

EC2

Europe-China Clean Energy Centre
中欧清洁能源中心



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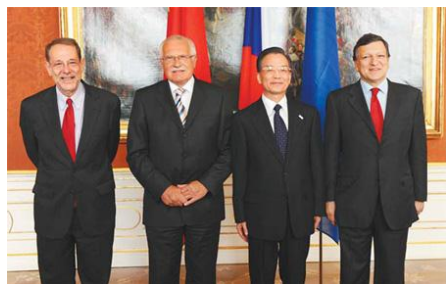
A Study of Potential and Constraints of the Biomass Sector in China



EU-China Cooperation on Clean Energy



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中欧清洁能源中心



11st EU-China Summit

20th May 2009

Energy Cooperation Priorities



Inauguration of the **Europe-China Clean Energy Centre**

30th April 2010

Promoters: European Commission, National Energy Administration (PRC), Ministry of Commerce (PRC)

Implementation: April 2010 – March 2015

Total budget: € 12.4 M

- ~ 9.5M EC contribution
- ~ € 2M Italian Ministry of Environment, Land and Sea



EC2 partners



POLITECNICO DI TORINO

Politecnico di Torino (POLITO) - Italy



Institute of Industrial Economics/ Chinese Academy of Social Sciences (IIE/CASS) - China



Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA) - France



CHALMERS
Chalmers University of Technology (CHALMERS) - Sweden



Centro Euro-Mediterraneo per i Cambiamenti Climatici (CMCC) - Italy



Energy Research Institute/National Development and Reform Commission (ERI/NDRC) - China



REGIONAL ENVIRONMENTAL CENTER
Regional Environmental Center for Central and Eastern Europe (REC) - Hungary



Tsinghua University (TSINGHUA) - China



Università della Calabria (UNICAL) - Italy



Italian Ministry for the Environment, Land and Sea (IMELS) - Italy



Chinese Renewable Energy Industries Association (CREIA) - China



INTESA SANPAOLO EURODESK
Intesa San Paolo Eurodesk (ISE) - Belgium



VIU
Venice International University
Venice International University (VIU) - Italy



Zhejiang China-Europe Low Carbon Economy Research & Cooperation Centre (ZJLCC) - China



EC2 overall Objective



To **support Chinese Government's** efforts to shape a more sustainable, environment-friendly and efficient energy sector

through access

to European policies, regulatory frameworks, technologies, relevant know-how and best practices



5 Focus Areas



CLEAN COAL



RENEWABLE SOURCES



BIOFUELS



ENERGY EFFICIENCY



SUSTAINABLE DISTRIBUTION SYSTEMS

Main Activities

- 1. Technological Platform for EU-China cooperation on clean energies**
- 2. Policy Advisory and Capacity Building**
- 3. Awareness Raising (project results and updates on focus areas)**



Objective and working plan

- **Objective:**

To assess the potential and constraints of the bioenergy sector in China

- **Working plan:**

Status through literature data and experts knowledge of:

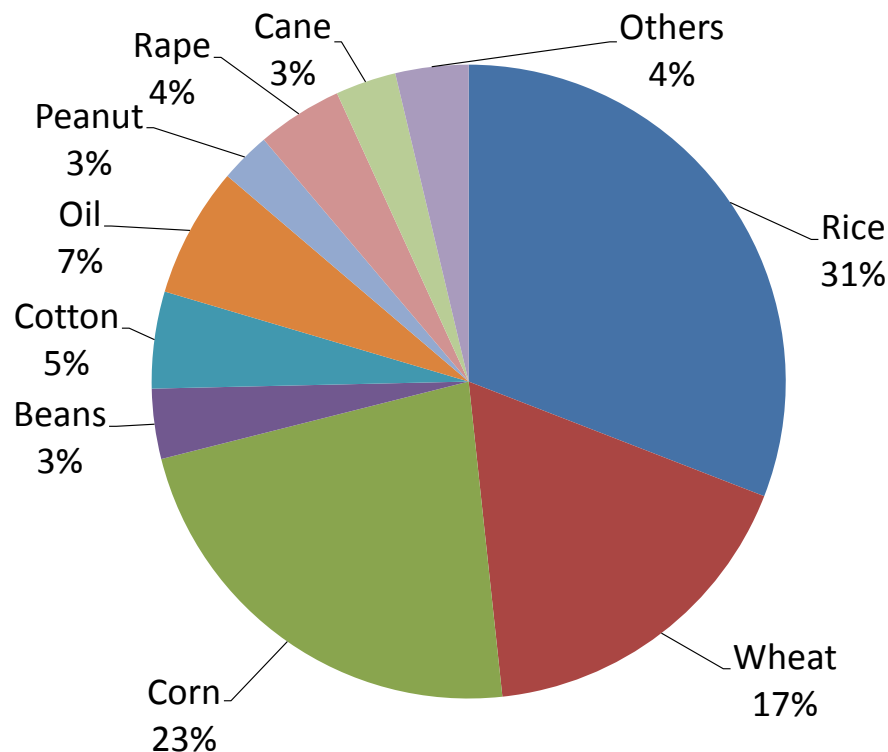
- Biomass potential
- Bioenergy technology

⇒ Proposals



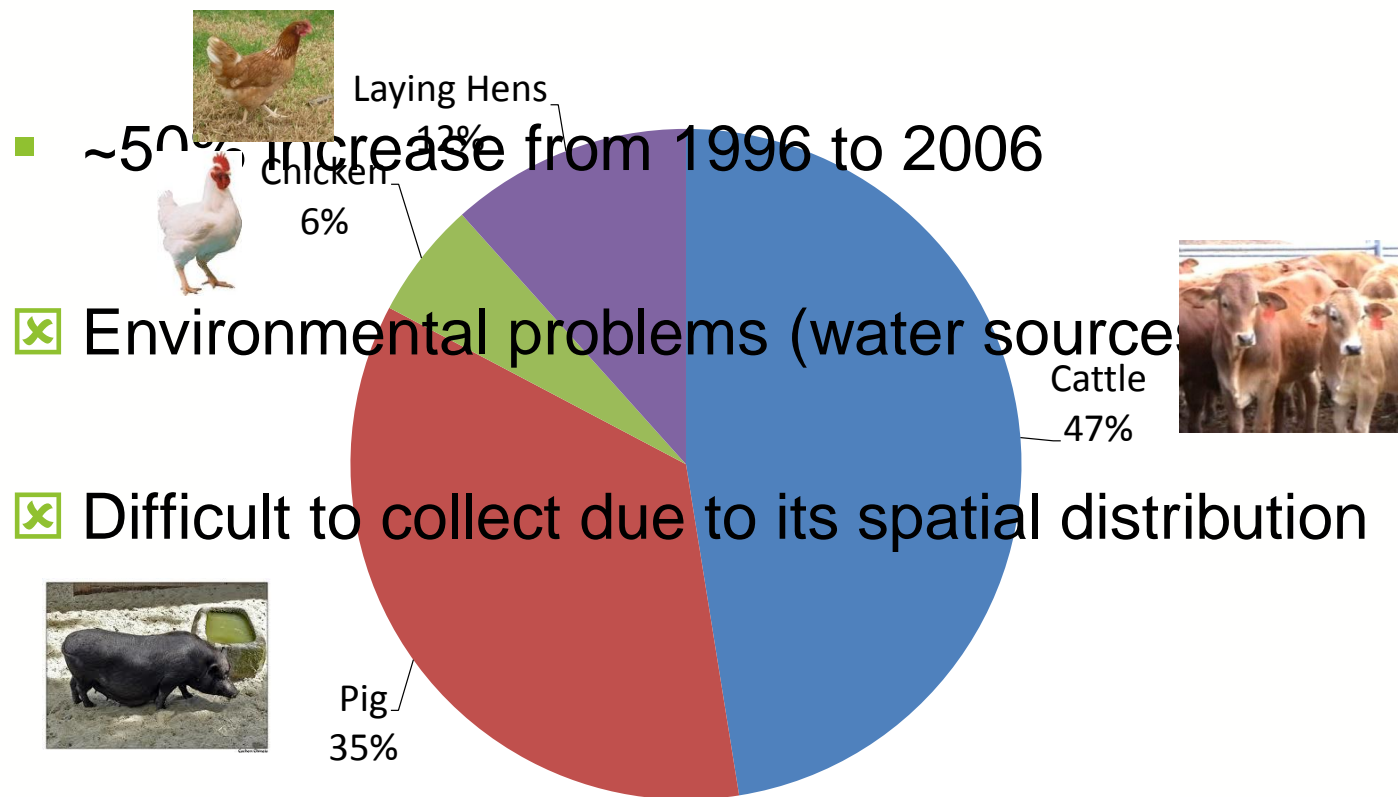
Agricultural by-products

- Total theoretical amount: **789 Mtons**
- Mostly from rice, corn and wheat



Manure resources

- Total available amount on dry weight: **232 Mtons**
- Mostly from cattle and pigs



Forestry residue resources

- Forest area: 175 Mha
 - ↳ Total amount of collectable wood resources: **12-50 Mtons**
 - Two origins:
 - residues from cutting and processing
 - management of forest
- ❑ Improvement required on technology for wood collection
- ❑ Over-cutting of forests?



Domestic waste

- Total amount: **15 Mtons**
- High increase during the last 30 years
- Mainly correlated with:
 - Population
 - Scale/number of cities
 - Income
 - Consumption level
 - Fuel-gas usage of people



Biomass plant resources

Plants rich in starch

corn, cassava, potato, wheat, barley, grain sorghum, sweet potatoes



Plants rich in sugar

sugar cane, sweet sorghum, sugar beet



Plants rich in cellulose, hemicelluloses and lignin

miscanthus, squirrel grass, willow, Yang fast-growing forests



Plants rich in oil

Soybean, rapeseed, sunflower, peanuts, palm, jatropha, oil Nan Capers, Green Yu-shu



- Still in experimental and demonstration phase
- Marginal lands: 24 Mha
- Potential amount (yield: 10 tons/ha): **240 Mtons**
- ☒ Competition with food

Assessment of biomass potential

Biomass type	Potential (Mtons)
Agricultural by-products	789
Plant resources	~240
Manure (dry)	232
Forestry residues	12-50
Domestic waste	15

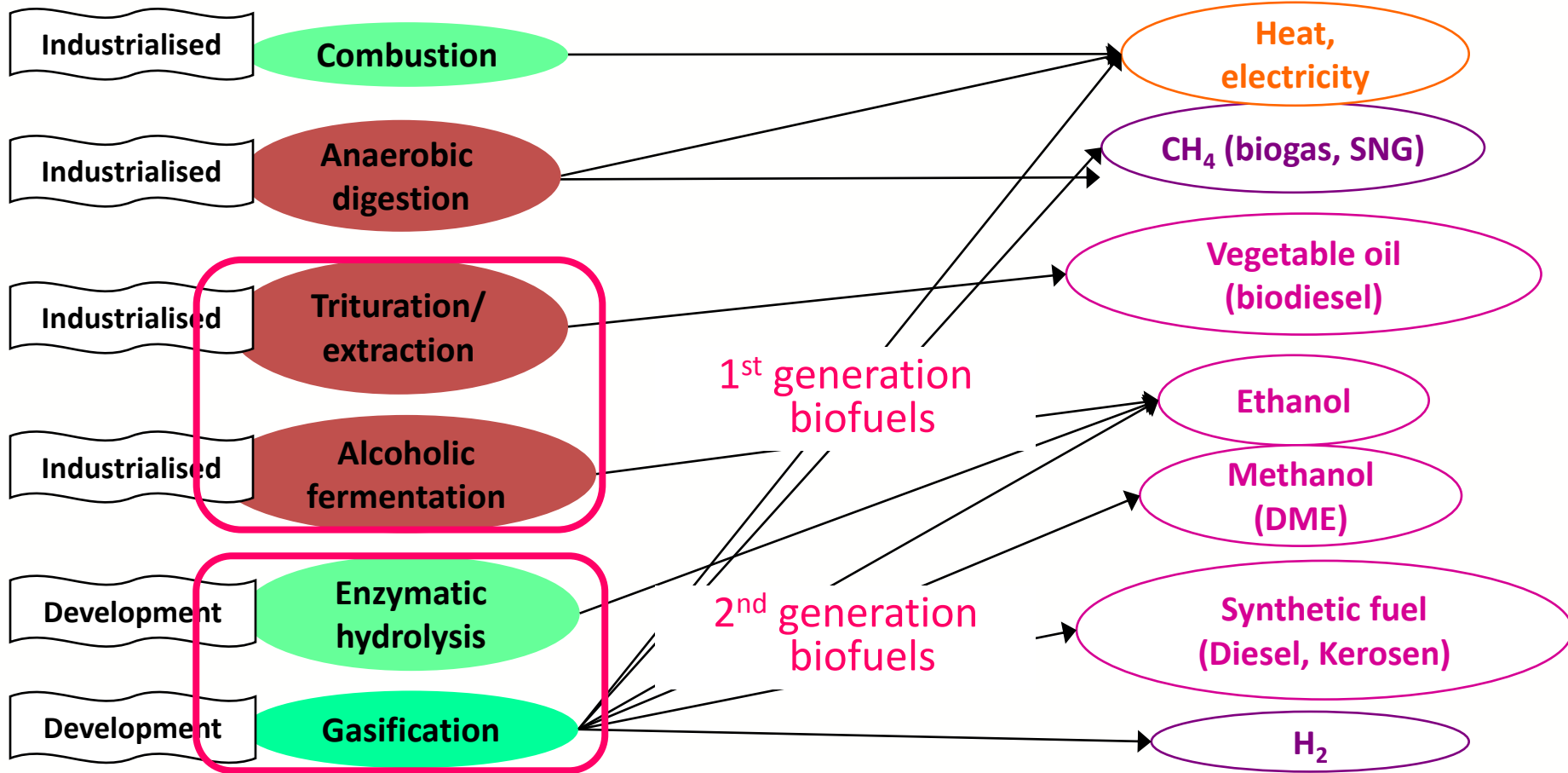
Total potential: ~1300 Mtons



How to use this huge potential in the best way?



Main bioenergy technologies



Wet biomass
Dry biomass (lignocellulosic)
Liquid fuel
Gaseous fuel
Other products



Combustion

- Mostly **biomass stoves** in rural areas for cooking and heating
- Thermal efficiency from 12% to >35%
- 2009: 400,000 high-efficiency and low-emission biomass stoves
- ☒ Source of environmental and health problems



- **Large-scale boilers:**
- Objective: to replace coal by biomass
- 50 M industrial boilers using coal...only 6 biomass boilers
- Co-combustion: encouraged but still late



Anaerobic digestion

- **Largely developed** and promoted by the Chinese policy
- Biogas projects to feed more than 10% rural households
- ✓ High potential due to:
 - The rural character of China
 - The very large amount of manure
- ✗ Large-scale units not developed due to the lack of reliable technology
 - Difficult to apply technologies from other countries to Chinese resources



1G biofuels

- **1G bioethanol:**
- Well-developed
- In 2009, total E10 production: 1.6 Mtons



- **Biodiesel:**
- Less developed: production ~0.1 Mtons
 - ↘ Inadequate incentive policies
 - ↘ Shortage of raw materials



2G conversion processes

- **R&D and demonstration units**

- **2G bioethanol:**

- R&D between Chinese and US universities



- **Gasification (pyrolysis):**

- Feedstock: mainly coal...but also rice husk or wheat straw
- Mostly stoves for cooking and heating
- High recent interest for more advanced applications: SNG
 - Lack of natural gas
 - Could replace up to 30% of the consumption



Proposals for the future



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- ➔ To improve the biomass **collection** system
- ➔ To increase the **R&D effort**
- ➔ To apply **technology from developed countries** to Chinese specificities
- ➔ To get a more **consistent global policy**
- ➔ To implement **standards and methods on safety and environmental pollution**



Conclusions



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Potential and constraints of bioenergy in China?

- **High biomass potential** constituted of:
 - Mainly agricultural biomass
 - Manure
- Still mostly used as in developing countries: **cooking** in rural areas
- But also **more advanced applications** now:
 - Biogas already largely developed at small scale
 - Interest for SNG by gasification
- **Needs** for the future:
 - To increase the R&D effort on technology
 - To get a global policy with emphasis on environmental aspects



Learn More

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Learn more about EC2 activities and download this Advisory Report by signing up for free to the ***EC2 Clean Energy Alliance Membership Programme*** on

www.ec2.org.cn

EC2 Clean Energy Alliance MEMBERSHIP PROGRAM

Europe-China Clean Energy Centre
中欧清洁能源中心

A hybrid initiative, providing support to the Chinese Government and key players in the energy sector

- TECHNOLOGY COOPERATION
- POLICY ADVISORY
- CAPACITY BUILDING
- AWARENESS RAISING

EC2 C1.2 Study of Potential & Constraints of the Biomass Sector in China
中国生物质能开发的潜力与障碍

EC2 C2.1 Guidelines and Recommendations on Integrating Scientific Tools in the Policy Making Process
关于在政策制定过程中引入科学工具的建议和指南

perspectives 清洁能源观察

Winds of change: Turning towards renewable energy sources
改变之风 —— 转向可再生能源

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