Disaster and Biodiversity

IUBS Trienial Program "DAB"

in cooperation with BDNJ

Workshop 2

Abstract

国際シンポジウム

要旨集

国際WS:大規模自然災害と生物多様性

－2014国際シンポジウム事前集会2－

Chuo University Korakuen Campus, Building 2,

6th floor, Room 2643

on Tuesday 28 January, 2014: 09:00 - 17:30

Organized by

International Union of Biological Sciences (IUBS)

&

Biodiversity Network, Japan (BDNJ)

Sponsored by: Japan Fund for Global Environment

IUBS/BDNJ Joint International Workshop

"International Workshop on Disaster and Biodiversity, IUBS Triennial Program 2013 DAB Workshop 2"

in cooperation with Biodiversity Network, Japan

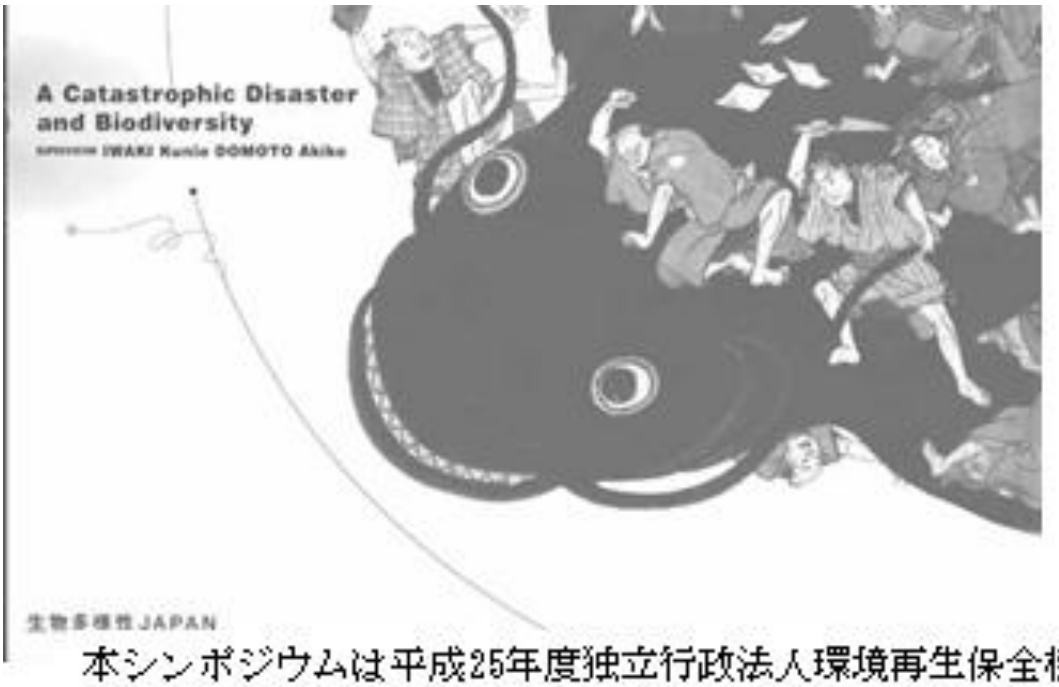
sponsored by Japan Fund for Global Environment

also supported by IUBS Committee of Science Council of Japan

Main workshop at Chuo University, Korakuen Campus

plus field excursion in Tohoku area

Date: 28-30 January, 2014



本シンポジウムは平成25年度独立行政法人環境再生保全機構
地球環境基金の助成を受けて開催されます

Event schedule

Jan. 28. Full day workshop at Chuo University Korakuen Campus, Building 2, Room 2643 (6th floor)

9:00 Meeting room open

9:15 Opening address: Harufumi Nishida

9:30-12:30 Discussion 1: Circumscribing the problems and facts

30 minutes presentation by each of 3 international and 2 Japanese speakers, and Discussion 1

Speakers:

Dedy Darnaedi (Indonesian Institute of Sciences, Indonesia) "Disaster and Biodiversity in Ring of Fire Indonesia"

Steven Wagstaff (Allen Herbarium, New Zealand) "Disaster and Biodiversity in New Zealand"

Kaiyun Guan (Xinjiang Institute of Ecology and Geography, CAS, China) "Disaster and Biodiversity in China"

Masahiro Ohara (Hokkaido University, Japan) "Museum collection and field research of the biodiversity in the Tsunami-hit area, Tohoku, Japan"

Osamu Miura (Kochi University, Japan) "Elucidating ecological and genetic damages on the coastal snail, *Batillaria attramentaria*, due to the 2011 tsunami"

12:30-13:30 Lunch

13:30-1500 Discussion 2: Addressing the DAB program

15:00-15:15 Break

15-15-17:30 Discussion 3: Organizing the International Symposium 2014

18:00- Dinner at a local restaurant

Jan. 29. Move to Sendai, half-day excursion by bus, stay at Ichinoseki

Jan. 30. Half-day excursion and back to Tokyo

Contact person

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Aims and perspectives of IUBS Current Program DAB, Disaster and Biodiversity
(modified from http://www.iubs.org/prg/dab.html)

The Great East Japan Earthquake that occurred on 11 March, 2011 followed by the collapse of the Fukushima Atomic Power Plant not only destroyed local human life and properties, but also seriously damaged biodiversity and primary industry of the area. Furthermore, many local museums and biological specimens were also lost or damaged. The local biodiversity and biological records are a part of global biological resources that insure future sustainability, and best be inherited to the next generation as good as possible. Japan has paid large attention to biodiversity, e.g., renewing four times the National Biodiversity Strategy since 1995. However, the 3.11 disaster clarified the lack of national academic and social systems that could continuously monitor local biodiversity and biological information to provide necessary data for urgent rescue activities of various aspects and fields. It is also an urgent need to establish a protocol for precautious measures in case of future disasters. Based on the experience in Japan the DAB project aims to accumulate similar problems worldwide in order to present a standard measures and policy from various aspects for minimizing disaster influences.

Leader: Harufumi Nishida

Steering Committee

(IUBS Committee, SCJ): Hiroyuki Takeda, Motonori Hoshi, Makoto Asashima, Hiroo Fukuda, Ikuko Nishimura, Noriyuki Sato, Harufumi Nishida

(Selected Japanese scientists)

Kunio Iwatsuki, Jun Yokoyama (Project Program Organizer), Toru Nakashizuka (Biodiversity Network, Japan)

Kunio Iwatsuki, Harufumi Nishida, Naoya Furuta, Mieko Kawamichi (Project Secretary and Treasurer)

(Possible International members)

Dedy Darnaedi (Indonesia), Steven Wagstaff (New Zealand), Guan Kaiyun (China) (The names are tentatively selected from international scientist

communities.)

Countries involved: Japan, followings are tentatively listed: China, Indonesia, Phillippines, New Zealand, Australia, Chile, Russia, others may be added

Field of Research: Ecology, Taxonomy, Molecular Biology, Medical Science, Agro-Forestry, Marine Biology, Museumology

Objectives:

The Japanese Tsunami and Earthquake disaster and further collapse of the Fukushima Atomic Power Plant in March 2011 evoked national movement to monitor the loss and recovery of biodiversity and related biological resources in local (affected) environments. The disaster also damaged many local museums and preserved biological specimens, including type specimens. Various natural disasters and related human-invoked chain disasters, such as one in Fukushima, and even wars, not only influence local biodiversity and bio-resources, but also damage biological records which should be kept safely for the future generations. The biological communities have never taken an international action to discuss about the influence of such disasters, recovery process, and future precautional approaches.

DAB summarizes recent disaster-related biodiversity loss, influence on the primary production (agriculture, fishing .. etc.), damages to biological information and records, their rescue and recovery process, then tries to establish an international protocol for establishing an effective logistics to minimize disaster influences based on precautional risk management.

DAB, Disaster and Biodiversity background:

One of the peculiar features of the current human and earth history is that human activities have reached to the level that could cause disasters. Possibly originated from human activities, huge storms, sea-water raise, and other unpredictable climate fluctuations caused serious biodiversity loss which is disadvantageous to the local as well as global economy. Recent natural disasters that have occurred worldwide, though incidental, even

caused human-based second disasters such as the Fukushima atomic pollution. Disasters, irrespective of natural or anthropogenic, destroy local biodiversity, ecosystems that provide ecological services and human life and culture. The 3.11 earthquake and subsequent disasters in Japan in 2011 gave us an opportunity to think and act seriously and globally on this issue. Similar disasters have recently occurred in various countries, e.g. China, Indonesia, New Zealand, and Chile. It is time that international academic societies should deal with this issue.

Articles published on DAB topic:

As the topic is rather novel based on recent incidents, only a limited number of articles are published in Japanese.

Iwatsuki, K. and Domoto, A. (eds.) 2012. Saigai to Seibututayousei (Disaster and Biociversity). Biodiversity Network of Japan, Tokyo. 150 pp. (in Japanese, partial English translation published in 2013)

Harufumi Nishida. 2011. Why we should take care of museums and specimens after the catastrophic disaster? In: Academic response to the Great East Japan Earthquake. Trends in the Sciences 16(12): 34-35, Japan Science Support Foundation, Tokyo. (in Japanese)

DAB, Disaster and Biodiversity detailed program

Action plan for the triennium

The IUBS Committee of the Science Council of Japan, Term 22nd had its first meeting on April 22, 2012, where the first discussion on proposing this DAB program was opened. Therefore, the present program for the first year of triennium will start to organize an international working group to summarise recent information related to DAB worldwide in order to address the activities for the next two years. The DAB action can be planned tentatively as below.

2013: Start a DAB Working Group (WG) consisting of Japanese members and up to five selected international members. To start with, one workshop meeting will be held in Japan.

2014: Organize at least one workshop and one international symposium. The frequency of the workshops and the meeting places will be decided in 2013 workshop. The symposium can be held either in Japan or other countries depending on national fund-raising results and the amount of IUBS funding.
2015: At least one workshop for editing a publication of the results. The final goal of this triennium is to issue a publication on DAB at the end of 2015.
Detailed action plan for 2013:
Organize an International Workshop in Tokyo or Iwate (Earthquake and Tsunami affected area). Prepare for 2014 workshop(s) and International Symposium. The first workshop is aimed to start case studies to classify different cases and problems, and to fix program strategies for the next two years, including fund-raising, nomination of additional international core members.

Disaster and Biodiversity in Ring of Fire Indonesia

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Indonesian Institute of Sciences

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Summary

Indonesia is a part of subduction zone ring of fire, along with Philippines, Japan, Canada, Middle America, and Peru-Chili South America. More than 20 major earthquakes in the last 60 years have been recorded along the subduction zone. Indonesia has more than 127 high volcanic mountains scatter in hundred island of Indonesia. Some mountains are active mountains and some others are in rest for temporary. The active mountains are scatter along the islands from Sumatera, Jawa, Celebes, Leuser Sunda Island, to Maluku and Papua, including some mountains in very small islands such as Mt Krakatau, Mt Gamalama in Ternate, etc.

Geographically Indonesian constructed by Asian and Australia continent elements, the two elements still moving significantly along the western parts of Sumatra, southern part of Java islands and in some other sides. These situations make Indonesia as a high risk disaster region by the earthquake and mountain eruption. Mountain eruptions and earthquakes follow by big wave or tsunami are frequently occurs in Indonesia. In last ten years, the biggest tsunami in Indonesia was the Aceh Tsunami (August 2004) that takes almost 310,000 people killed during and after the tsunami. Aceh Tsunami wakes up the government and public in Indonesia that the country with milliard of people along the ring of fire is in high risk from any disaster. Indonesia needs to pay serious attention, and needs to anticipate the high risk of any nature disasters in the future.

Our attention to the destruction of nature, important industries, public facilities, and in particular the loss of human being, are become our priority. But, attention to the loss of biodiversity and any other important scientific documents such as herbarium specimens, artefacts and others are still neglected behind. Our scientific discovery and new technology have to be concentrated to reduce impact from any disasters in the future

Catastrophic eruption of Mt Krakatau

The first well document disaster was the eruption of Mt Krakatau in August 1883, located in a small island lied between Java and Sumatera. It killed 36,000 people with a strong wave up to India and Africa. The catastrophic eruption scientifically is exciting phenomena and hundreds scientists around the world visited Krakatau to examine it. Geological process and monitoring the biological succession after the eruption was the most exiting studies in Krakatau. *The Krakatau: Changes in Century since Catastrophic Eruption in 1883,* was the subject of the discussion during the 100 years commemorated of the eruption. Hundreds of scientists gathering to discussed various issues related to geology, biology and social issues.

Recovery after disasters

Natural vegetation of Krakatau island was completely destroyed (Treub, 1883), no biological organism left after the big eruption. There was no information on biological diversity before the eruption, so we do not know the biological extinction in the island.

Natural process of recovery of the sterile island is an interesting subject. Botanical survey after the eruption started by Treub (1883, 1886, 1897), Earnst (1908), Backer, (1908) and followed by Docter van Leeuwen (1911-1932). Reported by Tagawa, et al (1985) that in Rakata Besar, the first dominant species were *Casuarina equisetifolia* (1897) follow by *Terminalia catappa* (1897), *Timonius compressicaulis* (1928), *Neonauclea calycina* (1905), *Dysoxylum caulostachyum* (1931) and *Schefflera polybotrya* (1951). In Rakata Kecil, the first three species are dominant one year later in (1896) follows by *Neonauclea calycina* and *D. caulostachyum*. In Sertung island almost the same with Rakata besar, but no record of *T. compressicaullis , D. caulostachyum* and *S. polybotrya.*

Geologically also important, that a new volcano, anak Krakatau appeared in 1928 and growing gradually by repeating eruption and flowing lava streams. In 1983, the size of the island is 156, 75 ha with 201, 5 m high. In 2004 becomes 212, 5 ha with 286, 63 m high. During 21 years anak Krakatau increase in size 55,75 ha and in high 85,13 or increase 2,65 ha/year in size and 4,05m/year in high (Suhadi et al., 2008).

Aceh Tsunami and Local Knowledge of Simeuleu people

Simeuleu Isl. is a small island close to centre of Earth Quake in Aceh (August, 2004). It was reported that when the sea level going down, all people ran away to the hill. Most people save, only 7 of 78.128 people living in the island died by Tsunami. They learn from their ancestors that a big wave (tsunami) will come after the sea level going down, just run to the mountain withput loing at the back. Collective memory of the local people, they learn from "Smong 07" a big tsunami in 1907.

Unpredicted biodiversity loss

It has been reported that during Aceh Tsunami, almost all thing were destroyed by big wave except some mangrove ecosystem, coconut plantation, a hill along the beach and mosque. It has been discussed, that mangrove ecosystem, beach vegetation and coconut plantation are the best systems for protecting low land system from any tsunami. Mangrove ecosystem along the beach in some places during tsunami in Aceh was destroyed, but the village and human population behind the mangrove are lest damage compare to other village that expose directly to the oceans. Coconut plantations with dense tree population also help to reduce the wave of tsunami, but single tree doesn't any help.

Rehabilitation of mangrove ecosystem by using local species after Aceh Tsunami is strongly recommended by Indonesian Government. Due to a total destroyed of the mangrove vegetation, rehabilitation was using other plants species from other side of Aceh. However, some seeds and seedlings from the site were also used for mangrove restoration (Univ. Syah Kulala, Banda Aceh, pers. communication).

Conclusion and recommendation

1. Mangrove vegetation along the beach in any area of high disaster risk has to be protected and managed as a buffer zone.
2. Natural beach vegetation with local species *(Terminalia catappa, Baringtonia asiatica* etc) and palm oil plantation has to be maintained as a natural protection from any disaster.
3. Pioneer species in Krakatau such as *Casuarina equisetifolia, Terminalia catappa, Timonius compressicaulis, Neonauclea calycina, Dysoxylum caulostachyum*

and *Schefflera polybotrya* are recommended as a past growing plant for beach rehabilitation.

4. Traditional knowledge and local wisdom has to be appreciated and promoted for future generation
5. Studies on earth science, soil science and biology (vegetation and succession) are important to be analyses for navigating future disasters.
6. National and regional strategy on disaster navigation and conserving biodiversity along the subduction zone on ring of fire is strongly recommended.
7. Aceh Tsunami wake ups the Indonesia Government, now Indonesia developed National and District Body for Tsunami and Disaster.

Disaster and Biodiversity in New Zealand

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Disaster and Biodiversity in China

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China is one of the most frequent natural disasters happened countries in the world. Natural disasters such as earthquake, drought, inundation, desertification, mud-rock flow, forest fire, hailstone, sand and dust storm, frost rain or extremely cold weather happened very frequently in recently years. Natural disasters can not only bring great loss of human life and properties but also may cause enormous influence to the ecological environment. Natural disasters also can seriously threaten the survival of living things and biodiversity. However, attention has been mainly paid to the life and economic loss created by natural disasters, cause or origin of disasters, forecasting and prevention of disasters in the past. The topic of "Disaster and Biodiversity" (DAB) is rather novel in China. Very few scientific researches on the influence or harm of natural disasters to biodiversity had been done in China. And nearly none publications related to the topic were published in Chinese. Natural disasters happened in China in recent years and their possible influence to biodiversity are summarized and discussed in this paper.

Top ten natural disasters in China from 1950 to 1985

1. The Huaihe River inundation. The inundation happened in July 1950 in Henan province and northern part of Anhui province. Over 2.3 million hectares of land were flooded and 13 million people were suffered.
2. The Changjiang River and the Huaihe River inundation. The inundation happened in July 1954. Over 3.17 million hectares of land were flooded and 18.88 million people were suffered.
3. Three-year natural disaster. From 1959 to 1961, most part of China suffered by continuously drought and late spring cold. Agricultural and industrial productions were greatly affected and food supplies were seriously shortage. The population of the whole country decreased 10 million only in the year of 1960.

4. The Haihe River flooding. Hubei province had five torrential rains in August 1963. The total rainfall was over 2000 mm within 7 days in some areas. Over 104 counties and 22 million people were affected.
5. Xingtai earthquake. The earthquake happened on March 8, 1966 in Xingtai, Hebei province. 8182 people died, 51,395 people injured and more than 5 million building collapsed.
6. Tonghai earthquake. The earthquake happened on January 5, 1970 in Tonghai, Yunnan province. 15,621 people died, 26,783 people injured and 338,456 buildings collapsed.
7. Henan inundation. From 5 to 7 August, 1975, Henan had heavy rain with total rainfall of 1605 mm within 20 hours. The heavy rain caused dyke breaching of three rivers and dam breaching of three reservoirs. This was a serious disaster and the direct economic loss was over 10 billion Yuan.
8. Tangshan earthquake. The earthquake happened on 28 July, 1976 in Tangshan, Hebei province. 242,769 people died, 435,556 people injured, 5.3 million buildings collapsed.
9. Drought in north China. From 1978 to 1983, north, northeast and northwest China had continuously serious drought. Only in 1981, 26 million hectares of farmland affected by drought, more than 12 million hectares of farmland had no any harvest, nearly 23 million people were lack of water.
10. The Liaohe River inundation. In August 1985, heavy rainfall caused more than 4000 dikes breaching. The flood affected 60 counties, 12 million people and 4 million hectares of farmland.

Top ten natural disasters in China from 2008 to 2013

2008:

1. Sichuan Wenchuan earthquake (8.0 Ms) on 12 May; 69,227 people died, 374,643 people injured and 17,923 people were missing;
2. Extremely large low temperature and frost rain and snow affected 21 provinces in early 2008;
3. Severe Tropical Storm Hagupit affected Guangdong and Guangxi;
4. Graveness inundation in south central China in June;

5. The second most serious drought in Xinjiang in the history;
6. Autumn inundation along the Changjiang River;
7. Sichuan Panzhihua-Huili earthquake;
8. Sichuan badly inundation in late September;
9. Ningxia serious drought;
10. Xizang heavy snow, 100 thousand people affected.

2009:

1. Blizzard attacked on 16 provinces;
2. Nine provinces of north, northeast and northwest China drought in summer;
3. Large area drought in north China and northwest China in winter and spring;
4. Ttyphoon Morakot caused more than 1.44 million people in 5 provinces;
5. Yunnan Yao-an earthquake in July (6.0 Ms);
6. Sichuan Wenchuan storm and hailstone strong convective weather in July;
7. Hunan heavy storm in July affected 12 counties (cities);
8. Anhui and Henan gale and hailstone in June;
9. Sichuan Kangding mud-rock flow on 23 July;
10. Yunnan Zhaotong landslide in late April.

2010:

1. Qinghai Yushu earthquake on 14 April (7.1 Ms);
2. Gansu Zhouqu extremely large mountain flood and mud-rock flow on 8 August;
3. Southwest China extremely drought from autumn to winter;
4. Torrential rain and inundation from May to July along the mid and lower reaches of the Changjiang River;
5. Northeast China inundation in late July;
6. Shanxi Ankang mountain flood and mud-rock flow;
7. Guizhou Guanlingshan huge landslide on 28 June;
8. Typhoon Fanapi;
9. Blizzard in northern part of Xinjiang in early of 2010;
10. Sea ice disaster in the Bohai and Huanghai Sea in the early year.

2011:

1. West China storm in autumn;
2. Southwest China drought from summer to autumn;
3. Yunnan Yingjiang earthquake (5.8 Ms);
4. Continuously drought from summer to autumn along the mid and lower reach of the Changjiang River;
5. South China inundation in June;
6. Drought from winter to spring in winter wheat cultivation area;
7. Typhoon Muifa;
8. Typhoon Neast;
9. South China frost rain and snow disaster;
10. Xizang earthquake on 18 September (6.8 Ms).

2012:

1. Inundation, storm and hail-stone in north China in July;
2. Yunnan Yiliang earthquake on 7 September (5.7 Ms);
3. Gansu Minxian extremely large mountain torrents, hail and mud-rock flow on 10 May;
4. Typhoon Saola and Davee in August;
5. Inundation, storm and hail in June;
6. Yunnan drought from winter of 2011 to spring of 2012;
7. Sichuan and central China inundation in July;
8. Sichuan and Chongqing torrential rain and inundation in August;
9. Inundation in south China in July;
10. Hunan torrential rain and inundation in June.

2013:

1. Sichuan Lushan earthquake (7.0 Ms);
2. Inundation, storm and hails in northeast China in August;
3. Inundation in Sichuan, northwest and north China in July;
4. Gansu Minxian earthquake (6.6 Ms);
5. Heat and drought in south China from July to August;
6. Typhoon Utor ;
7. Xizang Mozhugongka huge landslide in March;
8. Typhoon Fitow;

9. Storm, hail and inundation in Sichuan and central China;
10. Jilin Songyuan earthquake (5.5 Ms)

Other disasters happened in China in recent years

1. Forest fire

Forest fire happened nearly every year in China. In May 1987, Heilongjiang had a very serious forest fire and the burned area was over one million hectares, 70% of the burned area was forest. 7723 times of forest fire happened from 2010 to 2012, a total area of 1.16 million hectares was burned. In 2013, 3626 times of forest fire happened and 12,400 hectares of forest were burned.

2. Desertification

The total area of desert and gobi in China is 1739,700 square kilometers, which occupies 18% of the total Chinese land area. Statistics show that the deserted land enlarges its sphere at a rate of 1560 square kilometers per year in the 1950s. But the number reached a shocking 2460 in 1990s. It is said the rate will go on increasing in the future on the condition that no remedy measures is enforced. China's annual soil loss is estimated at 5 billion tons, according to a recent report released by the Asian Development Bank. Desertification is a significant factor leading to the deterioration of western China's environment, which manifests itself in the loss of stabilizing vegetation cover and nutrients and the destruction of the soil's structure and moisture-holding capacity.

3. Fog and haze

Eleven fog and haze happened in the first season of 2013, 1.3 million square kilometers of area and 6 hundred million people affected.

4. Sand and dust storm

Eight times of sand and dust storm happened in the 60s, thirteen times in 70s, 14 times in 80s, 20 times in 90s. One severe sand and dust storm happened in 2002 which lasted 49 hours and affected a total area of 1.4 million square kilometers and 1.3 hundred million people.

Biodiversity in China

China is the most abundant biodiversity country in the northern hemisphere and it is considered as one of the megadiversity countries. China has over 30,000 species of

higher plants, which plays the third place in the world. Among these plants, 2200 species are mosses (9.7% of the world total species, 106 families which occupies 70% of the world total); 52 families and 2200-2600 species are ferns (80% and 22% of the world total numbers respectively); 250 species in 10 families are gymnosperms ; around 30,000 species in 3123 genera, 328 families are angiosperms (around 75% of the world total families and 10% of the world total species). China is also rich in animals. There are 6347 species of vertebra (13.97% of the world total); 1244 species of birds (13.1% of the world total); 3862 species of fish (20.3% of the world total). Most species of invertebrates including insects, lower plants, fungi, bacteria, and actinomycetes have not been recognized so far. Many living things in China are endemic such as giant panda (*Ailuropoda melanoleuca*), white-flag dolphin (*Lipotes vexillifer*), *Metasequoia glyptostroboides*, *Davidia involucrata* , *Cathaya argyrophylla* and *Cycas panzhihuaensis.* Among the 30,000 species of higher plants, around 17,300 species are endemic to China, which occupies 57% of the total number of Chinese higher plants.

China has a history of over 7000 years of farming and domesticating with abundant germplasm resources of cultivated plants and domesticated animals. Many plants and animals which human beings rely on for our life and their kindred species are originated or kept in China. According to some statistics recently reported, China has 1938 cultivars or types of domesticated animals and insects, over 1000 species of economic plants, around 11,000 species of medicinal plants, 4215 species of forage plants and 2238 species of ornamental plants. China is one of the countries of the origin of rice (*Oryza sativa*) and the country of the origin of soybean (*Glycine max*) with 50,000 local cultivars of rice and 20,000 cultivars of soybean.

China has nearly all types of natural terrestrial ecosystems, marine ecosystems, various types of agro-ecosystems and urban ecosystems.

Possible influence of Disasters to Biodiversity in China

Among these top ten disasters in China from 1950 to 1985, 5 times were inundation, 3 times were earthquake and 2 times were drought. Among top ten disasters of each year from 2008 to 2013, 14 times were inundation, 10 times were earthquake and drought respectively, 7 times were typhoon, 6 times were storm and hail, 4 times were mud-rock flow, 3 times were landslide, 3 times were blizzard or heavy snow, 2

times were extreme low temperature and frost rain, 1 time was sea ice disaster.

As we can see from the above information that the most frequently happened disasters in China are inundation, earthquake, drought, typhoon, storm and hail. These disasters might cause directly influence or harm to biodiversity or the secondary disasters might cause more serious influence to biodiversity. Earthquake may cause landslide and barrier lakes. Species from the earthquake affected areas might destroyed directly or affected by lossing their living habitats or food sources. One example from China was that many giant pandas had to move to other places because of the earthquake happened in Wenchuan, Sichuan in 2008. Inundation can directly destroy many species especially domestic animals and cultivated plants. Many cultivated plants and domestic animals in remote areas of China are very important genetic resources for breeding purpose. Humankind won't be able got them back once lost them. It can be understood easily that drought will lead to the death of many plants and animals. Drought happens in China very frequently but nobody knows the exactly actual influence of drought to diversity in China. Drought might be changed the ecological environment critically and many species might disappear forever. The destruction of mud-rock flow and landslide to biodiversity depend on the scale of the disaster. However, some species would become extinct if such disaster happened in a habitat where an extreme small population of a species lives. Extremely low temperature and frost rain happened often in China in recently years. These disasters could directly destroy many species especially in the areas of subtropical and tropical areas of south China. Forest fire might be the most or one of the most critical disasters lead to destroy biodiversity. Major forest fire happened every year in China. However, very few studies on how many species had been destroyed, threatened, or some new species might appear after a forest fire. Desertification is a significant factor leading to the deterioration of western China's environment, which manifests itself in the loss of stabilizing vegetation cover and nutrients and the destruction of the soil's structure and moisture-holding capacity. All these changes would directly influence the present status of biodiversity in these areas. One severe sand and dust storm happened in 2002 in China which lasted 49 hours and affected a total area of 1.4 million square kilometers and 1.3 hundred million people. Nobody knows that how big influence of these disasters could be to biodiversity.

It is certain that disasters not only destroyed human life and properties but also influence greatly biodiversity. However, very few studies on the influence of disasters to biodiversity had been done in China as well as in the whole world. It is time for us to take international action to discuss about the influence of disasters and to establish an international protocol for future precautional approaches to minimize disaster influence to biodiversity.

2010 Nanchang Inundation

Forest fire in Anning, Yunnan

Drought in SW China

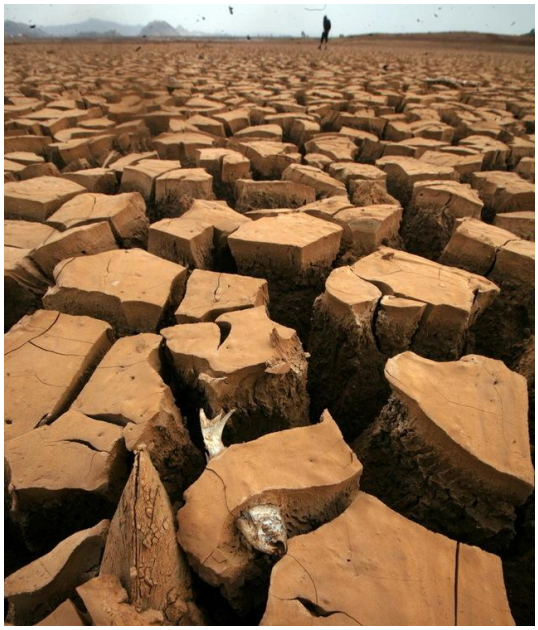
Many animals killed by inundation

Dust storm in Beijing

Sichuan Wenchuan Earthquake in 2008

Fog and Haze in Beijing

Landslide in Sichuan



Severe Drought in SW China

Wenchuan earthquke in 2008