1992, and the Ministry of Agriculture promulgated the *Regulation for the Protection of Aquatic Wild Animals* with the approval of the State Council on 5 October 1993. The *Wild Plant Protection Regulation*⁷⁵ ("WPPR") was passed to protect, develop and rationally utilize wild plant resources, conserve biodiversity and maintain ecological balance.⁷⁶ The Ministry of Agriculture further issued the *Provisions on the Protection of Agricultural Wild Plants*⁷⁷ ("PPAWP") in accordance with the WPPR to provide more concrete rules and measures to protect and rationally utilize rare and endangered wild plant resources and conserve biodiversity. Both

71. Yao Wenguo and Chen Hongjun, *supra* note 19, at 15.

72. The Wild Animal Protection Law was first adopted at the fourth meeting of the Standing Committee of the Seventh National People's Congress and issued by Order No.9 of the President of the People's Republic of China on 8 November 1988. The Law went into force on 1 March 1989. It was substantially amended in 2004.

73. The Wild Animal Protection Law, *supra* note 72, art. 1.

74. The Wild Animal Protection Law, *supra* note 72, art. 7.

75. The Wild Plant Protection Regulation was promulgated by the State Council on 30 September 1996. It went into force on 1 January 1997.

76. The Wild Plant Protection Regulation, *supra* note 75, art. 1.

77. The Ministry of Agriculture first announced the *Provisions on the Protection of Agriculture Wild Plants* on 6 September 2002. The Provisions went into force on 1 October 2002. It was amended on 1 July 2004.

the WPPR and the PPAWP have focused on protection of the habitats and prohibition of illegal harvesting, sale and export of relevant plants.

To introduce terrestrial wild animals for reproduction and cultivation purposes from foreign countries or from other provinces, autonomous regions or municipalities under direct control of the Central Government, the responsible parties must take proper measures to prevent accidental escape of the animals into the wild. Where it is necessary to release the animals into the wild habitat, the responsible parties must file an application with the provincial authority for forestry administration. The provincial authority then designates a science research institute to carry out scientific assessment. The case is then submitted to the SFA or its authorized body for approval. The release or escape of introduced wild animals into the wild, resulting from improper management, renders the parties liable for taking remedial measures, including being ordered to capture the released or escaped wild animals within a specified period of time.⁷⁸ Similar control is imposed on the introduction of aquatic wild animals. Anyone introducing aquatic wild animals from foreign countries must submit an application to the provincial level authorities of the fishery administration. The provincial fishery administration then designates a science research institute to carry out scientific assessment. The case is then submitted to the FAA of the State Council for approval.⁷⁹

C. Administrative Initiatives to Control Invasive Species

Despite the relatively weak legal control mechanism over alien invasive species, the Chinese government is demonstrating a commitment to fulfill its obligation under article 8(h) of the CBD. In 2000, the concept of biosafety caught the attention of policy-makers and the issue was addressed for the first time in the government policy statement.⁸⁰ Article 14 of the Compendium of National Ecological Conservation provides that “all the

78. The Regulation on the Protection of Terrestrial Wild Animals, art. 23. The Regulation was promulgated in accordance with the Wild Animal Protection Law by the Forestry Administration on 1 March 1992, with the approval of the State Council.

79. The Regulation on the Protection of Aquatic Wild Animals, art. 22. The Regulation was promulgated in accordance with the Wild Animal Protection Law by the Ministry of Agriculture on 5 October 1993, with the approval of the State Council.

80. The Compendium of National Ecological Conservation was promulgated by the State Council on 26 November 2000. It is a most important policy statement by

alien species have to go through risk assessment process. The import quarantine work has to be strengthened to prevent any harmful alien species from entering into China.” More recently, several departments have started working on plans and strategies to deal with alien invasive species as an important theme of its own, rather than a residual issue of quarantine control or wildlife protection. Major initiatives are being taken by the SFA, the Ministry Agriculture and SEPA.

The SFA has made significant progress in preventing biological invasion by strengthening control over the intentional introduction of alien species. By promulgating the *Rule on Quarantine Approval and Supervision over the Introduction of Tree Seeds and Seedlings and Other Reproductive Means* (the “Rule”),⁸¹ it aims to effectively prevent the invasion of injurious alien species through tightened quarantine management over introduced seeds and seedlings.⁸² The Rule requires all introducers, both institutions and individuals, to seek approval from the relevant forestry authority prior to introduction.⁸³ All applicants must possess seedling nurseries certified by the SFA and carry out trial planting of the introduced species in isolation.⁸⁴ During the trial planting period, the SFA and relevant provincial forestry authority have the responsibility to supervise and inspect the state certified seedling nurseries.⁸⁵ Prior to approval of introduction, a risk assessment must be completed for seeds or seedlings that are introduced to China or the relevant province for the first time, or introduced in extremely large amounts.⁸⁶ The introducers are required to inform the relevant supervisory forestry authority within seven days of the arrival of the introduced seeds or seed-

the central government on its commitment to combat ecological degradation and to conserve natural resources.

81. The Rule on Quarantine Approval and Supervision over the Introduction of Tree Seeds and Seedlings and Other Reproductive Means was promulgated by the State Forestry Administration on 30 May 2003, with immediate effect.

82. The Rule on Quarantine Approval and Supervision over the Introduction of Tree Seeds and Seedlings and Other Reproductive Means, *supra* note 81, art. 1.

83. The Rule on Quarantine Approval and Supervision over the Introduction of Tree Seeds and Seedlings and Other Reproductive Means, *supra* note 81, art. 3. According to art. 16 of the Rule, the approval is normally valid for two months.

84. The Rule on Quarantine Approval and Supervision over the Introduction of Tree Seeds and Seedlings and Other Reproductive Means, *supra* note 81, art. 5.

85. The Rule on Quarantine Approval and Supervision over the Introduction of Tree Seeds and Seedlings and Other Reproductive Means, *supra* note 81, art. 22.

86. The Rule on Quarantine Approval and Supervision over the Introduction of Tree Seeds and Seedlings and Other Reproductive Means, *supra* note 81, art. 11.

lings.⁸⁷ Where an epidemic situation occurs, the introducers are obliged to report immediately to the relevant forestry authority and take measures to prevent the dispersal of the epidemic situation in a timely manner. The introducers bear the full cost of quarantine control and treatment.⁸⁸ In order to respond more promptly and efficiently to the outbreak of an epidemic situation, or other situations injurious to the forestry resources, the SFA promulgated the *Provisions on Emergency Response to Biological Incidents Injurious to Forestry Resources* (the "Provisions").⁸⁹ It was passed to ensure timely and prompt response to biological incidents damaging to forestry resources so that harm and loss can be mitigated and dispersal of detrimental species can be contained and kept under control.⁹⁰ Although the Provision does not exclusively target alien invasive species, it does treat such invasion as a more harmful and dangerous incident (Category I incident) and requires the SFA to take charge of preparing the crisis management plan. The provincial forestry authorities are responsible for the crisis management plan for Category II incidents.⁹¹

The SFA has focused on the prevention of and emergency response to species invasion. Meanwhile, the Ministry of Agriculture, realizing that biological invasion seriously threatened China's economic security and biological safety, and the health and lives of the public, has made great effort to eradicate invasive species. It successfully launched a pilot program known as "One Province and Five Counties" (*yisheng wuxian*) in 2003 to eradicate ragweed in *Liaoning* province and croften weed in the five counties in *Yunnan* and *Sichuan* provinces.⁹² The Ministry prepared an action plan with a target eradication rate of 60% to serve as guideline for local governments to formulate their own

87. The Rule on Quarantine Approval and Supervision over the Introduction of Tree Seeds and Seedlings and Other Reproductive Means, *supra* note 81, art. 21.

88. The Rule on Quarantine Approval and Supervision over the Introduction of Tree Seeds and Seedlings and Other Reproductive Means, *supra* note 81, art. 24.

89. The Provisions on Emergency Response to Biological Incidents Injurious to Forestry Resources was issued by the State Forestry Administration on 13 May 2005. It was put into implementation on 1 July 2005.

90. The Provisions on Emergency Response to Biological Incidents Injurious to Forestry Resources, *supra* note 89, art. 1.

91. The Provisions on Emergency Response to Biological Incidents Injurious to Forestry Resources, *supra* note 89, art. 7.

92. The five counties are Kaiyuan city and Tengchong county of Yunnan province and Xichang city, Ningnan county and Renhe district of Panzhihua city of Sichuan province. See MINISTRY OF AGRICULTURE, NOTICE ON PILOT SCHEME TO ERADICATE ALIEN INVASIVE SPECIES (Mar. 17, 2003).

eradication plans.⁹³ The pilot scheme not only aimed at mechanical eradication of weeds but also educating, engaging and enabling the public to join in the efforts to fight the invasive species. The agenda of the action plan included seminars, expert consultation, poster exhibition, TV and radio programs, and skills training courses, all of which highlighted the harm and danger of the weeds and pointed out means of tackling the problem. The success of the pilot scheme led to a more extensive “Ten Provinces and One Hundred Counties” (*shisheng baixian*) program in 2004, with more targeted species for eradication including crofton weed, ragweed (bitterweed), and alligator weed.⁹⁴ In addition to formulating local action plans to carry out the task, most of the participating provincial agricultural administrations have established specialized offices to coordinate and supervise the work of eradication. Great efforts have been made to educate the public in order to better prevent and control biological invasion. Further, the Ministry is also working on strengthening risk assessment, monitoring and early warning mechanisms in order to control the invasion and expansion of alien species at their source. It plans to issue an emergency response rule in cases of outbreak of biological invasion that are seriously harmful to agriculture.⁹⁵

While the SFA and the Ministry of Agriculture focus more on protecting economic interests of the forestry and agricultural sectors from harm, SEPA’s major concern is the conservation of biodiversity. Recent efforts made by SEPA are found in two important documents issued in 2003. One is the *Notice on Strengthening the Prevention and Control of Alien Invasive Species*,⁹⁶ and the other is the *Notice on Issuing the First Inventory of Alien Invasive Species in China*, jointly issued with the Chinese Academy of Science.⁹⁷ SEPA has called upon local environmen-

93. MINISTRY OF AGRICULTURE, THE ACTION PLAN FOR THE ERADICATION OF ALIEN INVASIVE SPECIES FOR 2003 (Mar. 21, 2003).

94. MINISTRY OF AGRICULTURE, NOTICE ON ERADICATION OF ALIEN INVASIVE SPECIES FOR “TEN PROVINCES AND ONE HUNDRED COUNTIES” (2004). See also Yao Runfeng, *supra* note 2. The ten provinces (including municipalities directly under the Central People’s Government) are *Beijing, Liaoning, Jiangsu, Anhui, Jiangxi, Shandong, Hubei, Chongqing, Sichuan, Yunnan*.

95. Cai Yanhong, *supra* note 5.

96. SEPA Document, 2003, no.6.

97. SEPA Document, 2003, no.11. The Inventory lists the sixteen most harmful alien invasive species found in China and provides their characteristics, places of origin, distributions in China, pathways, impacts and methods of control. The sixteen species are crofton weed, mile-a-minute weed, alligator weed, ragweed (bitterweed),

tal protection bureaus (“EPBs”) to prepare prevention and eradication plans based upon investigations of invasive alien species in their own jurisdictions. Local EPBs are directed to carry out regular inspections of alien species. If such species are found to be invasive, the EPBs should order the responsible parties to immediately stop importation and take measures to control and eradicate the relevant species. The local EPBs must report such cases to both the local government and the environmental authority at a higher level. For invasive species that have established themselves, local EPBs are instructed to develop practical plans and take mechanical,⁹⁸ chemical,⁹⁹ and biological measures¹⁰⁰ to eradicate the species. Where a species cannot be eradicated in a timely fashion, EPBs need to take measures to contain it and prevent further spread.¹⁰¹ Where financial resources are limited, control and eradication measures should give priority to areas deserving special protection, such as nature reserves, well-known scenic sites, ecologically special and vulnerable areas, and inland waters. SEPA’s latest initiative is consistent with the three-stage hierarchical approach to alien species control suggested by the CBD: First, priority should be given to preventing entry of potential invasive alien species, both between and within States. Secondly, if entry has already taken place, actions should be undertaken to prevent the establishment and spread. The preferred response would be eradication at the earliest possible stage. Thirdly, if eradication is not feasible or cost-effective, containment and long-term control measures should be considered.¹⁰²

darnel rye-grass (poison darnel), smooth cord-grass, bitter bush (siam weed), water hyacinth, Johnson grass, banana moth, loblolly pine mealybug, red turpentine beetle, American white moth, giant African snail, Amazonian snail (apple snail), and American bull frog.

98. Mechanical control involves removing the species by hand or with appropriate machines such as harvesting vehicles, firearms or traps.

99. Chemical control involves the use of herbicides and insecticides. It is critically important to ensure that only the target species are affected, and that the potential problem of resistance developing over time is avoided.

100. Biological control involves the intentional use of populations of natural enemies of the target alien invasive species. It may give long-term suppression of an alien invasive species without recurrent costs.

101. STATE ENVIRONMENTAL PROTECTION ADMINISTRATION, NOTICE ON STRENGTHENING THE PREVENTION AND CONTROL OF ALIEN INVASIVE SPECIES, *supra* note 4.

102. CBD SECRETARIAT, GUIDING PRINCIPLES FOR THE PREVENTION, INTRODUCTION AND MITIGATION OF IMPACTS OF ALIEN SPECIES THAT THREATEN ECOSYSTEMS, HABITATS OR SPECIES, *supra* note 13, Principle 2.

IV.

STRENGTHENING SOCIO-LEGAL MECHANISMS
AGAINST BIOTIC INVASION

Under the CBD, member states should design laws that make use of both incentives and conventional regulatory approaches.¹⁰³ While policy-makers and state administrators are making effort to better manage alien invasive species in China, there is a fatal lack of a well-designed legal framework. Such a framework is essential to prevent and minimize the risk of unwanted introductions and to provide a basis for effective eradication and control measures. For the effective prevention and control of invasive species across all taxonomic groups, such a legal regime should incorporate fundamental principles of environmental law and environmental mechanisms that have been tested and proven effective. It should prohibit and restrict certain acts while at the same time promoting desired goals by way of economic and other incentives. There is urgent need for China to improve its current legal regime in order to effectively control and mitigate the adverse impacts of biological invasion. Major gaps and flaws of the current regime include narrowly defined objectives, failure to incorporate sound environmental law principles, a lack of prevention mechanisms, lack of post-entry control and management, a flawed liability regime, insufficient institutional coordination and low public awareness. It is therefore recommended that the following be given serious consideration and be incorporated into future biosafety legislation.

A. *Defining Objectives*

Defining objectives is of critical importance in developing legislation itself and in guiding its implementation. Objectives of existing Chinese laws and regulations are narrowly defined to focus on the prohibition of pests and weeds which are harmful to agroforestry or fisheries interests. Quarantine controls do not seek to prevent introductions in a broad ecological sense. That is, quarantine does not provide for the protection of all components of biodiversity against invasive processes, as mandated in the CBD. They are premised on narrow economic grounds primarily related to forestry, agriculture or human health. According to studies conducted by IUCN, specific objectives for alien species

103. Convention on Biological Diversity, *supra* note 7, art. 11.

legislation should include at least the following four aspects: 1) protection of animals, plants, plant products and human health against alien pests, including pathogens; 2) protection of species, subspecies and races against contamination, hybridization, and extinction or extirpation; 3) protection of native biodiversity, biological resources and ecological processes against adverse impacts generated by alien invasive species; and 4) protection against biosecurity threats, defined as matters or activities which, individually or collectively, may constitute a biological risk to the ecological welfare or to the well-being of humans, animals or plants of a country.¹⁰⁴

B. *Incorporating Sound Environmental Law Principles*

The dispersed character of existing provisions and inconsistent legislative treatment fails to incorporate fundamental principles of environmental law, such as the preventive principle, the precautionary principle and the polluter pays principle. Such a failure seriously impinges upon both the effectiveness and the efficiency of any control mechanisms, used as an integral component of conservation and economic development, to combat invasive species.

The preventive principle mandates prevention of unwanted introduction as the top priority. Once an introduced species becomes invasive, it will be both difficult and expensive to eradicate. If much time has elapsed, eradication will often be impossible, in which case the damage is irreversible. Prevention is more cost effective and environmentally desirable than remedial measures taken after the introduction or establishment of exotic species. If an alien species has been introduced, early detection and rapid action are crucial to prevent its establishment.¹⁰⁵ Taking a preventive approach does not impose an absolute duty on States to prevent all harm, but does require governments to exercise due diligence and act reasonably and in good faith in prohibiting and regulating activities that could result in biological invasion.¹⁰⁶

104. SHINE, *supra* note 6, at 43.

105. CBD SECRETARIAT, GUIDING PRINCIPLES FOR THE PREVENTION, INTRODUCTION AND MITIGATION OF IMPACTS OF ALIEN SPECIES THAT THREATEN ECOSYSTEMS, HABITATS OR SPECIES, *supra* note 13, Principle 2.

106. Although there are no settled criteria for the minimum damage, spread or size of the population needed for a species to be considered invasive, it is clear that a very small number of individuals, representing a small fraction of the species' genetic variation in its native range, can be enough to generate massive environmental

The preventive principle dictates different strategies for intentional and unintentional introductions. Prevention of intentional introductions may take the form of total prohibition or partial prohibition managed under a permit system to which conditions are usually attached. *The Guiding Principle* mandates prior authorization for the first-time intentional introduction or subsequent introductions of an alien species already invasive or potentially invasive within a country. An appropriate risk analysis, which may include an environmental impact assessment, should be carried out as part of the evaluation process before coming to a decision on whether or not to authorize a proposed introduction to the country or to new ecological regions within a country. States should make all efforts to permit only those species that are unlikely to threaten biological diversity. Authorization of an introduction may be conditioned upon the preparation of a mitigation plan, monitoring procedures, payment for assessment and management, and containment measures.¹⁰⁷ Prevention of unintentional introductions can be effected by identifying and controlling common pathways through appropriate mechanisms such as quarantine systems.¹⁰⁸

The precautionary principle plays a vital role in environmental decision-making, especially in situations of scientific uncertainty. It has gained international consensus and was written into the 1992 *Rio Declaration on Environment and Development*.¹⁰⁹ The principle was reiterated in the CBD Preamble for a more specific mission of biodiversity conservation: "lack of full scientific cer-

damage. For this reason, every alien species must be treated, for management purposes, as potentially invasive, unless and until there is reasonable indication that this is not so.

107. CBD SECRETARIAT, GUIDING PRINCIPLES FOR THE PREVENTION, INTRODUCTION AND MITIGATION OF IMPACTS OF ALIEN SPECIES THAT THREATEN ECOSYSTEMS, HABITATS OR SPECIES, *supra* note 13, Principle 10(1).

108. CBD SECRETARIAT, GUIDING PRINCIPLES FOR THE PREVENTION, INTRODUCTION AND MITIGATION OF IMPACTS OF ALIEN SPECIES THAT THREATEN ECOSYSTEMS, HABITATS OR SPECIES, *supra* note 13, Principle 11(2). Common pathways for unintentional introductions include sectoral activities, such as fisheries, agriculture, forestry, horticulture, shipping including the discharge of ballast waters, ground and air transportation, construction projects, landscaping, aquaculture including ornamental aquaculture, tourism, the pet industry and game-farming.

109. Rio Declaration on Environment and Development, Principle 15. The Rio Declaration is a non-binding instrument adopted at the UN Conference on Environment and Development in Rio de Janeiro, Brazil, on 3-14 June 1992. The "precautionary approach" is endorsed by Principle 15, which stipulates that the lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation.

tainty shall not be used as a reason to postpone measures to avoid or minimize a threat of significant reduction or loss of biodiversity".¹¹⁰ Precaution is particularly important in the context of invasive species due to inherent scientific uncertainty and limitations on predictive capacity. Thus, the precautionary approach was recommended as the first and foremost principle for member states to develop domestic legal regimes to combat alien invasive species:

Given the unpredictability of the pathways and impacts on biological diversity of invasive alien species, efforts to identify and prevent unintentional introductions as well as decisions concerning intentional introductions should be based on the precautionary approach, in particular with reference to risk analysis. . . . The precautionary approach should also be applied when considering eradication, containment and control measures in relation to alien species that have become established. Lack of scientific certainty about the various implications of an invasion should not be used as a reason for postponing or failing to take appropriate eradication, containment and control measures.¹¹¹

The precautionary principle provides a legal basis for using risk analysis tools to engage in well-informed decision-making on proposed introductions, activities and control strategies. It requires decision-makers to take into account scientific uncertainty in making judgments based on objective, inconclusive scientific evidence and available knowledge.

The approach most consistent with the precautionary principle is to control all categories of alien species proposed for introduction or release, whatever their origins or the purpose of the introduction. That is, no intentional introduction should take place without proper authorization in the form of permit or license. Where it is administratively or financially impossible to implement the permit system to all alien species, listing may be adopted for the operation of the permit system. Lists can be compiled with reference to established databases and in close collaboration with competent authorities in its neighboring countries or key trading partners and be regularly updated. Black lists are used to identify alien species with high risk of becoming inva-

110. Convention on Biological Diversity, *supra* note 7, Preamble.

111. CBD SECRETARIAT, GUIDING PRINCIPLES FOR THE PREVENTION, INTRODUCTION AND MITIGATION OF IMPACTS OF ALIEN SPECIES THAT THREATEN ECOSYSTEMS, HABITATS OR SPECIES, *supra* note 13, Principle 1.

sive.¹¹² Their intentional introduction, even into situations of containment, should be prohibited, as should their possession, sale and transport if they are inadvertently introduced.

While the black list approach, as adopted in China, has made an important contribution to border control and monitoring, it is always reactive,¹¹³ and can never be fully accurate, exhaustive or up-to-date. An alternative to the "black list" approach is the "clean list" method. That is, instead of designating harmful species that may not be imported, the relevant government authority only lists acceptable species which can be imported. The advantage of the "clean list" approach is that the burden is placed upon the introducer of the species to show that any unlisted species is not injurious. The ultimate benefit of the "clean list" approach is not necessarily to make it more difficult to introduce alien species, although greater difficulty would result if a high standard is adopted, but rather to place the duty of identifying undesirable introductions on the introducers.¹¹⁴

The polluter pays principle holds the polluter who creates an environmental harm liable for paying costs of remedying that harm. This principle can work in the context of alien invasive species to internalize the "external" cost of environmental damage. A party who imports the alien species could be viewed as a polluter and be held liable under the polluter pays principle. Introducers, either individuals or institutions, will bear the costs of control measures and biological diversity restoration. The polluter pays principle can supplement the existing liability scheme adopted in China, which can be characterized as mainly administrative in nature. In its Notice to the provincial level EPBs, SEPA mandates that any institutions or individuals engaged in the work of introducing and applying alien species should take preventive measures such as setting up insulation or buffer zones, and should carry out environmental monitoring and establish relevant monitoring files and records.¹¹⁵ Although no clear legal lia-

112. They may be known pests elsewhere in the region or be considered to be capable of reproducing in the wild in the country concerned. Species on such lists pose a serious threat to ecosystems, habitats and species.

113. Species are listed after they have been shown to be invasive, often based on a crisis management approach.

114. See Daniel P. Larsen, *Combatting the Exotic Species Invasion: the Role of Tort Liability*, 5 DUKE ENVIRONMENTAL LAW AND POLICY FORUM 21, at 28 (1995).

115. STATE ENVIRONMENTAL PROTECTION ADMINISTRATION, NOTICE ON STRENGTHENING THE PREVENTION AND CONTROL OF ALIEN INVASIVE SPECIES, *supra* note 4.

bilities are attached to relevant parties, SEPA has directed the local EPBs to establish a reward and disciplinary system. Those who achieve significant progress in preventing and controlling alien invasive species are rewarded, and those who have not carried out effective supervision and management are criticized and ordered to take proper measures within a specified time period. Where heavy losses are caused by failure to implement prevention, control and eradication plans, relevant leaders are held responsible. Where the ecosystem and the economy sustain significant losses due to illegal introduction of alien species, relevant parties bear criminal liability.¹¹⁶

C. *The Prevention Mechanisms*

While China's priority should be aimed at preventing alien invasive species from entering the country, the current legal and administrative regime has failed to provide effective mechanisms to achieve that end. Although quarantine measures are implemented to control unintentional introduction, the process of intentional introduction is not subject to the stringent screening process it deserves. The law should minimize the quantity of introduced species by imposing stringent approval procedures for intentional introduction. The *Guiding Principles* recommends adopting the precautionary approach.¹¹⁷ Under this approach, essential measures should be implemented before any decision is made on the approval of a proposed introduction. Such measures include risk analysis and environmental impact assessments, sample introduction, observation, and trial growth of the species while in isolation.¹¹⁸

According to IUCN, "assessing risk means looking at the size and nature of the potential adverse effects of a proposed introduction as well as the likelihood of them happening. [The risk assessment] should identify effective means to reduce the risks

116. *Id.*

117. CBD SECRETARIAT, GUIDING PRINCIPLES FOR THE PREVENTION, INTRODUCTION AND MITIGATION OF IMPACTS OF ALIEN SPECIES THAT THREATEN ECOSYSTEMS, HABITATS OR SPECIES, *supra* note 13, Principle 10(2). It provides that "decisions concerning intentional introductions should be based on the precautionary approach. . . . Where there is a threat of reduction or loss of biological diversity, lack of sufficient scientific certainty and knowledge regarding an alien species should not prevent a competent authority from taking a decision with regard to the intentional introduction of such alien species to prevent the spread and adverse impact of invasive alien species."

118. Zhu Lieke, *Emphasizing and Preventing the Harm of Alien Biological Invasion*, CHINA FOREST PEST AND DISEASE 36, at 38 (2002, no.6).

and examine alternatives to the proposed introduction.”¹¹⁹ The concept of risk analysis has been accepted by the Chinese government as an effective tool to prevent species invasion. When the State Council declared its policy statement on alien species in the *Compendium of National Ecological Conservation* in 2000, it proclaimed that risk assessment must be carried out against introduced alien species, and that import sanitary measures must be strengthened in order to prevent the entry of harmful alien species into China.¹²⁰ Unfortunately, that commitment has failed to be substantiated in subsequent rules and regulations.

The risk analysis mechanism functions differently in the contexts of intentional and unintentional introduction. For intentionally introduced species, a risk analysis tries to identify the likely ecological, social and economic consequences of the proposed introduction. It identifies and compares alternative measures, their consequences and feasibility. The risk analysis reviews management strategies; evaluates the likelihood of spread or establishment of the alien species under the proposed management measures; and determines how the proposed control measures can be effectively implemented, including evaluation, monitoring and adjustment in light of new information. In contrast, a risk analysis of an unintentionally introduced species focuses on the particular pathways of introduction, rather than on a specific alien species or group of species.¹²¹ While some pathways are known to present high risks of unintentional introductions, such as ballast water discharges, regulatory controls should not be limited to already-identified pathways. The precautionary principle requires a legal framework that is sufficiently flexible to allow response to new and emerging pathways that may be considered low-risk. To promote transparency and accountability, each stage of the risk analysis process should be documented and accessible to the public.

In addition to risk analysis, the CBD suggests carrying out environmental impact assessment on projects, programs and policies that are likely to have a significant adverse impact on biodiversity. It further recommends provisions for notification

119. IUCN – THE WORLD CONSERVATION UNION, GUIDELINES FOR THE PREVENTION OF BIODIVERSITY LOSS DUE TO BIOLOGICAL INVASION (2000).

120. The *Compendium of National Ecological Conservation*, *supra* note 80, art. 14.

121. Sectoral activities that are often pathways for introduction include fisheries, agriculture, forestry, horticulture, shipping, ground and air transportation, construction projects, landscaping, ornamental aquaculture, tourism and game-farming.

and exchange of information, and consultation with neighboring countries which may be affected by damaging processes and activities.¹²² The environmental impact assessment as mandated under the CBD is not only for specific projects but also for programs and policies that are likely to have significant adverse effects on biodiversity. The CBD calls upon Parties to integrate environmental impact assessments into work programs on alien species,¹²³ and recommends using environmental impact assessments before making decisions authorizing a proposed introduction of an alien species.¹²⁴

SEPA has taken the initial step of proposing the establishment of an environmental impact assessment regime whereby not only economic values will be considered, but also the potential impacts on biodiversity and the ecosystem. Only those species proven biologically safe can be introduced, applied and commercialized.¹²⁵ SEPA's proposal, however, must be incorporated into the legal framework to become a statutory requirement for any proposed species introduction. The environmental impact assessment seeks to ensure that adequate and timely information is available pertaining to the likely environmental consequences of a project, program or policy, possible alternatives, and measures to mitigate harm. It serves to inform decision-makers of the environmental consequences of their decisions, and to integrate environmental factors into socio-economic decision-making.¹²⁶

D. *Post-Entry Control and Management Mechanisms*

The existing legal provisions do not provide for post-entry or post-release control and management of the alien species. As a

122. Convention on Biological Diversity, *supra* note 7, art. 14.

123. COP Decision V/18. The Decision was adopted by the Conference of the Parties to the Convention on Biological Diversity at its fifth meeting held in Nairobi, 15-26 May 2000.

124. CBD SECRETARIAT, GUIDING PRINCIPLES FOR THE PREVENTION, INTRODUCTION AND MITIGATION OF IMPACTS OF ALIEN SPECIES THAT THREATEN ECOSYSTEMS, HABITATS OR SPECIES, *supra* note 13, Principles 10 and 11.

125. STATE ENVIRONMENTAL PROTECTION ADMINISTRATION, NOTICE ON STRENGTHENING THE PREVENTION AND CONTROL OF ALIEN INVASIVE SPECIES, *supra* note 4.

126. In applying this tool to alien species, a non-exhaustive list of factors that should be considered include: the cumulative, long-term, long-distance, direct and transboundary effects of alien species introductions; alternative actions, including prohibiting the proposed introduction; measures to avert or minimize the potential impact of the proposed introduction; and periodic review and monitoring to determine whether the introduction is in compliance with the conditions set out in the approval, and to evaluate the effectiveness of mitigation measures.

result, the lack of proper management and control of the introduced species has led to release or escape from designated plantations or farms into the natural environment, resulting in biological invasion. Given the varying nature and the diversified pathways of introductions, post-entry control and management mechanisms must be multifaceted, and should at least include the following: permit control, monitoring and response, and special protection zones.

Permit control or equivalent authorization procedures based on scientific assessments can provide an effective and flexible control mechanism for dealing with the intentional introduction of an invasive species.¹²⁷ The permit control mechanism allows for tailored, case-by-case regulatory control measures to be implemented with relative flexibility. Where an introduction permit is granted, legislation should provide a basis for attaching conditions minimizing the risk of the species' escape from human control. Appropriate conditions may include preparation of a mitigation plan, monitoring procedures, containment requirements and emergency plans. Permit conditions make it possible for those responsible for introducing a species to be bound by enforceable rules, which can be flexibly designed to cater to individual circumstances and to ensure a flow of information to the responsible authorities. Financial charges such as fees, levies, and deposit bonds may be attached to permits.¹²⁸ Non-compliance of

127. Basic components for a workable permit system should include: clear statement of what species are subject to the permit requirement; clear statement of information to be supplied by the applicant; public access to information on applications, criteria, hearings and decisions; risk analysis and environmental impact assessment, based on scientific principles and evidence; provision of objective and technically-sound information to guide decision-makers in determining permit applications; possibility of permit conditions (monitoring, emergency plans, containment procedures); possibility for allocating the cost of permit procedures to the applicant; and sanctions for breach and non-compliance with the permit. SHINE, *supra* note 6, at 52.

128. One example is to impose conditions on containment facilities. Many intentional introductions involve the import of alien species for contained use or situations of captivity. Relevant facilities include zoos, aquaculture and mariculture installations, research institutions, captive-breeding facilities, horticultural establishments where artificial propagation is carried out, pet shops and even traveling circuses. The siting conditions should be designed to avoid the establishment of containment facilities in the vicinity of protected areas, other areas of high biodiversity or endemism or on small islands. Where a full prohibition is not possible, such establishments should be subject to even stricter security conditions than elsewhere. Aquaculture and mariculture facilities are associated with particularly high risks of escape and invasions. Such facilities should be prohibited where there is communica-

permit conditions may lead to suspension or revocation of the permit in addition to other types of sanctions.

Monitoring and response mechanisms are essential components of post-entry management for both intentional and unintentional introduction. The CBD mandates the identification and monitoring of processes and categories of activities that have or may have the possibility of significant adverse impact on conservation and the sustainable use of biodiversity.¹²⁹ China has not yet established mandatory and systematic legal procedures for monitoring to detect the invasion of alien species. This explains why responses to invasions are often piecemeal, delayed and ineffective.

A well-designed legal framework should provide a formal basis for monitoring and surveillance of both terrestrial and aquatic environments. An effective monitoring mechanism is essential to any effort to prevent, control or eradicate alien invasive species. Detection and early warning systems are essential preconditions for rapid response to new invasions. Results of research and monitoring should then be fed back into a relevant knowledge base.¹³⁰ Legal reform and policy-making affecting invasive species depend on an accurate scientific and technical knowledge base. Where statistics are incomplete, the impact of invasion tends to be grossly under-estimated, which makes it difficult to build political will for new or improved legislation. Timely information is needed to make objective decisions on proposed introductions, allocation of scarce resources and implementation of effective control options.

tion with open water and be located outside the 100-year or even 500-year flood zone. See SHINE, *supra* note 6, at 60.

129. Convention on Biological Diversity, *supra* note 7, art. 7(c).

130. Such a knowledge base should include the following as suggested by the IUCN: information on the status, distribution and characteristics of alien species known to exist in each country and, where applicable, its sub-national units; Case histories on past invasions, including information on time lag, which can obscure human perception of the invasion process; information on ecological and economic impacts associated with different alien invasive species, to improve prevention and prioritize mitigation strategies; Records of commercial practices leading to invasions and other pathways, to provide a basis for developing new regulations; Technical advice and support to border control and quarantine officers, for use in applying regulations and developing contingency plans and rapid response tools. This may include generating advance lists of likely problem pests so that they can be identified and appropriate responses developed before they arrive; and Inventory of areas that are pest-free or of importance for biodiversity or other reasons, so that particularly stringent contingency plans and required resources or technical personnel can be put in place. SHINE, *supra* note 6, at 40.

Monitoring requirements may be varied, depending on the nature of the introduction. Where an introduction or release is intentional, the relevant permit may contain monitoring and reporting conditions. Where an introduction is unintentional or unlawful, detection must rely on general and targeted surveys.¹³¹ Regulations should preferably provide for a standardized reporting system for use by all agencies and other stakeholders involved in the monitoring and early detection of invasive species. Coordination and pooling of information is particularly important where legal frameworks are fragmented. SEPA can play a supervisory and coordinating role in that regard, and set up widespread monitoring network over the whole of China, at the local level EPBs. Together with the SFA and the Ministry of Agriculture, SEPA should build a national database reflecting the gathered information, and form contacts with foreign and international counterparts. The IUCN has published *100 of the World's Worst Invasive Alien Species*.¹³² This listing can be relied upon by the international community as an indispensable guide in developing national legal and institutional frameworks against alien species invasion. SEPA has recognized the value of maintaining a nationwide up-to-date catalogue of alien invasive species for the control and management efforts of Chinese regulators, parties involved in introduction and use of exotic species, and the general public. As a result, it published the *Catalogue of Sixteen Most Harmful Alien Invasive Species*.¹³³ That catalogue is presumably subject to constant review and amendment from time to time.

Special protection mechanisms should be adopted at biologically vulnerable zones. Certain ecosystems can be particularly vulnerable to non-native species and the risk of subjecting those systems to the potential irreversible damage caused by invasion is prohibitive. In line with the precautionary principle, the introduction of alien species to protected areas and vulnerable ecosystems should be prohibited or subject to extremely strict

131. Where there are resource constraints, surveys may need to be targeted in accordance with the predicted levels of risk. Surveys need to be species-specific, seasonally-timed, habitat selective and quite intensive.

132. IUCN – THE WORLD CONSERVATION UNION, *100 OF THE WORLD'S WORST INVASIVE ALIEN SPECIES*, available at <http://www.issg.org/database/species/search.asp?st=100ss&fr=1&sts=#SpeciesList>.

133. SEPA Document, 2003, no.11. The Catalogue lists sixteen most harmful alien invasive species found in China and provides their characteristics, places of origin, distributions in China, pathways, impacts and methods of control.

regulation. SEPA has prohibited the introduction or application of an alien species in the country's nature reserves, well-known scenic sites, ecological function zones, and other special and vulnerable ecosystems.¹³⁴ In addition, SEPA directs local EPBs to work with relevant local government departments in identifying key alien species and establishing key protection zones that include nature reserves, ecological function zones, well-known scenic sites, special and vulnerable ecosystems, and inland waters.¹³⁵ The administrative initiative of SEPA should be backed up by biosafety legislation that bans introduction in, or adjacent to, nature reserves unless scientists can prove that the introduction is safe for both the ecosystem and the species, and that domestic species cannot perform the functions of the introduced species. Site-specific controls of this kind are a key component of, but are not a substitute for, an ecosystem approach to alien invasive species management. It is important to implement complementary measures around protected areas to avoid creating refuges of native biodiversity in close proximity to degraded areas vulnerable to invasion.

E. *The Liability Regime*

Alien species can cause more severe damage to land and water ecosystems than can traditional pollutants. Invasive species reproduce and multiply within an ecosystem. Species proliferation can tear the tenuous threads of the food web through predation, competition for food and space, and habitat modification. The longer they are allowed to establish themselves within an ecosystem, the harder it is to eradicate them later. As a result, alien species are potentially more dangerous to ecosystems than any other human pollutant.

In China, the liability regime is seriously flawed in that no civil liability is imposed upon intentional or negligent introduction that results in biological invasion. While criminal penalties are

134. STATE ENVIRONMENTAL PROTECTION ADMINISTRATION, NOTICE ON STRENGTHENING THE PREVENTION AND CONTROL OF ALIEN INVASIVE SPECIES, *supra* note 4. According to Wan Bentai, Director of the Ecosystem Protection Department of the State Environmental Protection Administration, China has established 2,194 nature reserves by the end of 2004, covering almost 14.8 percent of the country's land territory. *China's Ecological Assets Worth Six Trillion Yuan*, XINHUA NEWS AGENCY, May 22, 2005.

135. STATE ENVIRONMENTAL PROTECTION ADMINISTRATION, NOTICE ON STRENGTHENING THE PREVENTION AND CONTROL OF ALIEN INVASIVE SPECIES, *supra* note 4.

provided, they are far from adequate. The *Chinese Criminal Law* provides that anyone who evades the animal and plant quarantine process in violation of relevant provisions of the animal and plant quarantine law and "has caused a significant animal and plant epidemic situation" will be sentenced to a maximum of three-year imprisonment or detention, with fines imposed.¹³⁶ In practice, "epidemic situation" is understood to be relating to an outbreak of disease, pest and weed, seriously affecting the output of agriculture and forestry or the health and safety of human beings. Such offences are generally considered minor despite the potentially irreversible damage inflicted by invasive species.

Based on the polluter pays principle, responsible parties should pay for the resulting environmental damage just as they would pay for other pollution discharges which contaminate public resources.¹³⁷ An introducing party should bear the cost of mitigation, including eradication and containment, when an alien species becomes invasive. In the case of unauthorized intentional introductions, the introducer should be subject to criminal penalties in addition to mitigation costs. However, it is unclear who should bear the mitigation costs of an authorized introduction that becomes invasive. Parties liable for foreseeable or avoidable unintentional introductions should bear the cost of mitigation. Where a group of actors is identifiable, the group should be jointly liable. Further, where a party is guilty of recurring unintentional introductions, the repeated acts should be considered presumptively intentional.¹³⁸

By imposing both civil and criminal liabilities for importing listed alien invasive plants and animals, the law can directly influence people's behavior and deter them from knowingly importing prohibited species. A strict liability scheme would strengthen the incentives for parties to avoid importing destructive alien species by raising the standard of care required to avoid liability. Strict liability demands whatever is necessary to prevent biological invasion.

136. Chinese Criminal Law, art. 337.

137. Larsen, *supra* note 114, at 52.

138. Lyle Glowka, *Bioprospecting, Alien Invasive Species, and Hydrothermal Vents: Three Emerging Legal Issues in the Conservation and Sustainable Use of Biodiversity*, 13 *TULANE ENVTL. L. J.* 329, 349 (2000), citing P. Jenkins, *Avoiding a Rat-infested, Zebra-Mussel-fouled, Nasty Weed Patch for a Planet: Global Policy Changes Needed to Stop Biological Invasions Caused by International Trade* (1999) (paper on file with Lyle Glowka).

F. Institutional Coordination

The CBD suggests the integration of biodiversity-related considerations into sectoral and cross-sectoral plans, programs and policies.¹³⁹ The IUCN recommends that states consider establishing a scientific authority for alien species control. This authority would provide scientific input to planning and decision-making procedures including environmental impact assessment and risk analysis, and advise on the design and implementation of regulatory measures and criteria.¹⁴⁰ The respective functions of the regulatory and scientific authorities, and the necessary cooperative mechanisms between the two bodies, must be specifically provided by legislation. In China, the role of the scientific authority has been played by the Chinese Academy of Science. The regulatory control authority involves many different sectors including environmental protection, agriculture, forestry, customs, quality inspection, science and technology, foreign affairs, international trade and other industries. Any successful efforts will demand the involvement, cooperation and support of all these sectors. To date, the level of coordination between the varying sectors responsible for phytosanitary matters, trade, agriculture, forestry, fishery, natural resources and biodiversity conservation has been inadequate.

Coordination is essential to consistent policy-making, implementation and monitoring. One way to improve institutional coordination is to set up cross-sectoral bodies involving the representatives of the governmental institutions involved. In 2003, the Ministry of Agriculture established the Alien Species Management Office. The purpose of this office was the coordination of a nationwide alien species prevention taskforce, which included SEPA, the State Administration for Quality Supervision, Inspection and Quarantine Control, the SFA, the Ministry of Science and Technology, the Customs Administration, and the State Ocean Administration.¹⁴¹ The Ministry of Agriculture has recently organized a panel of experts from eight government departments to work on the drafting of the *Regulation on the*

139. Convention on Biological Diversity, *supra* note 7, art. 6(b).

140. SHINE, *supra* note 6, at 42.

141. Yao Runfeng, *supra* note 2.

*Management of Alien Species and a State Plan for the Prevention and Control of Alien Invasive Species.*¹⁴²

G. *Public Awareness and Support*

Despite the recent national campaign on the eradication of alien invasive species carried out by the Ministry of Agriculture, general public awareness of the issue has remained minimal. There is a daunting lack of knowledge, awareness and commitment with regard to non-native species in China. The issue of biological invasion has very low visibility in planning processes pertaining to the national environment and biodiversity. Units and individuals engaging in the introduction of alien species have little awareness of the potential ecological impacts of such introduction, and generally no scientific risk assessment is carried out. Further, introduced species often bring economic and socio-cultural benefits to at least certain groups of stakeholders. Even where alien species present known invasive characteristics, some interest groups may still strongly support their continued introduction and use. The perceived "benefits" are more readily visible, while the negative impacts may take a long time to emerge. Additionally, environmental costs are always difficult to quantify and sometimes poorly understood by policy makers.

Promotion of public education and awareness should be an indispensable and integral part of any effective campaign to fight against species invasion.¹⁴³ Legal and regulatory frameworks alone cannot solve all the problems presented by invasive species. Regulation must be complemented by non-regulatory efforts, particularly information, education and awareness-raising campaigns. A well-educated public is a prerequisite for the successful implementation of a well-designed legal system. Effective enforcement of any legal regime, to a large extent, depends on the participation and cooperation of parties involved and members of the public who can play a vital role in monitoring the implementation and enforcement of the law.

Educating the public about the potential danger, risk and harm of alien invasive species can occur by all possible means, including newspapers, websites, TV programs and radio broadcasting. Use of the media can keep the public informed and get them

142. Cai Yanhong, *supra* note 5. See also "Ministry of Agriculture Soon to Promulgate the *Regulation on the Management of Alien Species*" (March 17, 2006), available at www.ampcn.com (zhongguo nongzi wang).

143. Convention on Biological Diversity, *supra* note 7, art. 13.

involved in efforts to prevent and control biological invasion. In addition, the planning and decision-making processes on alien species issues should involve the public, governmental and non-governmental stakeholders in different sectors and at all levels. Open and transparent procedures create opportunities for the participation of affected and interested parties, communities, and the general public in planning, permit-issuing and the development of mitigation and management strategies. Such participation has important educational benefits and helps raise public awareness, without which a regulatory system cannot be effective. Further, this participatory approach needs to be complemented by judicial review procedures to guarantee individual rights. Affected parties should be given the right to appeal against decisions such as the refusal of permits, while interested individuals/groups should have the ability to challenge administrative decisions that are considered to be unlawful, unreasonable or inconsistent with protection or conservation objectives of relevant legislation.

CONCLUSION

Alien invasive species are found in all taxonomic groups, from viruses and fungi to plants and animals. Species existing outside their historic area of distribution are no longer subject to the natural brakes and checks that limit their population growth. When alien species successfully invade a new habitat and growth is out of control, they can cause irreversible damage and serious “biological pollution”. A high number of documented extinctions have been caused by alien species, with the ir retrievable loss of native species and ecosystems.¹⁴⁴

China is a country historically rich in biodiversity, possessing RMB6 trillion *yuan* (USD481 billion) worth of ecological assets.¹⁴⁵ These invaluable biological resources are under increasing threat from human activities, biological invasion and ineffective supervision and management. There is an urgent need to reverse this trend by developing proper and effective legal regimes.

144. SHINE, *supra* note 6, at 10.

145. *China's Ecological Assets Worth Six Trillion Yuan*, *supra* note 134. This latest survey was jointly conducted by the Beijing Normal University and the State Bureau of Statistics.

Although complex, it is desirable that China enact core legislation on the control and management of alien invasive species. The current undertaking of the Ministry of Agriculture in drafting a new regulation on the management of alien invasive species represents a good start in the right direction towards more comprehensive law-making to tackle the problem of biotic invasion. The new law should help harmonize legislative goals, control criteria and management procedures that currently exist in various laws, regulations, rules and policy statements in a piecemeal and fragmented manner. Such a core enactment should implement and enforce international standards on quarantine measures and transport controls. It should incorporate the preventive principle, the precautionary principle and polluter pays principle, using a variety of regulatory tools including risk analysis, environmental impact assessment, and permit control to prevent and manage alien species invasion. In addition, the enactment should prohibit or strictly regulate the introduction or release of alien species into or near vulnerable ecosystems and protected areas. Further, the law should provide for monitoring, early warning, and emergency response systems to support crisis management when biological invasions are detected. It should mandate timely measures for the eradication and control of species that are already invasive or are likely to become invasive in the future. The law should also strengthen compliance by the public, the commercial and private sectors, and support research, training, education and public awareness campaigns. With such a well-designed piece of legislation in place, China will be more capable of fully implementing its obligations under article 8(h) of the CBD and better conserve its biological resources to ensure biosafety now and in the future.