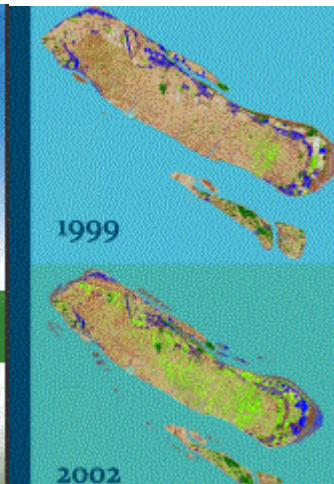
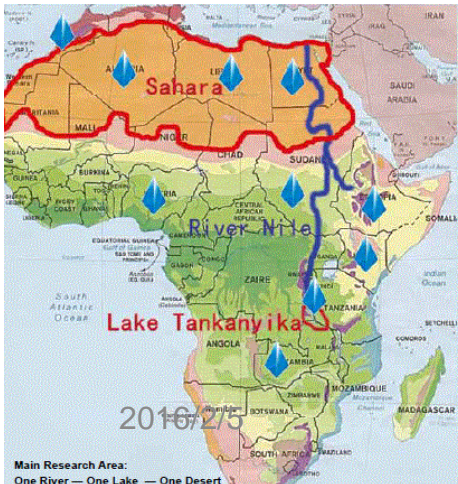


# Contribution from UNEP-Tongji Institute of Environment for Sustainable Development



崇明  
生态岛  
碳源碳汇  
核算研究报告



# Where is Tongji



TONGJI  
UNIVERSITY

同济

JADING CAMPUS

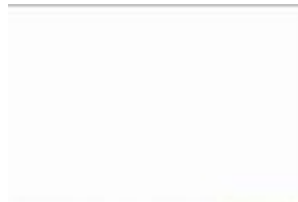






Tongji  
**1907**  
German Medical School













Tongji  
**1927**  
National Tongji University










Tongji  
**1941**  
Displaced to Lizhuang, Sichuan Province: eventful days in the Anti-Japanese War

Tongji  
**1952**  
Nationwide Restructuring of higher education in China


Tongji  
**1978**  
Resuming traditional links with Germany and developing into a multi-disciplinary institution








Tongji  
**2007**  
Centennial Celebration

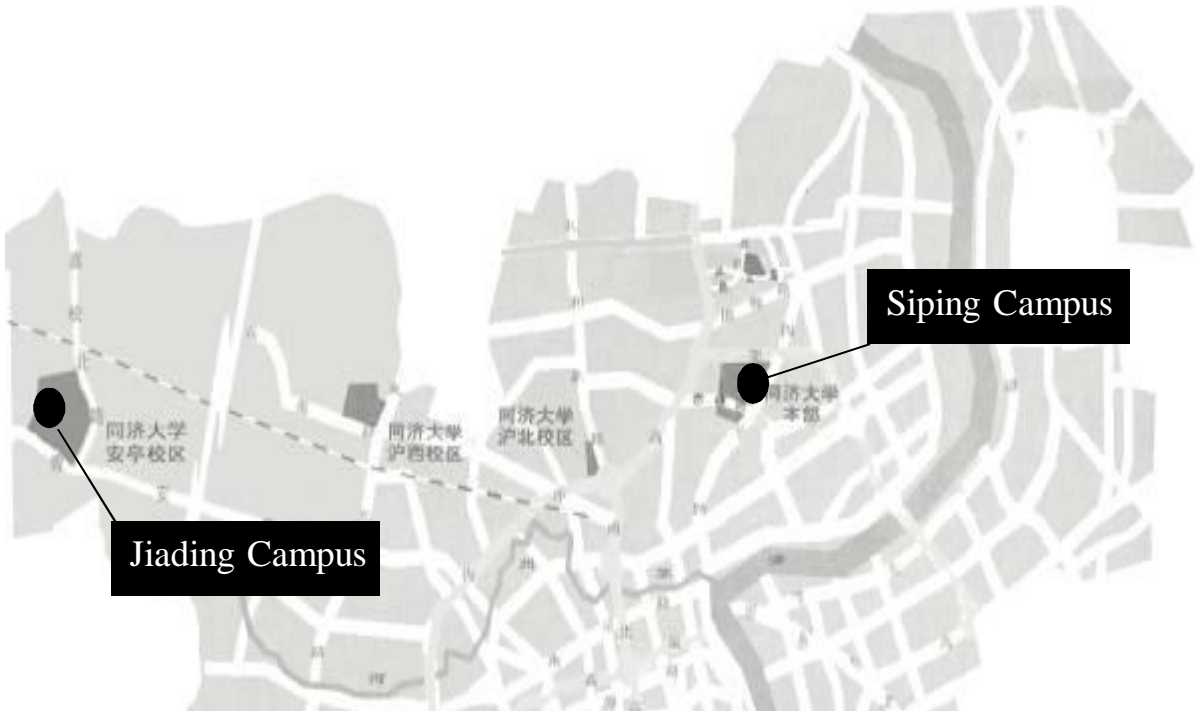
同舟共濟  
繼往開來







Tongji Campuses





**IESD**

Key Figures |



**50,000** Students

**21,000** BA/BSc, **10,000** MA/MSc, **3,300** PhD, **3,800** International Students

**3300** Teaching & Research Faculty and Staff

**830** full professors, **1,470** associate professors, **2,800** teachers

**6** academicians from the Chinese Academy of Sciences

**7** academicians from the Chinese Academy of Engineering

**250,000** Alumni

# EDUCATION OF ENVIRONMENT

- 1978 Department of Environmental Engineering
- 1982 College of Environmental Engineering
- 1998 College of Environmental Science and Engineering
- 2002 UNEP-TJU Institute for Environment and Sustainable Development

# Introduction of IESD

- **About IESD**
- **Prospects**
- **Education**
- **Research**
- **Outreach**
- **Sustainability-Oriented University**



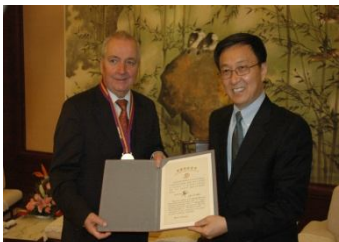
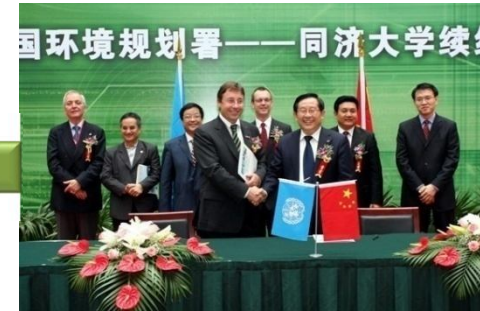
# ABOUT IESD

## ESTABLISHMENT & DEVELOPMENT



May 9, 2002  
Establishment of UNEP-Tongji Institute of Environment for Sustainable Development (IESD)

May 18, 2007  
Agreement Renewal of Cooperation between UNEP and TJ.



# ABOUT IESD

## OBJECTIVES & SUPPORT



**To serve as the engine for sustainability-oriented university construction**

**By promoting environmental academic and information communication and education reform**



**To establish an internationalized educational base in respect of environment and s. d. with the support of UNEP, leading institutes and related companies.**

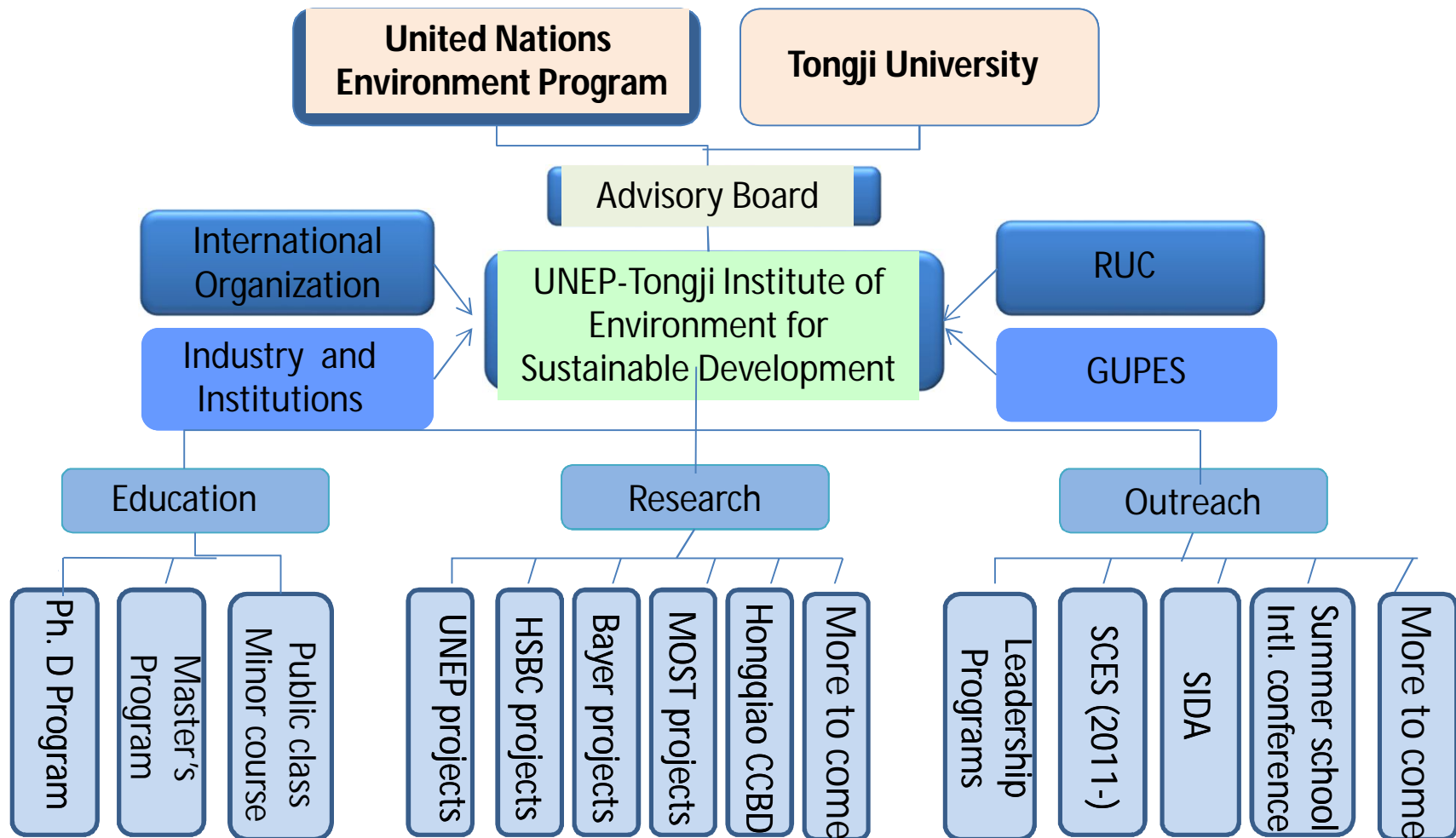


**To set up a think tank for UNEP**

**By conducting global environmental studies and technology innovations, promoting and practicing beneficial technology in environmental protection, and generating scientific results**

# ABOUT IESD

## ORGANIZATION & STRUCTURE



# IESD Board



**Mr. Guangdao Wang**  
Director of  
Commission of  
environment and  
resources, Congress



**Mr. Achim Steiner**  
Under secretary  
of UN,  
Executive of  
UNEP



**Prof. Gang Wan**  
Minister of  
Science and  
Technology



**Mr. Xiaoqing Wu**  
Vice Minister of Environmental  
Protection



**Mr. Guguang Zheng**  
Director National  
Administration of  
Meteorology



**Prof. Gang Pei**  
President of  
Tongji



**Prof. Qidi Wu**  
Former Vice  
Minister of  
Education



**Prof. Jiang Wu**  
Vice President of  
Tongji

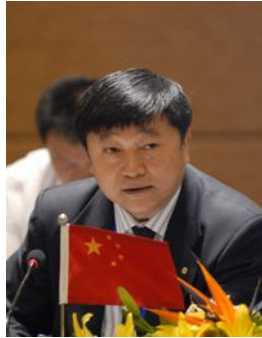


**Mr. Surendra Shrestha**  
Director of  
Resource and  
Mobilization, UNEP



**Dr. Young-Woo Park**  
Director of UNEP  
in Asia and Pacific

# Board Members



**Prof. Meng Wei**  
academician of China



**Prof. Jianmin Xu**  
academician of China



**Ms. Jiarong Zhao**  
Director of Environment and  
Resources, NDRC



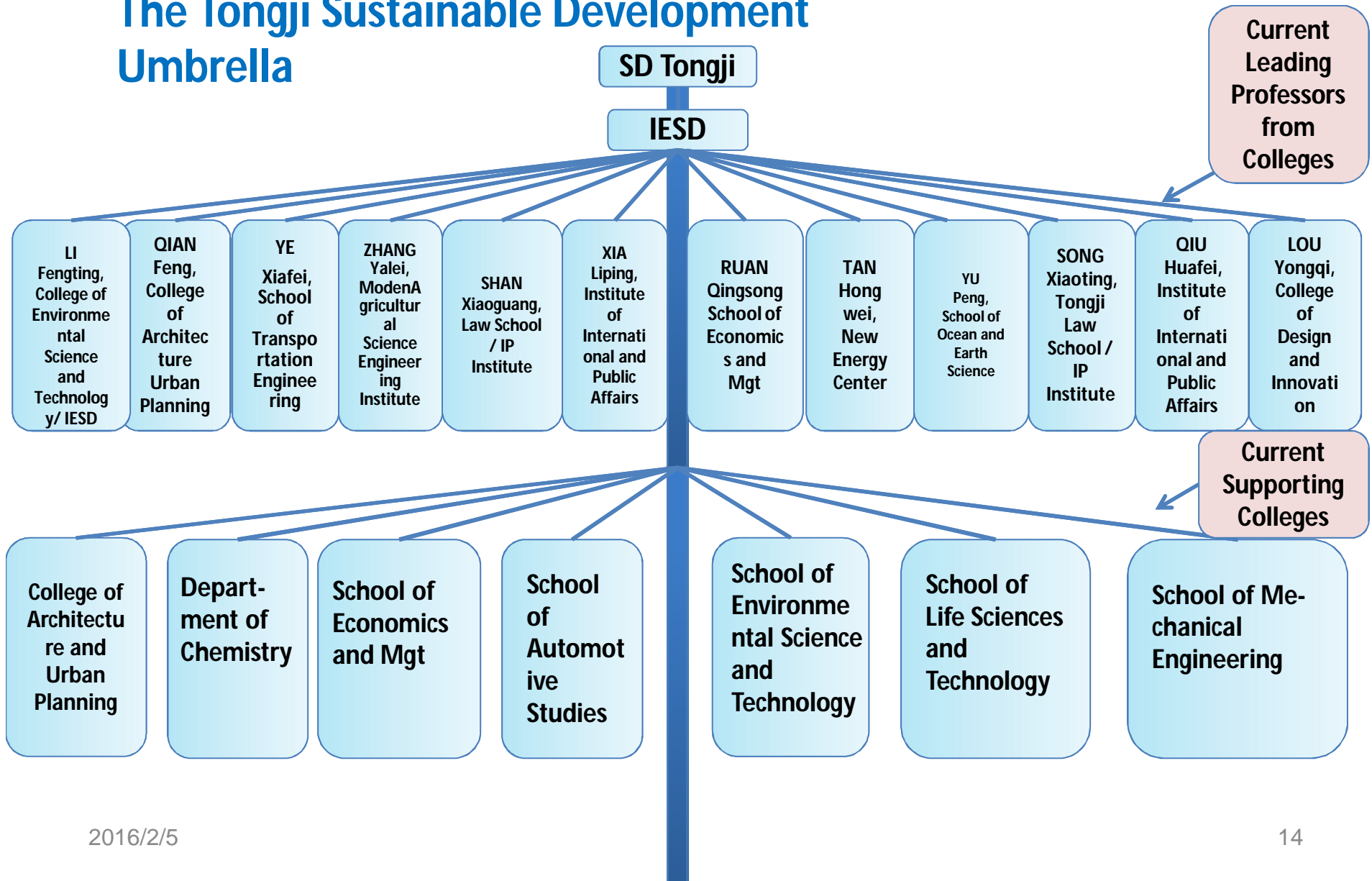
**Prof. Dai Xiaohu**  
Dean of College of  
Environment and  
Engineering



**Prof. Fengting Li**  
Deputy of IESD and  
college of Environment

# PROSPECTS

## The Tongji Sustainable Development Umbrella



# EDUCATION

## International Education Programs

International Ph.D Program in Environment Management and Sustainable Development

International Master Program in Environment Management and Sustainable Development

International Master Program in Environmental Engineering

# EDUCATION

## Curriculum

Environmental Ethic	Environmental Ecology
Environmental Sociology	Environmental System Analysis
Environmental Science	Global Environmental Changes
Environmental Economy and Circular Economy	Environmental Project Management
Framework and Tools for SD	Atmospheric Science and Climate Change
Environmental Management and Policy	Professional Foreign Language

### Public Class of "Sustainable Development and Future"

- An interdisciplinary public elective course for undergraduates

### Minor Course of "Sustainable Development"

- A minor course to prompt sustainable development education for postgraduates



# EDUCATION

## Public Class of "Sustainable Development and Future"

- An interdisciplinary public elective course for undergraduates

### Public Class of SD

**5 parts of courses:** SD general introduction;  
economy construction, management and SD;  
eco-environment and SD;  
science and technology and SD;  
individual growth and SD;

More than **800** students from **14 faculties** attended this class organized by IESD  
**6 students made reports** on Sustainable Development Education Planning, Green Internet of Things and S.D., etc.



# EDUCATION

## Minor Course of "Sustainable Development"

- A minor course to prompt sustainable development education for postgraduates

### 4 core + 8 optional courses:

The Frontier of Global Sustainable Development;

Green Economy;

Integrated Management of Resource & New Energy;

Ecosystem Management

Supported by 8 colleges;

Attracted more than 200 students from 25 colleges of TJ



# EDUCATION

## International Faculty



Bindu N. Lohani, Vice-President of Asian Development Bank



Mr. Mahesh Pradhan, UNEP-ROAP



Dr. Eheart, University of Illinois



Marion Cheatle, Deputy Director and Acting Chief, UNEP-DEA-CDB)



Prof. Deo Prasad (UNSW)



Dr. Klaus Toepfer, Former Under-Secretary-General of UN, Honorary Professor of Tongji University



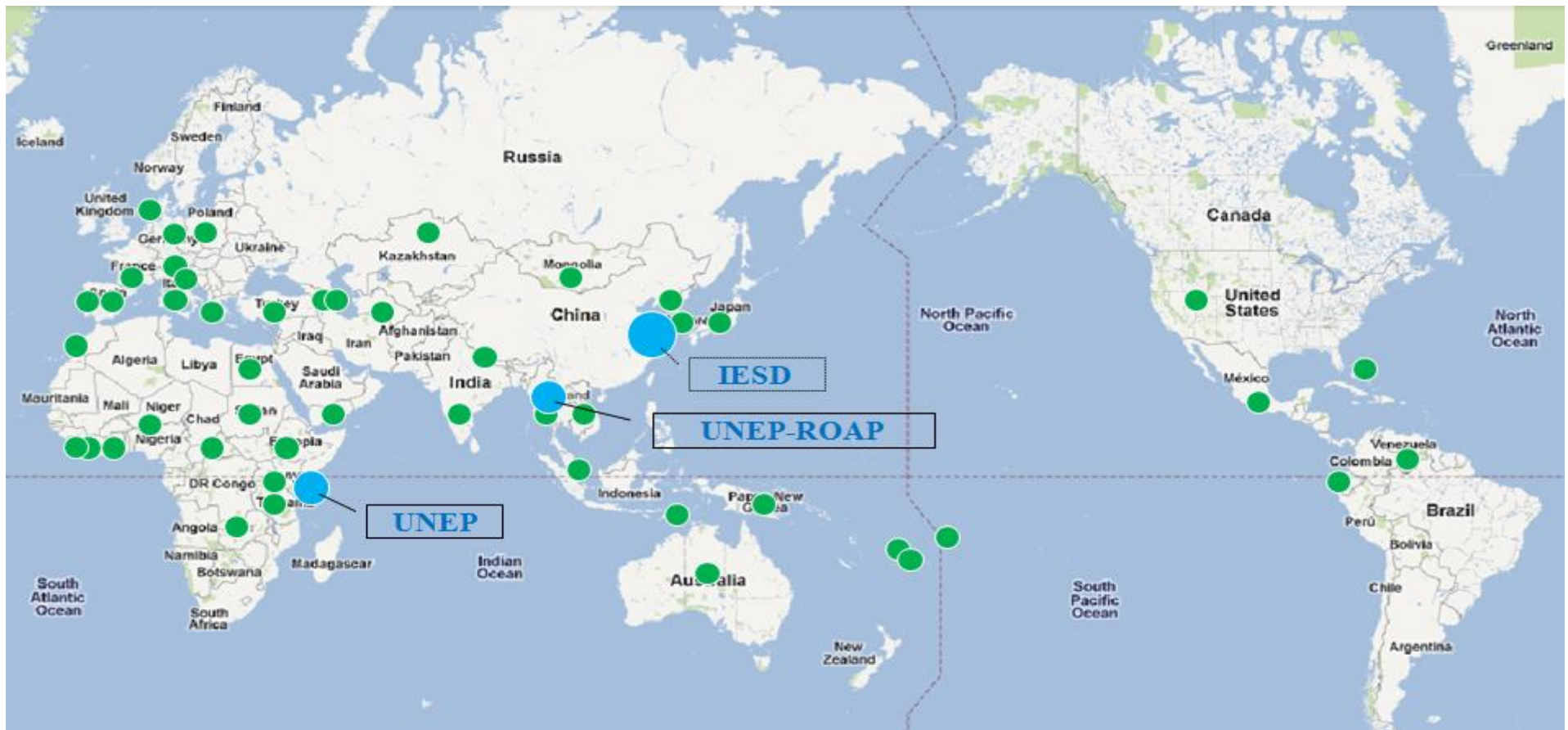
Prof. Xia Kunbao, Member of the Committee of Science and Technology, Ministry of Environmental Protection



Prof. Mario T. Tabucanon, United Nations University

# EDUCATION

Up to now, **209** Students from **47** nations have been recruited in IESD.



# EDUCATION

## Scholarship

- ✓ Scholarship of "Green Future" for Social Practice
- ✓ Scholarship of "Green Seedling" for Student Research
- ✓ Klaus Toepfer Environmental Scholarship
- ✓ Klaus Toepfer Environmental Innovation Student Competition
- ✓ Praxiar-Tongji Environmental Scholarship



**2012年“绿色未来”**

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**2012年“绿苗计划”**  
申请指南：  
一、综合性  
二、企业节能减排目标的落实  
三、水  
四、农村水污染治理的技术应用  
五、城市居民居住区节约水、电、气、油  
六、我国住宅或者公共建筑能耗  
七、我国农村新能源发展的应用  
八、大气  
九、我国PM2.5要求与我国PM10  
十、不同地区城市空气污染的防治  
十一、土壤  
十二、我国农村新能源发展的应用  
十三、我国农村新能源发展的应用  
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一百、我国农村新能源发展的应用

**2012 Klaus Toepfer 环境创新大赛**

北京绿色未来环境基金会  
汪光先生于2011年发起，为鼓励我国高等院校环境专业在绿色未来环境基金会在每年的绿色未来大赛中，评选出环境专业领域的优秀学生和教师，并鼓励其在环境专业领域的创新和实践。

**2012 Klaus Toepfer 环境创新大赛**  
申请指南：  
围绕我国发布的《中华人民共和国气候变化国家行动方案》和《联合国气候变化公约》附件二、三、四、五、六、七、八、九、十、十一、十二、十三、十四、十五、十六、十七、十八、十九、二十、二十一、二十二、二十三、二十四、二十五、二十六、二十七、二十八、二十九、三十、三十一、三十二、三十三、三十四、三十五、三十六、三十七、三十八、三十九、四十、四十一、四十二、四十三、四十四、四十五、四十六、四十七、四十八、四十九、五十、五十一、五十二、五十三、五十四、五十五、五十六、五十七、五十八、五十九、六十、六十一、六十二、六十三、六十四、六十五、六十六、六十七、六十八、六十九、七十、七十一、七十二、七十三、七十四、七十五、七十六、七十七、七十八、七十九、八十、八十一、八十二、八十三、八十四、八十五、八十六、八十七、八十八、八十九、九十、九十一、九十二、九十三、九十四、九十五、九十六、九十七、九十八、九十九、一百。

**普莱克斯—同济环境奖学金招募通知**

简介：  
普莱克斯—同济环境奖学金系普莱克斯（中国）投资有限公司为鼓励和支持优秀青年学生参与科技创新和国际交流、培养学生的创新精神和实践能力，与联合国环境规划署—同济环境科学与可持续发展学院（IESD）共同协商设立。该奖学金面向同济大学环境科学与工程学院以及IESD在校硕博研究生（含外国学生）公开选拔，其中博士研究生5名，硕士研究生3名。

本奖学金分为两个等级，如下：  
一等奖4名，每名获奖者获得奖金人民币15,000元/年；  
二等奖4名，每名获奖者获得奖金人民币10,000元/年。

**奖励对象：**  
1. 品学兼优、学有余力，有较强的独立思考和创新意识；  
2. 对科学研究、科技活动或社会实践有浓厚的兴趣和坚强的毅力；  
3. 具有自主学习、团队协作以及提出问题、分析问题、解决问题的能力；  
4. 学业成绩优秀，须在所在专业前50名以内（含50名）；  
5. 在核心期刊上发表论文，或发表英文论文者优先；  
6. 有参与重大科研项目经验者优先（含参与IESD或者环境学院重大活动志愿者、参加国内外重大学术会议或非学术环境领域活动、重大国际科研项目等）；  
7. 有IESD志愿者经历者优先。

**提交材料：**  
1. 普莱克斯—同济环境奖学金申请表；  
2. 普莱克斯—同济环境奖学金推荐信（申请表和推荐信由各班主任转发），由导师推荐签字，IESD办公室收集并统一找学工办盖章；  
3. 科研方面的成果，如论文发表、专利证书、科技发明等证明文件；  
4. 参与重大国际交流项目的证明、志愿者证书等。

注：同济环境科学与工程学院已于2012年12月25日前完成所有申请者的评审工作，若获奖者在2013年度内获得环境学院奖学金和普莱克斯奖学金，则不再参加2013年度环境学院奖学金的评选。

请将领表材料交于2012年12月25日前交至综合楼903室。

联合国环境规划署—同济环境科学与可持续发展学院  
二〇一二年十二月十日

# EDUCATION

Summer Schools in in Japan, Germany, Korea, African, etc.



2016/2/5

22

# EDUCATION

## Graduates

- ✓ Currently, most of IESD graduates have been employed in international organizations, government agencies, NOGs, universities and other institutes engaged in the field of sustainable development.

<b>United Nations</b>	<ul style="list-style-type: none"><li>• United Nations Environment Program</li><li>• United Nations Development Program</li></ul>
<b>Government</b>	<ul style="list-style-type: none"><li>• Thailand Ministry of Environment</li><li>• Ministry of Environment of Mongolia</li><li>• Environment Protection Agency of Liberia</li></ul>
<b>NGOs</b>	<ul style="list-style-type: none"><li>• World Vision</li><li>• ...</li></ul>
<b>Companies</b>	<ul style="list-style-type: none"><li>• P&amp;G</li><li>• ...</li></ul>

# Graduates from IESD



2016

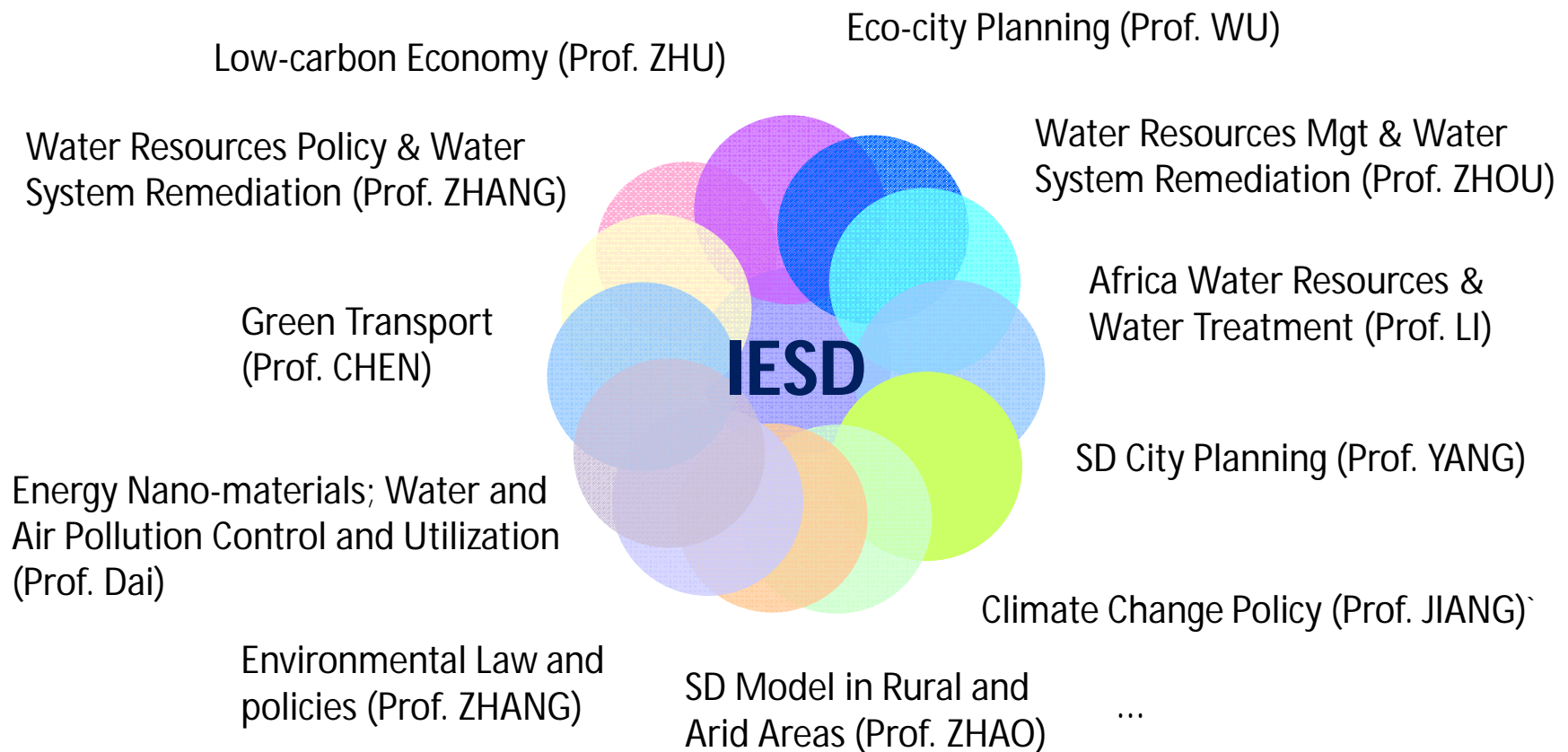


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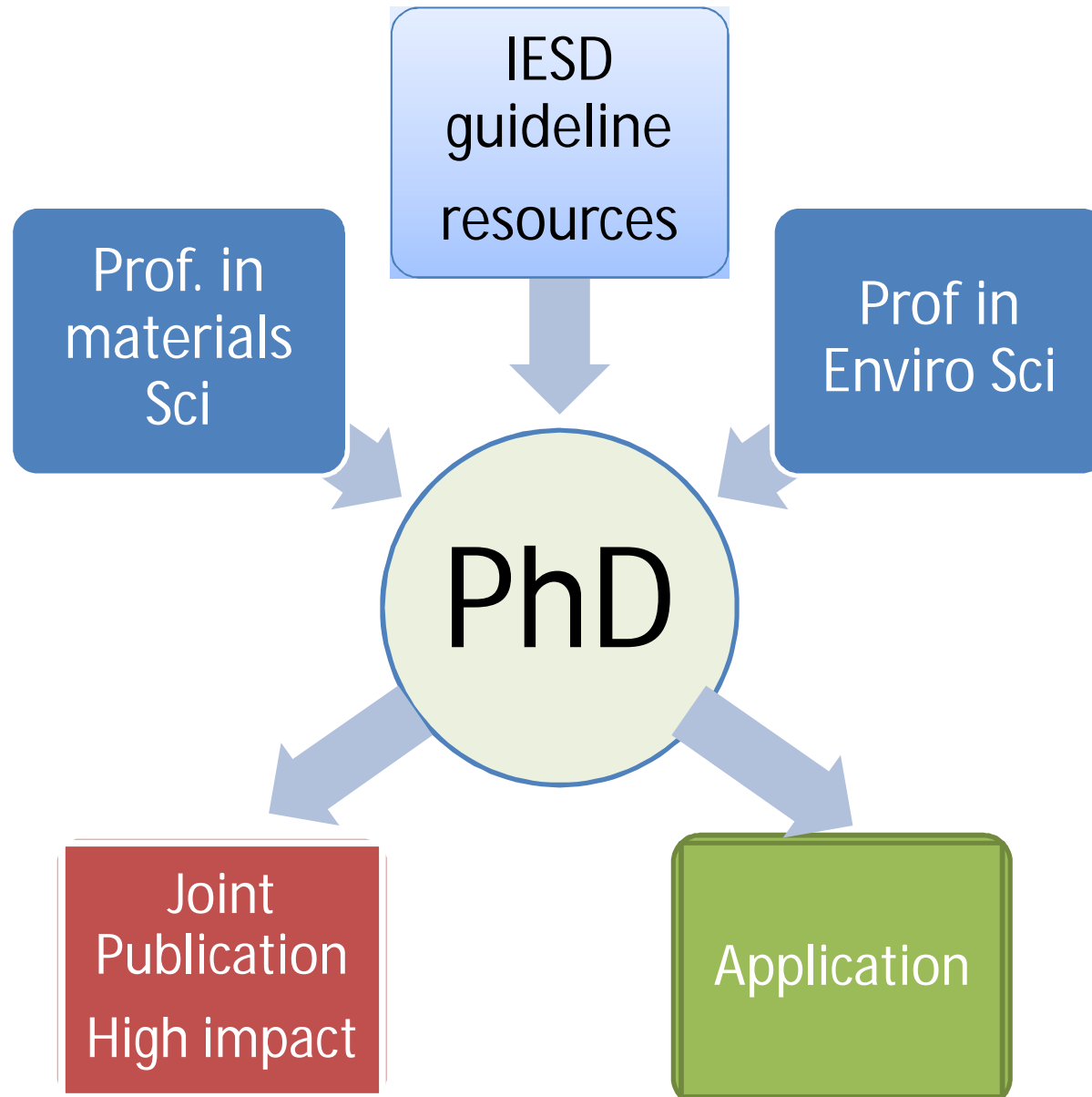


# RESEARCH

20 research teams led by experts

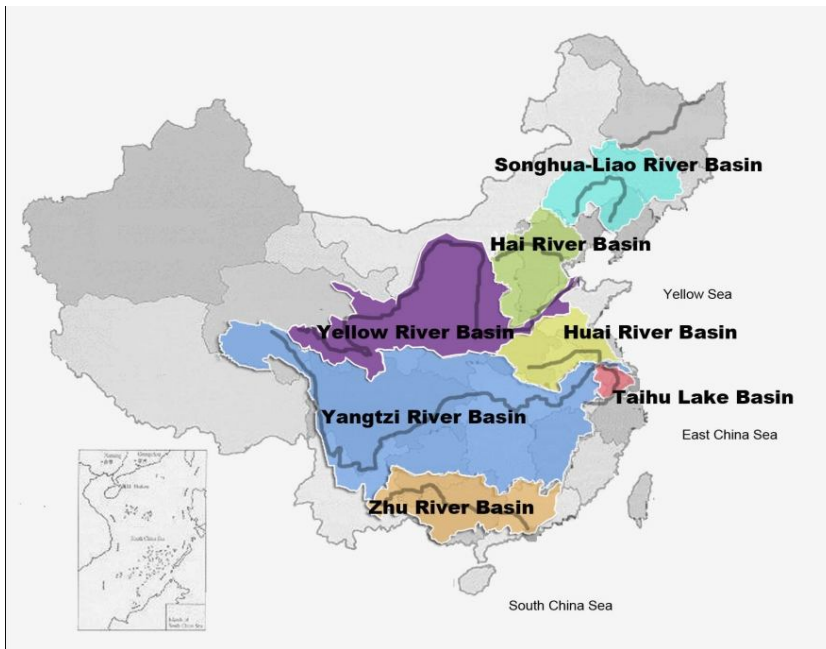



# Joint Research promotion



# RESEARCH

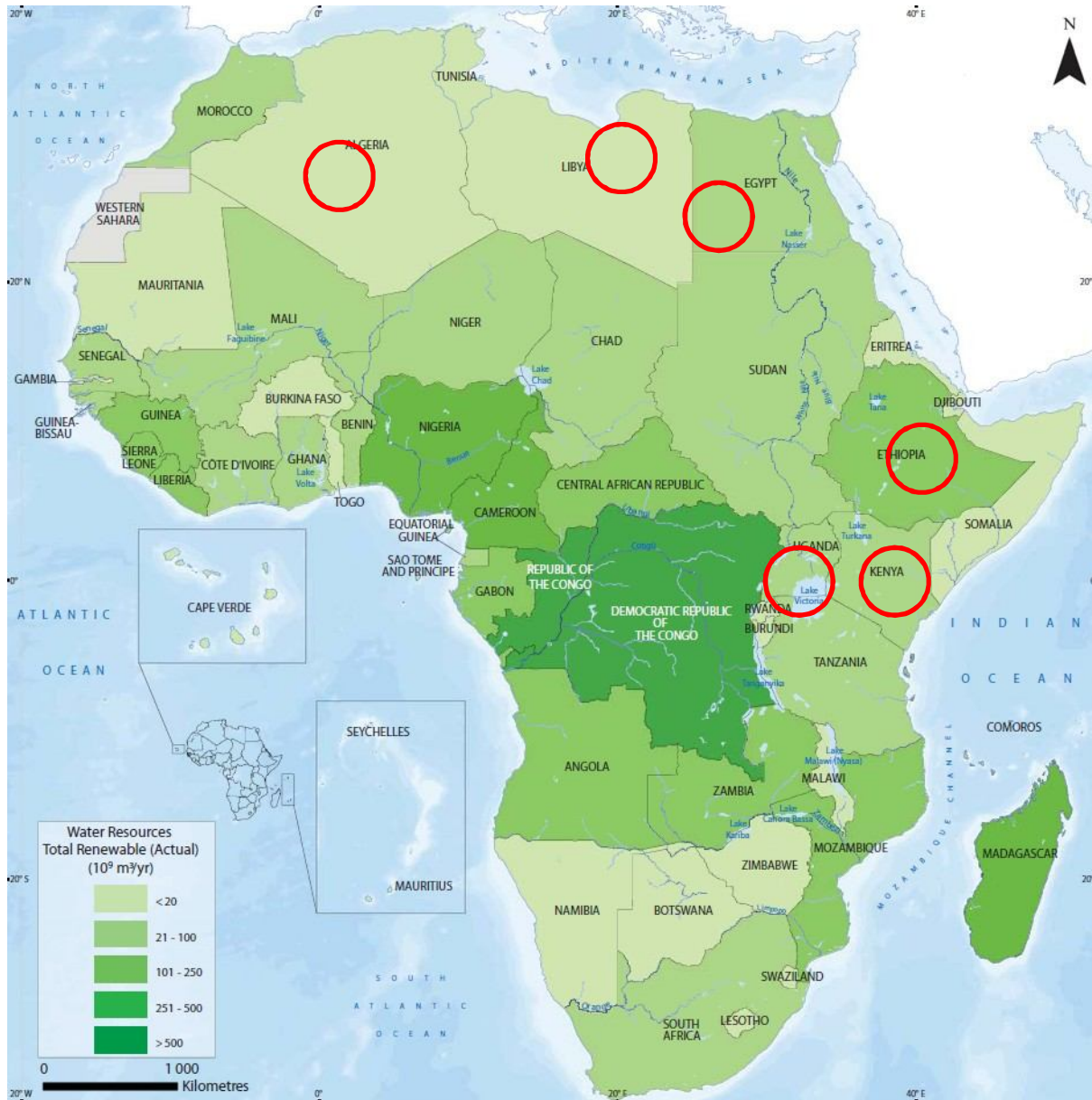
## Achievements & Fruits



Research Fields at the National Level



More than 100 patents are applied in the environmental fields in China



## Case study and demonstration

**Kenya and Ethiopia**

**Nairobi water (drinking water and waste water treatment)  
rain-harvesting**

**Uganda, Nigeria and  
Algeria (rain-harvesting and rural water supply)**

## JOINT STATEMENT



*The challenge of providing safe water and adequate sanitation will be aggravated by unchecked climate change and rising urban populations.*

**Africa's urban population is projected to triple to over 1.2 billion by 2050 in cities already challenged in many places and in many ways by shortages of safe drinking water and inadequate sanitation services.**

Access to clean drinking water and sanitation is perhaps one of the most important Millennium Development Goals because of its links to human health and the ability of people to carry out productive employment. It is also linked to gender and the nutrition of women and as well as their role in collecting water for families and communities.

Child mortality is also inextricably linked to water. Globally, at least 1.8 million children under the age of five years, or one every 20 seconds, die every year from water-related diseases. On the overall more people die from water-related diseases than are killed by all forms of violence including wars. Thus access to clean water is in many ways a pre-requisite for sustainable development.

The challenge of providing safe water and adequate sanitation will be aggravated by unchecked climate change and rising urban populations. As the world prepares for the UN Conference on Sustainable Development in 2012, 20 years after the Rio Earth Summit of 1992, water and urbanisation need to be key issues on the sustainability radar.

There is strong and growing evidence that a Green Economy, within the context of poverty eradication and sustainable development, can accelerate and scale-up delivery of these services

if countries and communities commit themselves to managing the use and the sources of water such as forests, wetlands and other ecosystems central to this sustainability equation.

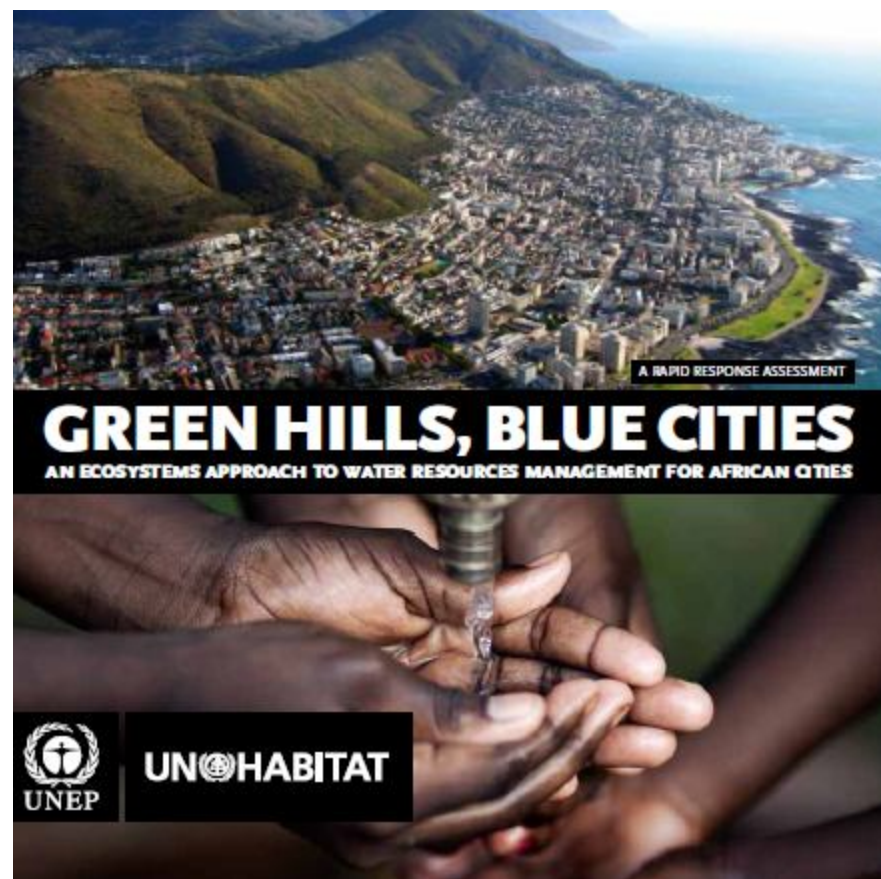
Creative and forward-looking policies, alongside partnerships across all sectors including agriculture, will also be key to sustainability.

This report, jointly produced by UNEP and UN-HABITAT in collaboration with the Africa Ministers' Council on Water (AMCOW) and funded by Tongji University, the Ministry of Science and Technology of China and Bayer Foundation, shows that there is a way forward for a more sustainable future where restoration of ecosystems, often in the green hills and watersheds surrounding cities, can provide cheaper, efficient and resilient water supply systems in a changing world.

Launched in Cape Town, a South African city surrounded by green hills that support water supplies to that city, it is our hope that World Water Day 2011 can provide a fresh vision for cities across Africa and beyond.

**Achim Steiner** | **Joan Clos**  
Executive Director, UNEP | Executive Director, UN-HABITAT

# Africa Water Report

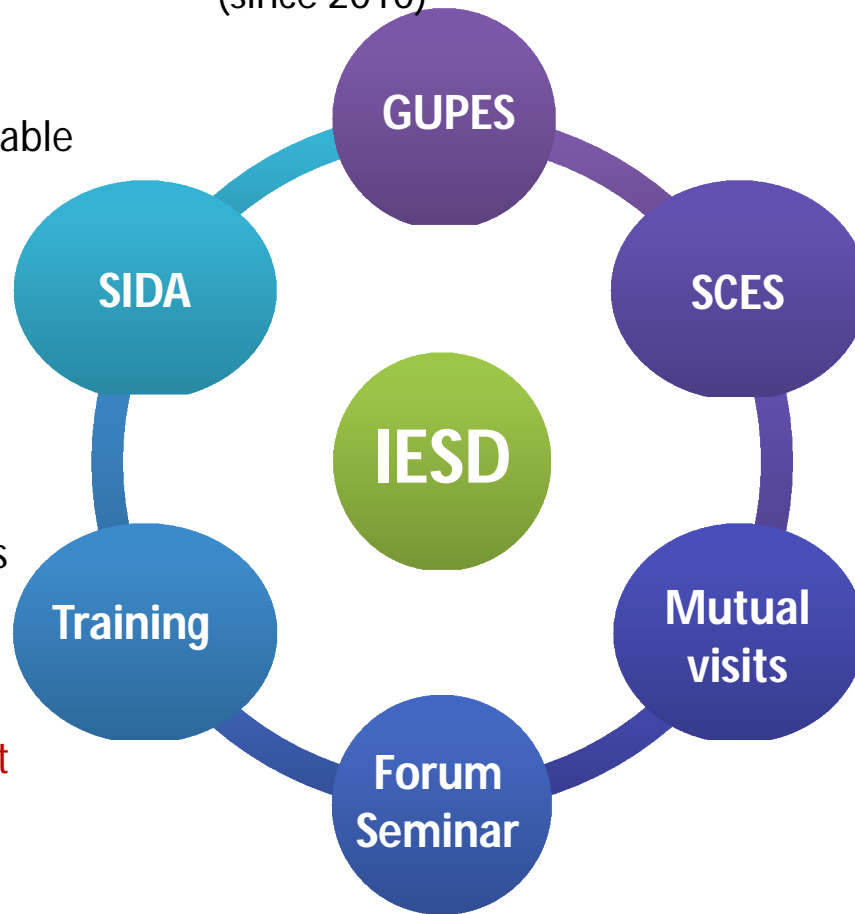


# OUTREACH

International Training Program (ITP) on "Education for Sustainable Development (ESD) in Higher Education"

Asia-Pacific Leadership Program for S. D.;  
**Tongji-HBSC Leadership Program;**  
 Young Environment Leaders Program for African Countries;  
**Workshop on New Energy Utilization and Environment Conversation for Shanghai Administrator ...**

Global Universities Partnership on Environment and Sustainability Meeting (since 2010)



International Student Conference on Environment and Sustainability (2011, 2012)

Stockholm+40 Partnership Forum for SD...  
**Students in COP 15, 16, "Rio+20" Summit;**  
**UN's Visit to TJ; TJ's visit to NATO;**  
 China-EU Green World International Forum...

Shanghai Int'l Eco-island Chongming Forum; Sino-France Scientific Seminar  
**Sino-European Symposium on Green Economy and Eco-system Mgt;**  
 Bayer-Tongji-UNEP Seminar on Food Safety and Health, Environment and Health;  
**International Water Seminar;** Interdisciplinary Academic Salon...

Sustainability-oriented university

# Global University Partnership on Environment and Sustainability (GUPES) initiated with cooperation with UNEP



**GUPES has been established in 2010 and WU Jiang, Vice President of Tongji University was re-elected as the president in 2012. The Secretariat has been set up in IESD.**



# OUTREACH



2016/2/5



# OUTREACH



Student Conference on  
Environment and Sustainability

- ✓ **Annual** activity
- ✓ **400+** students
- ✓ **30+** nations
- ✓ **Top 10 posters**

## Green Future Foundation



# OUTREACH

## Training

IESD has held many local and international seminars and training programs to promote the **concept and technology of sustainable development** and share Tongji's experience on **green campus construction**.



Sino-DPRK Workshop on Educational Resources for Water and Waster Treatment and Rense Technology



2012 Asia-Pacific Leadership Program on Environment for S.D



Tongji-HSBC Leadership Program



The workshop of "Urbanization, Demographic Development, Climate Change and Sustainable Development"

2016/2/5

# OUTREACH

## The International Training Program (ITP) on “Education for Sustainable Development (ESD) in Higher Education”

- ✓ financed by Swedish International Development Cooperation Agency (Sida)
- ✓ implemented by IESD in cooperation with Niras Natura AB.
- ✓ The fourth phase of this program attracted 31 trainees from the education sectors of six Asian countries, Bangladesh, Cambodia, India, Kyrgyzstan, Mongolia and China.



2016/2/5



# Sudan Training Program on Waste Management

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- **22 researchers** and staff s from **Sudan Academy of Science** participated in the training programme on Solid Waste Management in Tongji University
- involved lectures on **solid waste management**, water resource management and sustainable development in China
- provided the participants the technique visits to **Huangpu Sanitary Solid Waste Transfer** and **Laogang Landfill** to have a better idea about the solid waste technology and management in China.

# Lecture on 2013 Sudan Training Program

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- **Issues, Challenges and Opportunities in Municipal Solid Waste Management-China and Shanghai perspective by Niu Dongjie**
- **Water Challenge in China by Li Fengting**
- **Sustainable Development in China by JIANG Dahe**



# Discussion on 2013 Sudan Training Program



**IESD**

- **Hazardous substances in industrial demolition debris**
- **Khartoum Solid waste Management**
- **Metal recovery from industrial wastes containing Zn and Pb by alkaline hydrometallurgy method**
- **Quality Assessment of Physical Properties for Groundwater in Khartoum State**
- **Solid waste in our life**
- **Sustainable landfill technology of municipal solid waste**



**IESD**

# Cooperation Leads to Success



UNEP-Tongji Institute of Environment for Sustainable Development



# Rural solid waste management in China

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School of Environmental Science and Engineering, Tongji University**



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◆ **Introduction**

◆ **Characteristics**

◆ **Problems and challenges**

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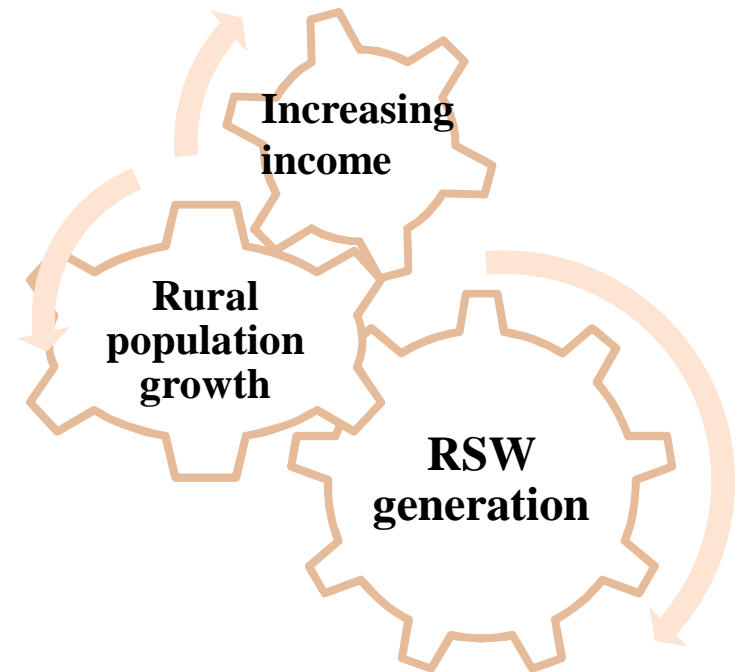
◆ **Summary**

## ■ China

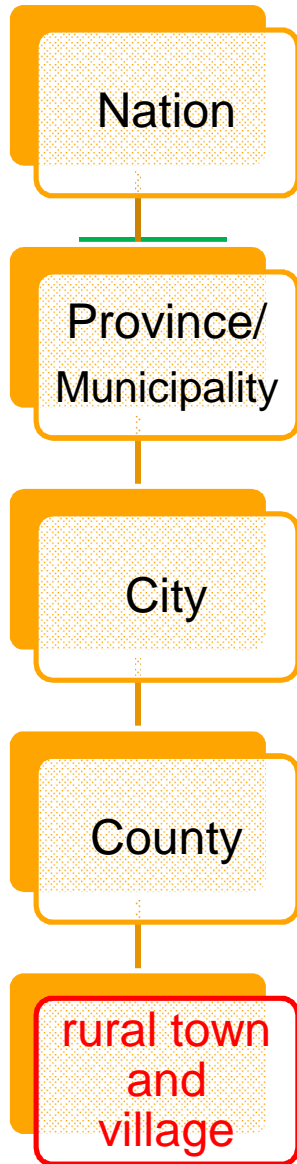
- Faced with multiple environmental problems, and one of the increasingly serious consequences is rural solid waste (RSW)

## ■ RSW

- low densities of rural households
- regional differences
- unbalanced economic development
- complicated characteristics



- Government has recognized the severe situation of rural pollution in recent years



- Current social and economic backgrounds of the typical rural areas in different cities or provinces varied greatly.
- RSW: discharged from daily activities or services by rural residents in China, and prescribed by laws and administrative statutes.
- Data: collected directly or indirectly from literature, Statistical Yearbooks, government websites or documents and official media.



No. <sup>a)</sup>	location	year	survey method	generation rate (kg/capita/day)
1	Beijing 1	2006	household survey	1.5-2.1
2	Beijing 2	2010	questionnaire	1.46
3	Shenyang, Liaoning province	2005	household survey	0.66-2.33, average: 1.2
4	Jilin province	2010	questionnaire	1.25
5	Hebei province	2010	questionnaire	1.13
6	Yixing 1, Jiangsu province	2004	household survey	0.15-0.27
7	Yixing 2, Jiangsu province	2005	demonstration project	0.255
8	Yixing 3, Jiangsu province	2002-2005	household survey	0.15-0.30
9	Nantong, Jiangsu province	2007	household survey	0.69
10	Fujian province	2006	questionnaire	0.73
11	Zhejiang province 1	2006	questionnaire	1
12	Zhejiang province 2	2008	household survey	0.48
13	Zhejiang province 3	2010	questionnaire	0.83
14	Hangzhou & Lin' an, Zhejiang province	2010	household survey	0.6-0.7
15	Chongqing	2008	household survey	0.21-0.43
16	Hainan province	2008	demonstration project	0.23
17	Anhui province	2010	questionnaire	0.75
19	Sichuan province	2010	questionnaire	0.73
20	Yunnan province	2010	questionnaire	0.58
21	Guangzhou, Guangdong province	2012	questionnaire	0.82
22	Dongguan, Guangdong province	2012	questionnaire	0.75
23	Zhongshan, Guangdong province	2012	questionnaire	0.58

## □ RSW generation

### RSW generation rates across regions of China

- Most data are less than  $1 \text{ kg} \cdot (\text{capita} \cdot \text{d})^{-1}$ , an increasing trend.
- Varied significantly among different rural villages across regions of China
- The rate in Northern China is higher than that of Southern China, and the rate in Eastern China is higher than that of Western China.



pulation and its distribution

- income level, dietary habits
- consumption level
- etc.

### Comparison of typical distribution of RSW composition

- The proportion of RSW compositions differs dramatically owing to differences on climate, dietary habits, culture, season and living standards.
- RSW compositions were similar to MSW composition in some relatively developed rural areas of Eastern China.
- Major components: food residue and miscellaneous inorganic wastes (coal ash, slag and dust as well as plant ash).
- Northern China: inorganic content, Eastern China and Southern China: organic content.
- A certain amount of recyclable waste.

■ **Collection**

- A centralized facility at roadside, usually called refuse chute, which is made of cement or just natural pit.
- Outdoors trash cans: Reduce the risk of waste exposure, mosquito and fly growth as well as odor occurrence.

■ **Classification**

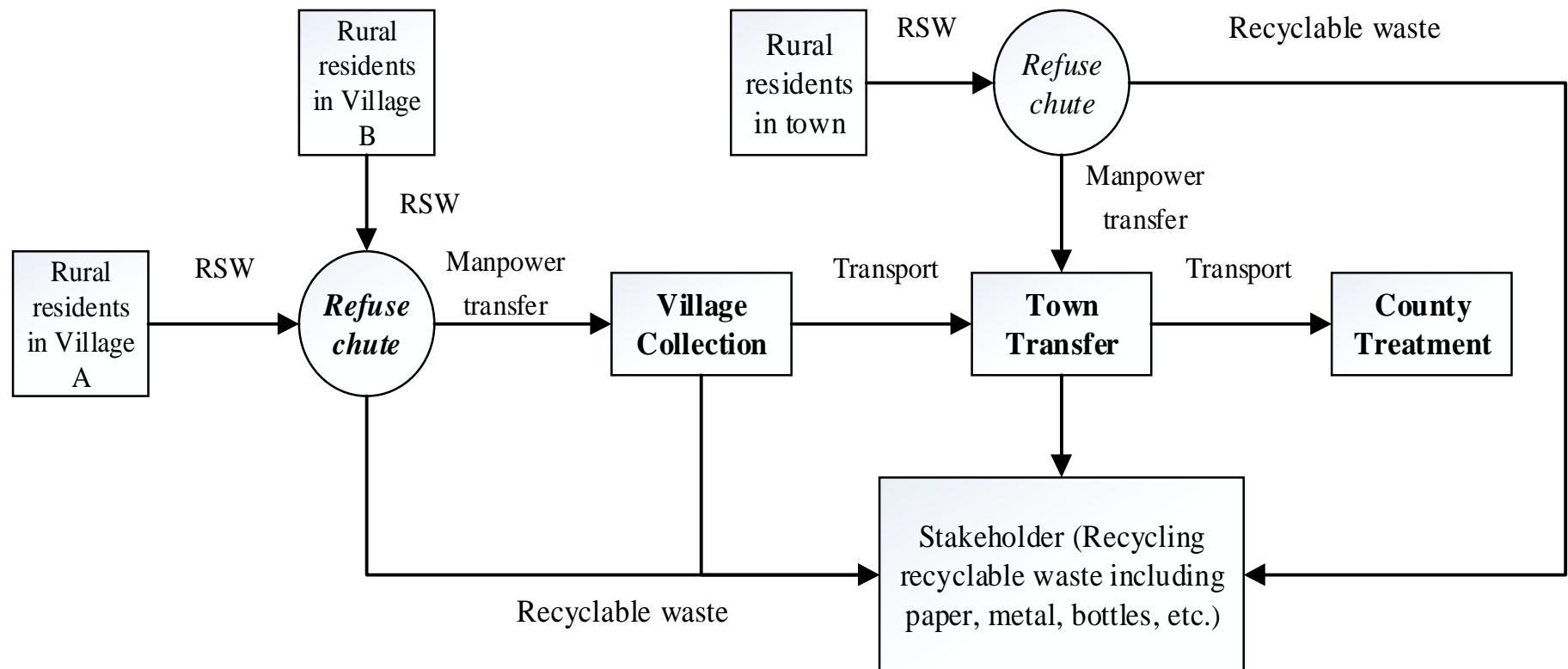
- Not implemented in rural areas, only several pilot programs.
- RSW mixed together and shipped to the refuse chute.
- A voluntary classification of recyclables.

■ **Recycling**

- Informal sectors: some rural residents or scavengers.
- Door-to-door service or deliver recyclables to the service sites by rural residents.

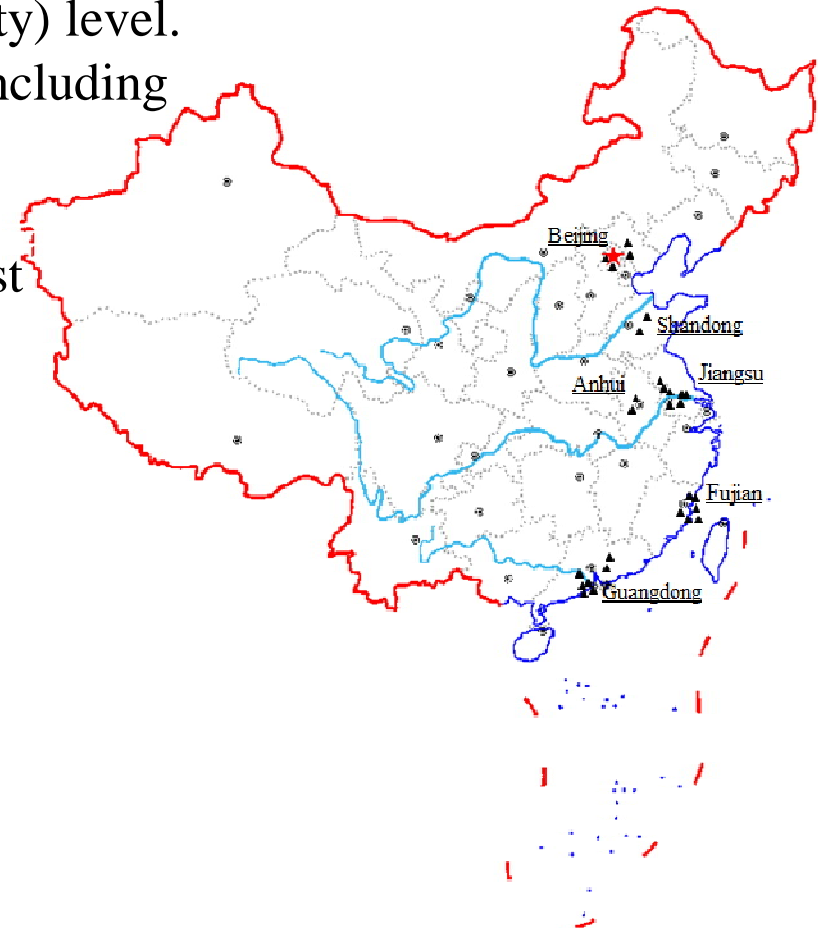


- The fundamental mode of *household classification, village collection, township transfer and county treatment.*



## □ RSW treatment and disposal

- The first list with 28 counties (districts or cities) with the full coverage of RSW treatment in county (district and city) level.
- Mainly in relatively developed regions including Beijing, Jiangsu, Fujian, Anhui and Guangdong provinces
- The implementation of this mode in most remote rural areas was restricted by many factors.
  - the high transport cost
  - the lack of manpower and budget



- **County treatment:** Sanitary landfill, incineration and composting.
- New technology for RSW treatment.
  - pilot scale case study of bioreactor landfill combining soil infiltration system
  - on-site process for the bio-treatment using mesophilic two-phase anaerobic digestion combined with composting as well as decentralized composting
- Most RSW are discarded randomly, incinerated temporarily or dumped on the river banks and the roadsides

- A series of laws and regulations on environmental protection.
- Few were involved in RSW specifically.
- In 2005, the National People's Congress (NPC) incorporated RSW into the scope of public administrative for the first time——*Law of Environmental Pollution Prevention and Control Law of Solid Wastes*
  - the local government should formulate the specific measures for preventing and controlling environmental pollution of RSW according to local conditions.
- *Circular Economy Promotion Law.*
  - established a legal framework as well as emphasizes the detail guiding principles on Reduce, Reuse and Recycle (3R principle)
  - encouraged the establishment of classification, collection and recycling system of RSW
- *The regulations of Technique Code for Village Rehabilitation.*
- *Etc.*

## □ Related laws and regulations of RSW

# Legislation

laws and regulations	issued by	major related contents	main concerns
Environmental Pollution Prevention and Control Law of Solid Wastes (April 1, 2005)	National People's Congress (NPC)	<ul style="list-style-type: none"> <li>the specific measures for preventing and controlling environmental pollution of RDSW shall be formulated by local government.</li> </ul>	local government and provincial department of environmental protection
Circular Economy Promotion Law (January 1, 2009)	NPC	<ul style="list-style-type: none"> <li>encourage the establishment of RDSW classification, collection and recycling system (reduce, reuse and recycle), and promote RDSW recycling.</li> <li>make overall plan on the construction of facilities for waste between urban and rural areas.</li> <li>reasonably arrange the waste recycling network and market, support the recycling operators and business.</li> </ul>	local government and authorities, department of environmental protection, recycling operators and enterprises.
Technique Code for Village Rehabilitation (August 1, 2008)	Ministry of Housing and Urban-Rural Development (MOHURD)	<ul style="list-style-type: none"> <li>provide guidelines aimed at reuse and appropriate final disposal of RDSW.</li> <li>encourage the establishment of collection, transport of RDSW.</li> </ul>	local government and authorities
Implementation Plan about Promoting Solutions to Prominent Rural Environmental Problems (February 27, 2009)	Ministry of Environment Protection (MOEP), Ministry of Finance (MOF), National Development and Reform Commission (NDRC)	policy specifically support the key solutions to improve environmental quality of village, and RDSW treatment is one of the priority support areas.	local government and authorities

laws and regulations	issued by	major related contents	main concerns
Interim Measures for the Management of Special Funds for Environmental Protection in Rural Areas (April 21, 2009)	MOEP, MOP	<ul style="list-style-type: none"> <li>● Provide special funds to support the key solutions to improve environmental quality of village, and RDSW treatment is one of the priority support areas.</li> </ul>	local government and authorities
Technical Specifications of Domestic Pollution Control for Town and Village (January 1, 2011)	MOEP	<ul style="list-style-type: none"> <li>● Standardize the technical specifications of transport, recycling, treatment and disposal.</li> </ul>	local government and authorities, recycling operators and enterprises.
Guideline on Project Construction and Investment for Rural Garbage Classification & Click-Transport and Treatment (November 11, 2011)	MOEP	<ul style="list-style-type: none"> <li>● Detail guiding principles on classification, collection, transport of RDSW and project planning, approval, site selection, designing, construction, acceptance, operation, management during the RDSW disposal engineering.</li> </ul>	local government and authorities
Instruction on How to Improve Rural Living Environment (May 16, 2014)	General Office of the State Council (GOSC)	<ul style="list-style-type: none"> <li>● Accelerate the comprehensive rehabilitation of rural environment, emphasize the treatment of RDSW and sewage.</li> <li>● Implement the systematic planning, construction and management of RDSW and sewage in rural areas within county level.</li> </ul>	local government and authorities

## Decentralized multiple generation sources

- A dilemma of large amount of total generation at nationwide but decentralized across regions.
- Increased the costs in waste collection, transport, treatment and disposal.
- Informal collection and recycling still play a significant role in rural areas today
- Suitable technology is unavailable.
  - some have fatal drawbacks of geographical restrictions
  - high cost for operation or strong pertinence for one kind of waste
  - some can achieve benefit only under a certain processing scale
- RSW pollution is more serious than that of MSW.

## A poor infrastructure construction

- Refuse chute at roadsides for RSW collection is not enough at all.
- the phenomenon of *Garbage Besieging Villages* is often reported.
- Zhejiang province: achieved only 61.23% of the town coverage ratio of RSW transfer stations, and approximately 63% of centralized collection for RSW ratio by 2007.



## Imperfect legislation system

- Most of the legislations and administrative regulations designed intended to treat the MSW.
- National specific guidelines to execute published laws are absent in Chinese laws.
- The unclear responsibility mechanism makes it more ineffective in RSW management.
- Many equivocal words in the related laws and regulations of RSW.
- Like so much in China, the legislative process of environmental protection is always led by the government, while the part of public participation is often overlooked.

## Increasing financial resources

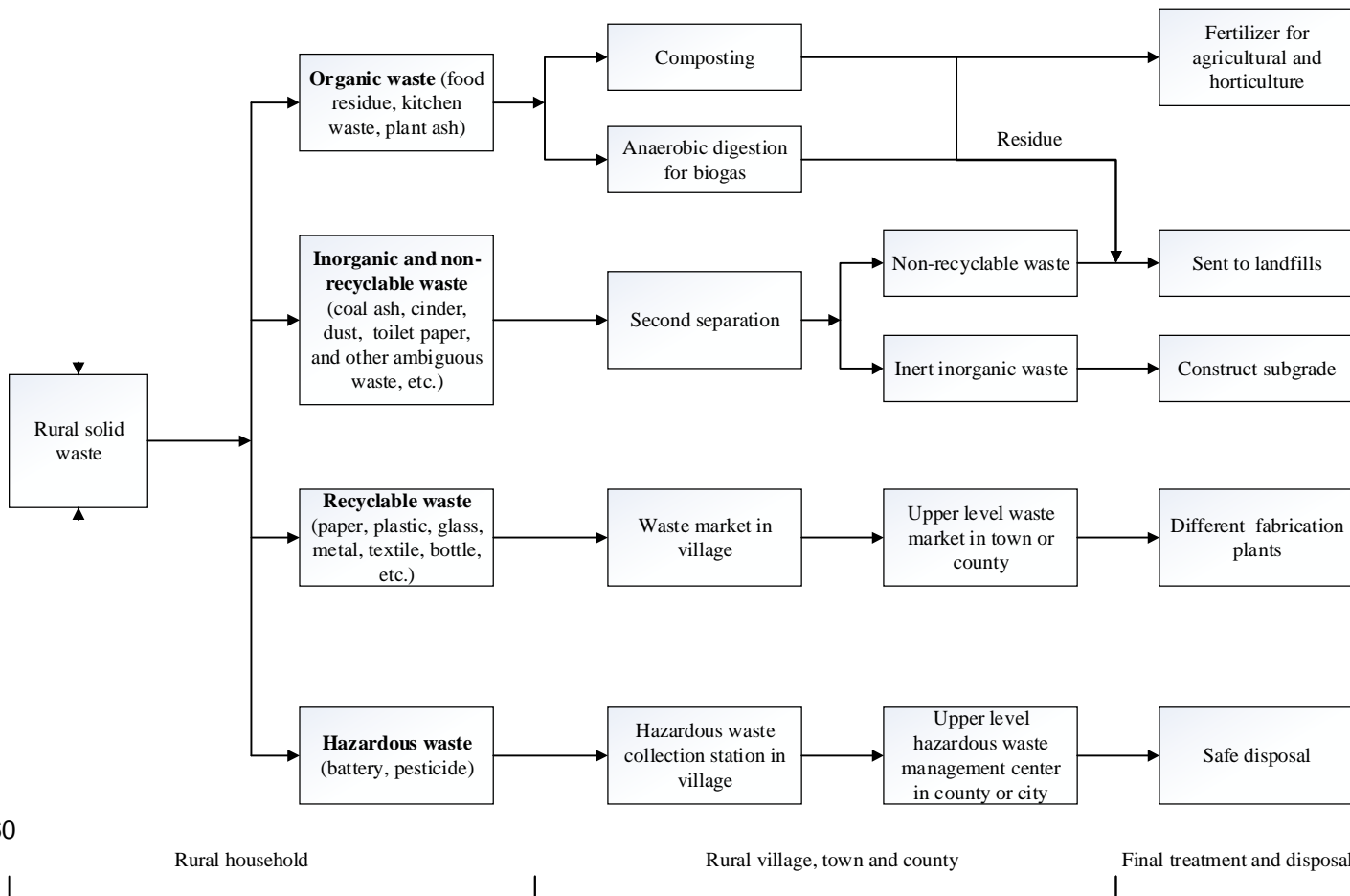
- Continual attentions and efforts should be paid, especially in relatively underdeveloped rural areas.
- National and provincial budgets should be continuously allocated to the local authorities.
- The financial capacities of Villagers' Committees need to be enhanced by providing more fiscal transfers from the upper-level government.
- The system of infrastructure facilities involving RSW collection, transportation and treatment is weak thus pollution caused by unsafe disposal of RSW must be cleaned up immediately.

## Establishing collection and transport network

- The RSW collection and transport network in town and village should be established to optimize the route and decrease the transport costs.
- Related infrastructures or facilities should be constructed and completed.
- It is an obligation for the government to improve the establishment of RSW facilities construction in rural areas.

## Promoting source classification and recycling

- Source classification should be a priority.
- Multiple encouraging policies need to be implemented.
- The standardization of waste market should be established in rural areas.



## Improving treatment technology

- RSW treatment technology is a complex uncertainty problem.
- Sanitary landfill will not be fully suitable for RSW in rural areas.
- Fundamental research of resource utilization options should be taken into full consideration of its suitability for local differences as well as technology performance.

## Conclusion

- China has recognized the critical situations of RSW and has devoted considerable efforts to promoting RSW management.
- RSW management is relatively developed.
  - the improvement of related laws and regulations, financial support and investment infrastructure
- RSW management system is now still small scale in parts of rural areas.
  - legal system limitations, practical technical assistance, rural residents' participations, local governments' implementations and actions
- RSW characteristics differ considerably across regions of China, since survey results of RSW generation rates range from 0.25 to 2.1 kg·(capita·d)<sup>-1</sup>.
- The fundamentally formal mode of *household classification, village collection, township transfer and county treatment* for RSW management has been partially established.
- Related laws and regulations on RSW are imperfect.
- source classification and waste recycling are regarded as effective methods to minimize the waste from the source



*Thanks for your attention!*

**Chao Zeng, Dongjie Niu, Youcai Zhao. A comprehensive overview of rural solid waste management in China. *Frontiers of Environmental Science & Engineering*. 2015. 9:949-961.**

**Chao Zeng, Dongjie Niu, Hangfen Li, Tao Zhou, Youcai Zhao. Public perceptions and economic values of source-separated collection of rural solid waste: A pilot study in China. *Resources, Conservation & Recycling*. 2016. 107:166-173.**