Ideas and strategies for China to pursue substitution of toxic and hazardous materials (products)

China Center for Information Industry Development of MIIT
Li Boyang, Doctor/associate professor

Hangzhou, March 25, 2013

Introduction of CCID

- **Ministry of Industry and Information Technology(MIIT):** Ministry under State Council. Also the administrative department taking charge of industries and communication industries. Established in 2008;
- **Department of Energy Saving and Comprehensive Utilization**: takes charge of the industrial energy saving and emission reduction, comprehensive utilizing the resources and cleaning production, etc.;
- **China Center for Information Industry Development(CCID):** Research institution directly under the MIIT;
- **Institute of Industrial Energy Conservation and Environment Protection:** Established in 2010, assists the work of the Department of Energy Saving and Comprehensive utilization in areas including energy saving industry, green and low-carbon industrial development, energy saving and emission reduction facilitated by combining informationalization and industrialization, etc.

Content

1, Necessity of substitution of toxics and hazardous substances;

2, Overall strategies and ideas;

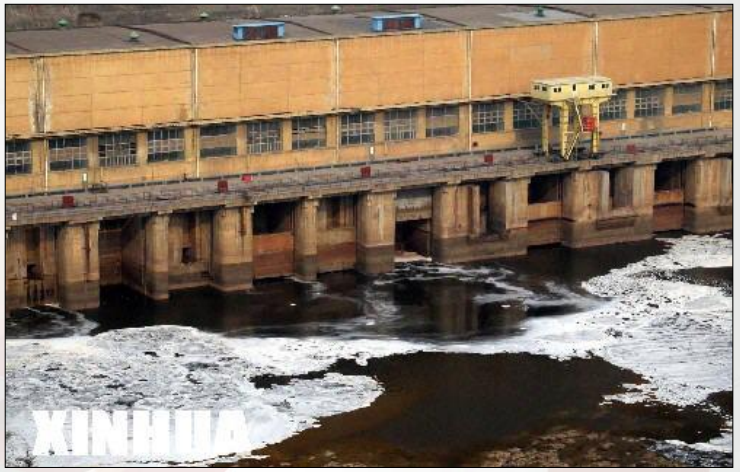
3, Submission, assessment and publication of the first list of alternative substances;

4, Significance and limitations of the list;

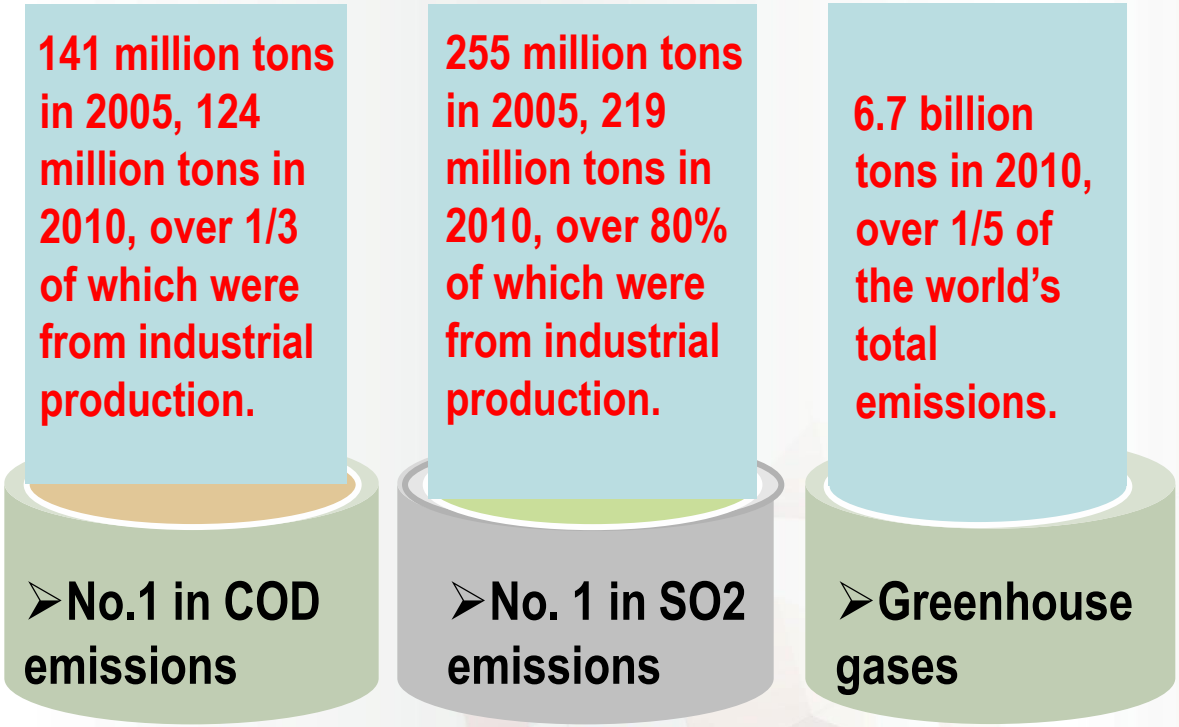
5, Works to do next.

1-1 Media Reports

- Luo Xiwen, Academician: 300 million *mu* (20 million hectares) of farmlands in China are threatened by heavy metal pollution;
- Zhong Nanshan, Academician: lungs of Guangzhou natives over the age 50 are black;
- Research on water pollution in China: 360 million people do not have safe water to drink.



1-2 Emission levels of pollutants remain high



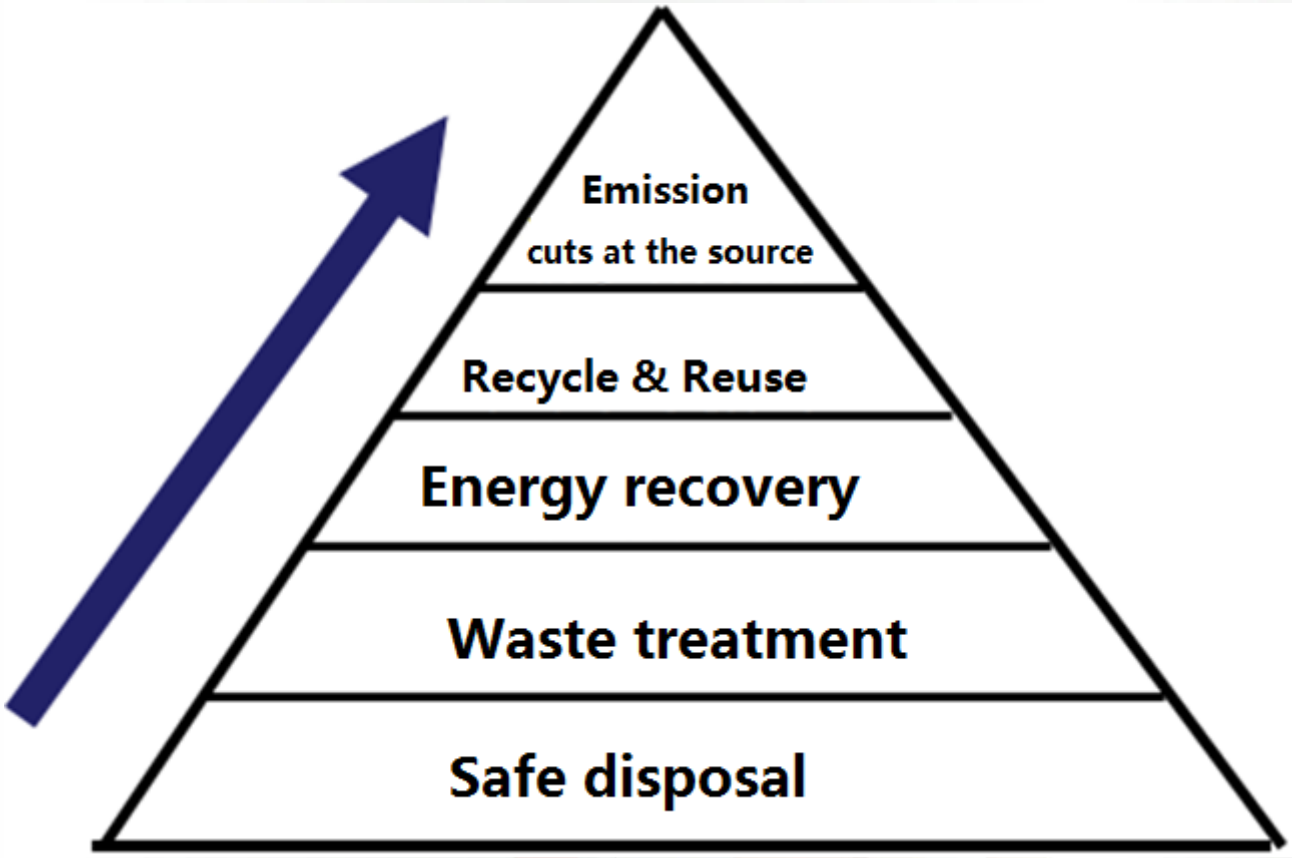
1-3 Dire situation for prevention of industrial pollution

- The overall level of prevention of industrial pollution is relatively low while the costs on the environment and natural resources remains high. Key industries, including heavy chemical industry, make significant contribution to the total industrial pollution and emission.
- Compliance with emission standards of enterprises is low.
- Industrial pollution is showing the trend of spreading from economically developed regions to less developed regions, and from urban centers to rural areas.
- Heavy metal pollution incidence of great magnitude and other environment emergencies are taking place frequently.
- Conventional environmental problems are not held back, whereas new environmental crises are looming large.

1–4 ”End-of-pipe Treatment” vs “Prevention at the Source”

- End-of-pipe Treatment, rather than prevent the generation of pollutants during production, deals with pollutants after production ends, in order to meet emission standards.
- High costs for remediating
- Technological difficulties
- Unable to reduce resource waste during production
- High costs on administrative supervision and management

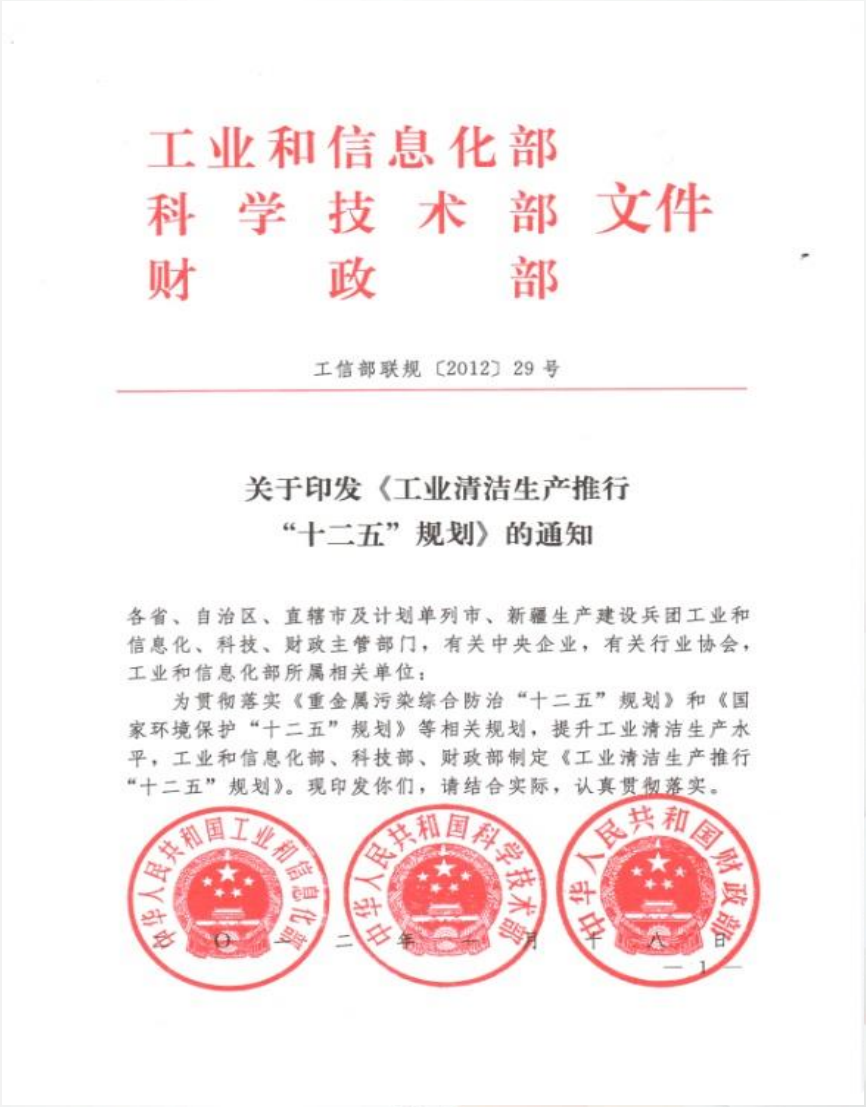
1-5 Optimization for pollution control



2-1Emphasis given by the Government

- 12th Five-Year Plan(FYP) for Environmental Protection
- 12th FYP for Heavy Metal Pollution Prevention and Control
- 12th FYP for Industrial Transformation and Upgrade Plan
- 12th FYP on Energy Saving and Environmental Protection Industry
- 12th FYP on Industrial Cleaner Production Implementation
- Plan of Prevention Control on: Hazardous Wastes, Persistent Organic Pollutants, etc.

2-2 Plan on Implementation of Cleaner Production



工业和信息化部
科学技术部 文件
财政部

工信部联规〔2012〕29号

关于印发《工业清洁生产推行“十二五”规划》的通知

各省、自治区、直辖市及计划单列市、新疆生产建设兵团工业和信息化、科技、财政主管部门，有关中央企业，有关行业协会，工业和信息化部所属相关单位：

为贯彻落实《重金属污染综合防治“十二五”规划》和《国家环境保护“十二五”规划》等相关规划，提升工业清洁生产水平，工业和信息化部、科技部、财政部制定《工业清洁生产推行“十二五”规划》。现印发你们，请结合实际，认真贯彻落实。

中华人民共和国工业和信息化部 中华人民共和国科学技术部 中华人民共和国财政部

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- In an effort to guide industrial sectors to full implementation of cleaner production, this plan is devised in accordance with the *Outline of the 12th Five-Year Plan for Economic and Social Development* as well as based on the practicality of clean production in industrial sectors.

2-3 Proposal of Substitution

目 录

- The main tasks of the 12th Five-Year plan on cleaner industrial production include: develop eco-friendly design for industrial products, improve technologies for cleaner manufacturing process, **launch substitution for toxic and hazardous materials (products)**.

2-4 Strategies and Principles

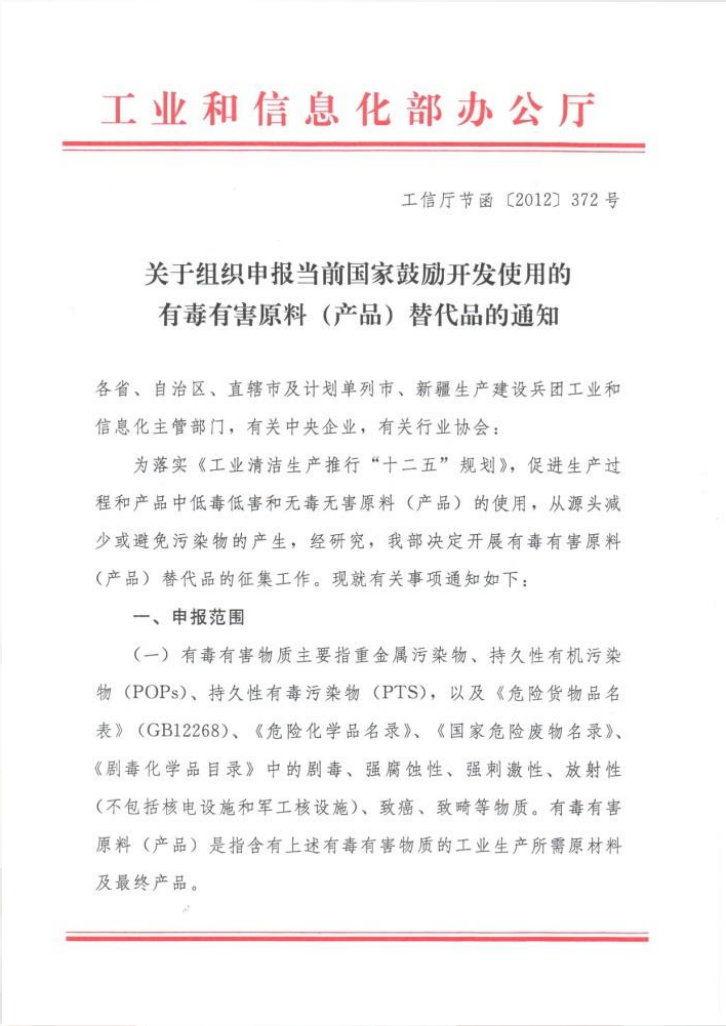
- Adhere to the principle of combining improving technology and expanding application
  - With the goal of reducing the amounts of heavy metals and hazardous pollutants, concentrate efforts on developing a batch of key clean production technologies that can be commonly used, and promoting the application of a batch of mature and practical technologies and low-hazardous, low-toxic or non-hazardous, non-toxic materials (products).

2-5 Strategic Importance of the Publication of the List

- A dearth of info on relevant technologies, products and the current situation of industrial development in China;
- Requirements of improvement on scientific decision-making;
- Necessity for raising public awareness of substitution;
- Laying a foundation for future policies.

3-1 Solicitation of Advice on Substitutes

- MIIT has launched the program to solicit advice on substitution for toxic and hazardous materials (products) in an effort to promote the use of materials (products) with low or no hazard/toxicity during the manufacturing process and cut down or cut off the pollutants at the source；
- Three key categories, i.e. **heavy metals**, **organic pollutants** and **pesticides**, are established for solicitation to reduce the use of toxic and hazardous substances, such as mercury, chromium, lead, cadmium, arson, cyanide, and POPs.



工业和信息化部办公厅

工信厅节函〔2012〕372号

关于组织申报当前国家鼓励开发使用的有毒有害原料（产品）替代品的通知

各省、自治区、直辖市及计划单列市、新疆生产建设兵团工业和信息化主管部门，有关中央企业，有关行业协会：

为落实《工业清洁生产推行“十二五”规划》，促进生产过程和产品中低毒低害和无毒无害原料（产品）的使用，从源头减少或避免污染物的产生，经研究，我部决定开展有毒有害原料（产品）替代品的征集工作。现就有关事项通知如下：

一、申报范围

（一）有毒有害物质主要指重金属污染物、持久性有机污染物（POPs）、持久性有毒污染物（PTS），以及《危险货物品名表》（GB12268）、《危险化学品名录》、《国家危险废物名录》、《剧毒化学品目录》中的剧毒、强腐蚀性、强刺激性、放射性（不包括核电设施和军工核设施）、致癌、致畸等物质。有毒有害原料（产品）是指含有上述有毒有害物质的工业生产所需原材料及最终产品。

3-2 Scope of Substitution

赛迪智库
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- **Toxic and hazardous substances** mainly include heavy metal pollutants, POPs, persistent toxic substances (PTS) and highly toxic, highly corrosive, radioactive (excluding nuclear power facilities or military nuclear facilities), carcinogenic and mutagenic substances included in List of Dangerous Goods (GB12268), Catalogue of Extremely Toxic Chemicals, National Hazardous Waste Inventory, and Catalogue of Hazardous Chemicals.
- **Toxic and hazardous materials (products)** are raw materials needed for manufacturing and the end product that contained the aforementioned toxic and hazardous substances.
- **Substitutes for toxic and hazardous materials (products)** (referred to as "substitutes" thereafter) are materials (products) with low hazards/toxicity or no hazard/toxicity in urgent need of development, promotion and application in order to reduce or prevent pollution at the source.

3-3 Key Categories

Heavy-metals-related	**Mercury**	Substitution for batteries, catalyses and fluorescent lamps containing mercury
	Chromium	For electroplating products, such as phosphorus/chromium/nickel-free pre-painting solution, cyanide/ formaldehyde-free or acid copper plating solution
	Lead	For Pb-free solders produced by electronic products and binary, ternary, or multicomponent alloys
	Cadmium	Cd-free lead-acid batteries
	Arsenic	Substitution for As-containing products used in pesticides, dyes and leather industry
Organic pollutants	**PFOS**	Substitution for PFOS-free chromic acid fog inhibitor used in electroplating industry, photoresist and anti-reflection coating used in semiconductor industry
	Chloride	Low-chloride-content raw material for steel sintering
	HBFR	Halogen-free brominated flame retardantsused in electronics products
	Volatile organics	Water-based paint in painting industry and non-solvent oil-based ink in printing industry
	DDT	Substitution for DDT in Marine anticorrosive paint
	PAHs	Substitution for PAH-containing products in plastic and rubber industry
	PCBs	Substitution for PCB-containing paints, additives, plastics and flame retardants
	SCCPs	Substitution for SCCP-containing water pipelines, floor boards, thin films, artificial leather, plastic products and daily necessities
Pesticides	**Persistent organic pollutants:** Substitution for pesticides containing POPs including DDT, Chlordane, Mirex, Aldrin, Dieldrin, Endrin, Heptachlor, Toxaphene, PFOS, Endosulfan and etc.	

3-4 Substitution Methods

- **Replacement:** On the condition that the performance or reliability of the original product is not affected, toxic and/or hazardous materials (products) are replaced with non-toxic and/or non-hazardous materials (products) where no new hazard or toxicity is generated;
- **Reduction:** On the condition that the performance or reliability of the original product is not affected, toxic and/or hazardous materials (products) are replaced with low-toxicity and/or low-hazard materials (products) where no new hazard or toxicity is generated.

3-5 Classification of substitutes

- The “developing class”, referring to the non-toxic, non-hazardous or low-toxic, low-hazardous alternatives that require urgent development.
- The “applied class”: referring to the promising non-toxic, non-hazardous or low-toxic, low-hazardous alternatives that are successfully developed but yet to be commercialized;
- The “established class”: referring to the mature alternatives that need wide-spreading and utility in the future.

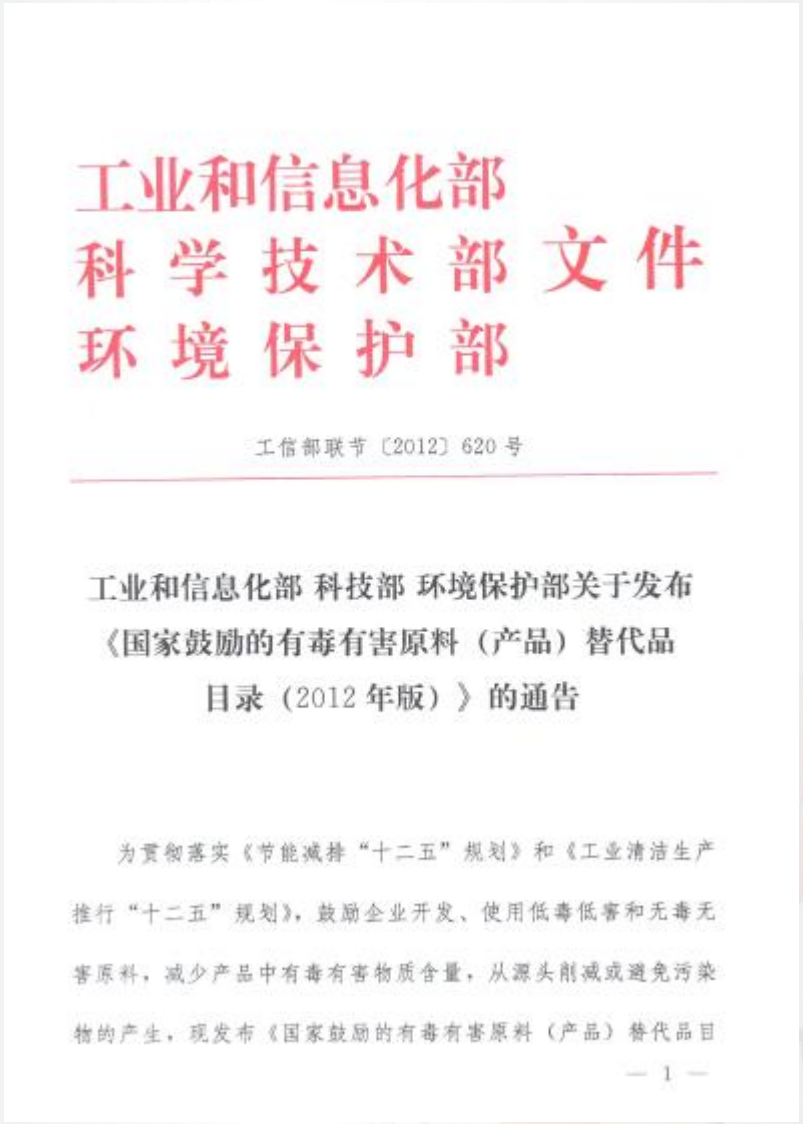
3-6 Key points to be included in submission

- Name of the alternative
- Key ingredient
- Hazard type: non-toxic, non-hazardous or low-toxic, low-hazardous.
- Field of application
- Status and prospect of application
- Manufacturing techniques
- Source of technology
- Substitution effect

3-7 Overview of Submission and Assessment Process

- Solicitation ended in late June;
- Altogether 305 submissions have been received;
- They cover more than 30 industrial sectors;
- Screening of submissions;
- Experts' assessment and evaluation;
- Online public disclosure;
- Consultation with the relevant departments;
- Joint publication of the list by three ministries: MIIT, MOST and MEP.

3-8 Overview of the List



工业和信息化部
科学技术部文件
环境保护部

工信部联节〔2012〕620号

工业和信息化部 科技部 环境保护部关于发布《国家鼓励的有毒有害原料（产品）替代品目录（2012年版）》的通告

为贯彻落实《节能减排“十二五”规划》和《工业清洁生产推行“十二五”规划》，鼓励企业开发、使用低毒低害和无毒无害原料，减少产品中有毒有害物质含量，从源头削减或避免污染物的产生，现发布《国家鼓励的有毒有害原料（产品）替代品目

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Classification	Number
The developing class	Heavy metals 3 Organic pollutants 9 Total 12
The applied class	Heavy metals 7 Organic pollutants 14 Pesticides 2 Others 3 Total 26
The established class	Heavy metals 12 Organic pollutants 18 Pesticides 8 Others 5 Total 43

4-1 Significance of the List

- It is a preliminary collection of basic information on relevant technologies, products and industrial developments in various sectors of China;
- Different encouraging measures can be implemented based on the phase of the technology and the product to ensure the efficiency of and the science of the measure;
- It is a promotion and education effort to raise the public awareness;
- It helps with the launching of future corresponding measures, e.g. strengthening of environmental supervision, enforcement of green-credit policy, and phase-out of backward production facilities.

4-2 Limitations of the List

- The measures are advisory rather than compulsory;
- The coverage is limited;
- Accuracy of information regarding alternatives' phase of implementation and field of application is hard to determine;
- The list concerns mostly materials and few products, due to lack of substitution technologies for products;
- Methods of keeping tabs on substitution are limited;
- It can be a guiding policy on environmentally friendly industrial upgrading, but it does not set limits for choices of technology.

5 Works to do next

- Release the next list depending on the development;
- Follow the trends of technologies and industries relevant to substitution, research and develop subsequent policies and measures;
- Promote the use of materials (products) with low hazards/toxicity or no hazard/toxicity during the manufacturing process;
- Research and devise elimination flow chart for key toxic and hazardous materials (products) depending on the circumstances;
- Promote eco-friendly designs for industrial products, reduce the environmental influences during products' life-cycle, provide more green products.

THANK YOU!

李博洋 (博士/副研究员)
Boyang Li (Doctor/associate professor)

工业和信息化部赛迪研究院（中国电子信息产业发展研究院）
工业节能与环保研究所
China Center for Information Industry Development of MIIT
Institute of Industry Energy Conservation and Environment Protection
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E-mail: lby7977@hotmail.com
liboyang@ccidthinktank.com
Tel: 010-68200723
Fax: 010-68200759
http://www.ccidthinktank.com