

Chemicals and Waste Management Beyond 2020 Series

COMMUNITY OF PRACTICE



**NATURE BASED SOLUTIONS
AND CLIMATE ACTION**



Session 1

Sound Management of Chemicals and Waste: Practicing Green Chemistry

04 March 2021, 09:00 - 10:30 am EST

Webinar organized by CoP Environment





TODAY'S SPEAKERS



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EU Chemicals Strategy for Sustainability

Presentation given in the webinar on
“Sound Management of Chemicals and Waste:
Practicing Green Chemistry”
organized by UNDP on 4 March 2021

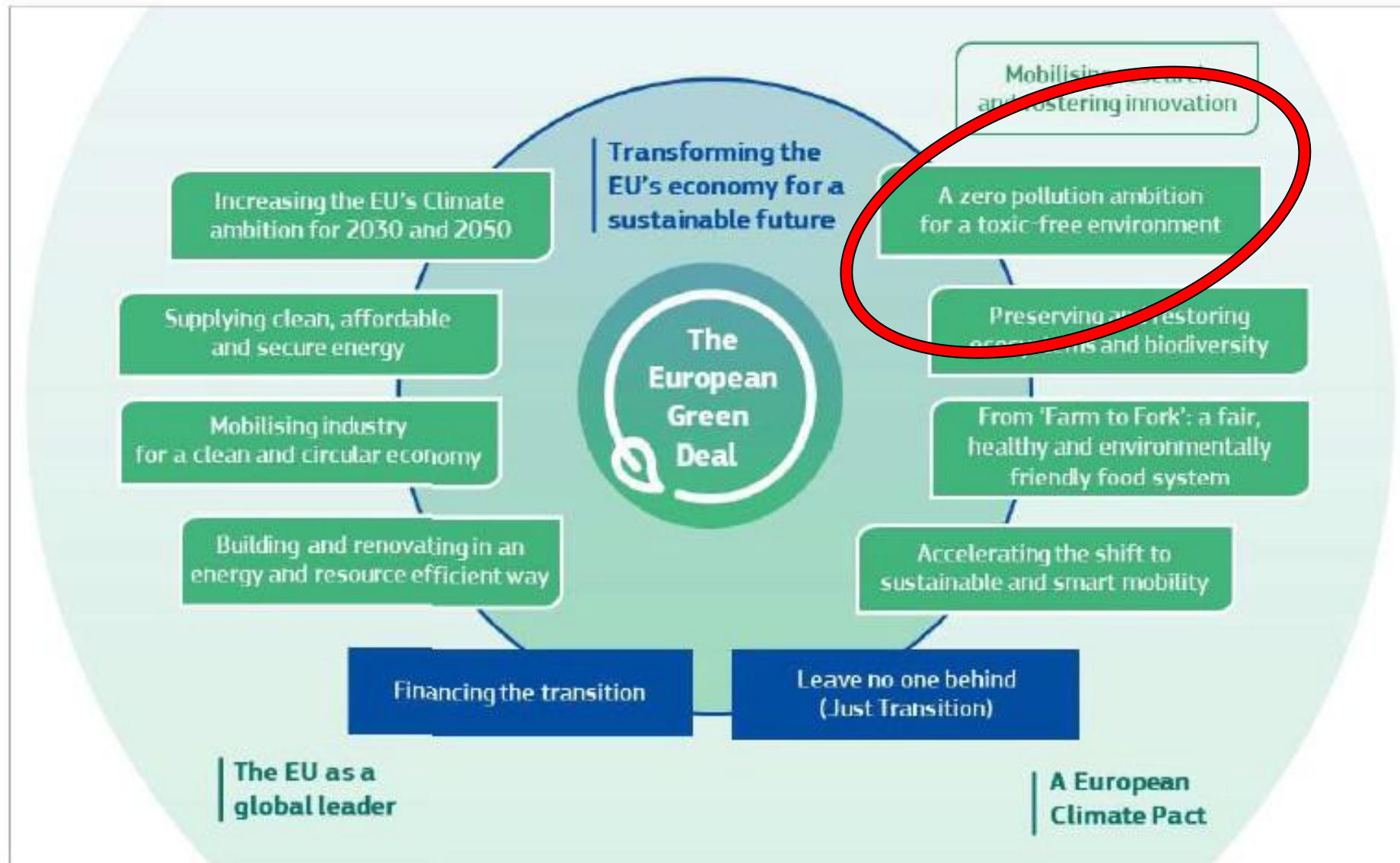
Juergen Helbig
European Commission
Directorate-General for Environment

#ChemicalsStrategy
#EUGreenDeal

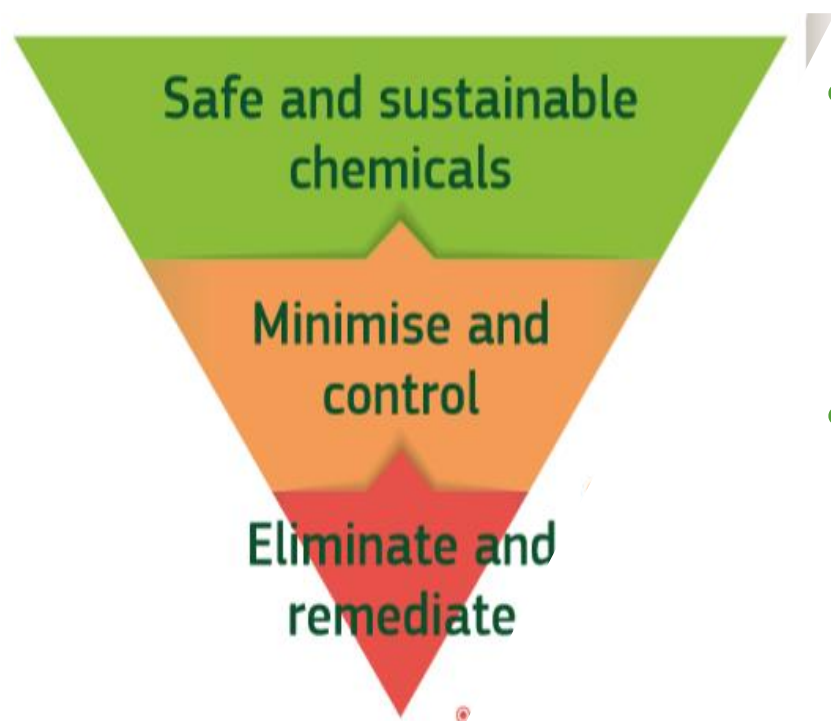


European
Commission

The European Green Deal



2030 vision – towards a toxic-free environment



- Chemicals are produced/used in a way that **maximises their benefits to society** while **avoiding harm to planet & people**
- Production and use of *safe and sustainable chemicals* becomes the EU market norm and a global standard

TOXIC-FREE ENVIRONMENT: 5 building blocks

Innovation,
competitiveness,
recovery

Strengthen
legislation for
better protection

Simplification &
coherence

Knowledge and
science

Global

Boosting innovation



- Develop EU safe and **sustainable-by-design criteria**
- **Provide funding for:**
 - **safe and sustainable by-design substances, materials and products**
 - **greening chemical production**
 - **access to risk finance**, in particular for SMEs and start-ups
- **Promote non-toxic material cycles & waste decontamination solutions**

Strengthening legislation



- **All chemicals** on the market to be used safely and sustainably.
- Substitute and minimise as far as possible **substances of concern**
- Avoid the **most harmful chemicals** in consumer products esp. for vulnerable groups

Endocrine
disruptors

PFAS

Mixtures

Environmental
impact

A comprehensive knowledge base

- Establish a EU research & innovation agenda for **chemicals**
- Promote **innovative testing and risk assessment methods** and their regulatory uptake
- **Improve knowledge on chemical properties** and uses
 - by requiring more information
 - by tracking substances of concern in products/materials
- **Human and Environmental (Bio)-monitoring**
- **EU early warning and action system** for chemicals
- Framework of **indicators** to monitor impacts of chemicals



Setting the example globally

- **Global strategic objectives and targets** beyond 2020
– meet 2030 goals for sound chemicals management
- Promote the use of the **Globally Harmonized System of Classification and Labelling of Chemicals (GHS)** and propose new hazard classes
- **Common standards** and innovative assessment tools internationally (OECD)
- Sound management of chemicals **in international cooperation**
- Chemicals **banned in the EU not for export**



Thank you!!!

EU Chemicals Strategy for Sustainability

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Federal Ministry
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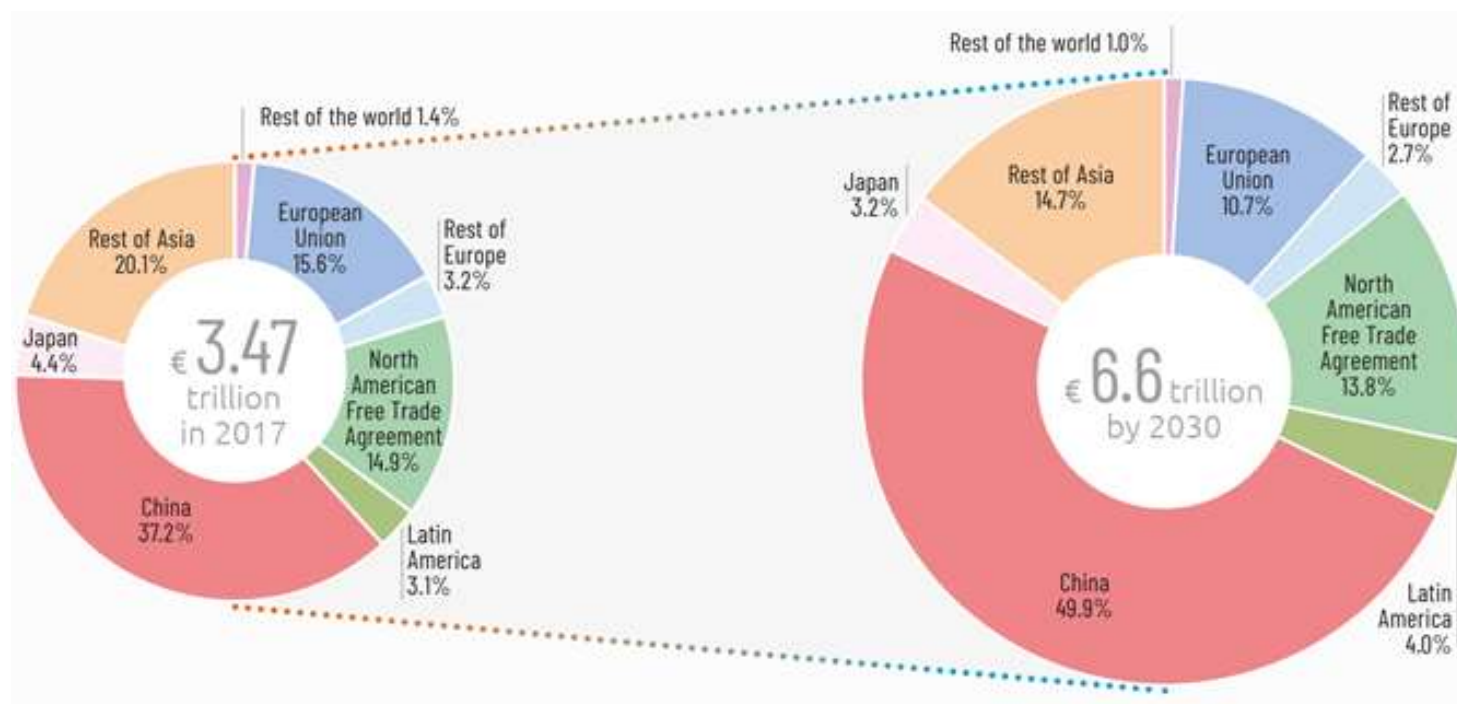
Policy and Regulation for sustainable chemicals management / green chemistry

Dr. Jutta Emig

Federal Ministry für the Environment, Nature
Conservation and Nuclear Safety



GCO II: projection on chemicals sales



Global chemical sales (excluding pharmaceuticals) are projected to grow from EUR 3.47 trillion in 2017 to EUR 6.6 trillion by 2030. Asia is expected to account for almost 70 per cent of sales by then.

(adapted from European Chemical Industry Council 2018, p. 34)



Poorly used and managed chemicals are threats to human health and environment



- 2015: three times more people died from environmental pollution than from AIDS, tuberculosis or malaria combined
- 2020: approx. 800 million children suffer from significantly elevated lead blood levels
- the actual numbers of premature deaths and illnesses may still be vastly underestimated



SDG 12

Ensure Sustainable Production and Consumption Patterns



Target 12.4

By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment



Sustainable Chemistry

Is expected to offer solutions to achieving the Goals of the 2030 Agenda and satisfying societal demands

- ➡ Zero Hunger
- ➡ Affordable and Clean Energy
- ➡ Sustainable Cities and Communities
- ➡ Decent work and economic growth
- ➡ Climate Action
- ➡ No Poverty



Sustainable Chemistry

Builds on:

- Precautionary Approach
- Regulation and institutional arrangements for a sound management of chemicals and waste
- Collaboration and Transparency
- Education and Research for Sustainable Development
- Sustainable and Responsible Innovation



The International Sustainable Chemistry Collaboration Centre

- The ISC3 aims to shape the transformation of the chemical sector towards sustainable chemistry.
- For the ISC3, the key activity fields for achieving this transformation are **Collaboration, Innovation, Education, Research, and Information.**



Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety



For further information please visit:

www.isc3.org

UNDP webinar 4th March

Chemicals and Waste Management beyond 2020

Swedish chemical policy and priorities

Sofia Tingstorp, Ministry of the Environment Sweden



Challenges

- Hazardous substances spread by air water and via products.
- Protecting children and young people in everyday life.
- Less than 0.1 per cent of chemicals with known intrinsic health hazards are regulated throughout their lifecycle.
- Many countries still lack capacity for a sound chemicals and waste management.



Essential elements on sound management of chemicals

We need

- Generation of knowledge in all countries that producing chemicals and global mechanisms for sharing of data.
- Transfer of information, applying the GHS system and information on chemicals in products
- Phase out of the most hazardous substances
- Secure implementation of precautionary chemicals control worldwide (legislation, cost recovery mechanisms)



We need to work together globally

Chemicals respect no borders

National legislation on chemicals and waste not enough.

Importance of the SAICM Beyond 2020 process

High ambition alliance on chemicals and waste



Read more

- [Circular economy – Strategy for the transition in Sweden - Government.se](#)
- [Guidance on chemicals control contributing to national progress and safety | UNEP - UN Environment Programme](#)
- Sustainable financing of institutional capacity for chemicals control
[Report \(kemi.se\)](#)





Green and sustainable chemistry

John Munthe



What is Green Chemistry?

- Introduced by P. Anastas and J. Warner in 1998*
- 12 principles for safe and sustainable production and use of chemicals
- Developed as an alternative to traditional chemistry (trad chemistry focus of producing chemicals for single specific application)
- Applied in education, research and practice to support change of knowledge base to include environment and sustainability
- Life cycle perspective important – consider risks of chemical exposure and effects in production, use and disposal/recycling stages.

*Green Chemistry: Theory and Practice Paul T. Anastas and John C. Warner, Oxford University Press 1998















Green and sustainable chemistry



The 12 Principles of GREEN CHEMISTRY

Green chemistry is an approach to chemistry that aims to maximize efficiency and minimize hazardous effects on human health and the environment. While no reaction can be perfectly 'green', the overall negative impact of chemistry research and the chemical industry can be reduced by implementing the 12 Principles of Green Chemistry wherever possible.

1. WASTE PREVENTION  Prioritize the prevention of waste, rather than cleaning up and treating waste after it has been created. Plan ahead to minimize waste at every step.	7. USE OF RENEWABLE FEEDSTOCKS  Use chemicals which are made from renewable (i.e. plant-based) sources, rather than other, equivalent chemicals originating from petrochemical sources.
2. ATOM ECONOMY  Reduce waste at the molecular level by maximizing the number of atoms from all reagents that are incorporated into the final product. Use atom economy to evaluate reaction efficiency.	8. REDUCE DERIVATIVES  Minimize the use of temporary derivatives such as protecting groups. Avoid derivatives to reduce reaction steps, resources required, and waste created.
3. LESS HAZARDOUS CHEMICAL SYNTHESIS  Design chemical reactions and synthetic routes to be as safe as possible. Consider the hazards of all substances handled during the reaction, including waste.	9. CATALYSIS  Use catalytic instead of stoichiometric reagents in reactions. Choose catalysts to help increase selectivity, minimize waste, and reduce reaction times and energy demands.
4. DESIGNING SAFER CHEMICALS  Minimize toxicity directly by molecular design. Predict and evaluate aspects such as physical properties, toxicity, and environmental fate throughout the design process.	10. DESIGN FOR DEGRADATION  Design chemicals that degrade and can be discarded easily. Ensure that both chemicals and their degradation products are not toxic, bioaccumulative, or environmentally persistent.
5. SAFER SOLVENTS & AUXILIARIES  Choose the safest solvent available for any given step. Minimize the total amount of solvents and auxiliary substances used, as these make up a large percentage of the total waste created.	11. REAL-TIME POLLUTION PREVENTION  Monitor chemical reactions in real-time as they occur to prevent the formation and release of any potentially hazardous and polluting substances.
6. DESIGN FOR ENERGY EFFICIENCY  Choose the least energy-intensive chemical route. Avoid heating and cooling, as well as pressurized and vacuum conditions (i.e. ambient temperature & pressure are optimal).	12. SAFER CHEMISTRY FOR ACCIDENT PREVENTION  Choose and develop chemical procedures that are safer and inherently minimize the risk of accidents. Know the possible risks and assess them beforehand.

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What can we learn and apply from green chemistry?

- Assess hazards and risks of new chemicals and new materials before introduction in production and market
- Examples of actions:
 - Apply developing knowledge-base and experiences from global sources (databases), models and experimental test methods.



What can we learn and apply from green chemistry?

- Substitute hazardous chemicals in use today – minimize hazards associated with intended function.
- Examples of actions:
 - Systematic methods for substitution are available



What can we learn and apply from green chemistry?

- Set criteria for contents of potentially hazardous chemicals in materials and products to ensure proper management and use.
- Examples of actions
 - Design criteria
 - Pressure on providers and producers



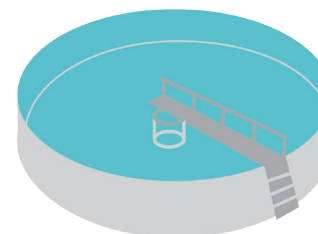
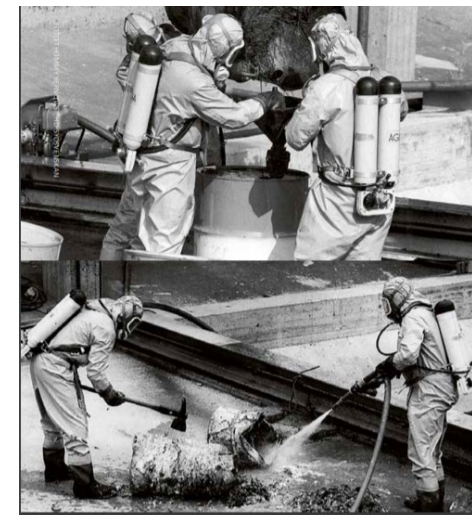
What can we learn and apply from green chemistry?

- Remove hazardous substances from circular material flows
- Examples of actions
 - Identification of products/materials containing hazardous substances from waste/recycling material flows
 - Take action – remove and ensure safe disposal, destruction
 - Enhance recycling of critical materials (metals, plastics etc).



What can we learn and apply from green chemistry?

- Remediation of contamination in society – safe disposal/destruction
- **Track and document production/import, use, exposure, emissions of potentially hazardous substances.**



Regulatory aspects

- Global conventions and agreements
 - SAICM; Stockholm Convention; Minamata Convention
- EU – many different regulations
 - Targeting the use of chemicals: *REACH* - (EC/1907/2006); *Biocidal Products Regulation* (EC/528/2012); *Cosmetic Products Regulation* (EC/1223/2009) *Plant Protection Products Regulation* (EC/1107/2009)
 - Targeting the protection of ecosystems: WFD - Water Framework Directive (2000/60/EC); Urban Waste Water Treatment Directive (91/271/EEC);
- EU Chemicals strategy*
 - The EU's chemicals strategy for sustainability towards a toxic-free environment
 - Chemicals are essential for the well-being of modern society but most chemicals have hazardous properties which can harm the environment and human health.
 - The EU already has sophisticated chemicals laws in place, but global chemicals production is expected to double by 2030. The already widespread use of chemicals will also increase, including in consumer products.



Conclusion

A holistic approach taking into account Green chemistry and the Sustainable Development Goals is needed to protect human health and the environment from hazardous chemical exposure

Many existing problems need to be solved

- Removal of POPs, mercury from societal use (products, materials) – reduce emissions to air, water
- Remediation of contaminated sites
- Safe disposal of hazardous substances
-

The Mistra SafeChem vision: To enable and promote the expansion of a safe, sustainable and green chemical industry in Sweden

- and cooperation on a global scale!

A 4 + 4 yr. research programme targeting green chemistry with a holistic approach to chemicals.

By working on new synthesis processes, tools for improved risk-assessment and life cycle management the scientists hope to predict and avoid risks already in a design phase.

www.mistrasafechem.se

INDUSTRY PARTNERS



RESEARCH PARTNERS



FINANCIER



Thank you

John Munthe (john.munthe@ivl.se)
IVL Swedish Environmental Research Institute



Global Environment Facility



**Ministry of Industry and Trade
Vietnam Chemicals Agency**



**United Nations
Development Programme**

Application of Green Chemistry in Vietnam to support green growth and reduction in the use and release of POPs and other harmful chemicals

-

SHARING RESULTS

Vietnam, February - 2021

Project information

Implementing partner (NIP)

- MOIT (VINACHEMIA and Sustainable Department Office)

Duration

- 2018-2021 (4 years)

Budget

- GEF seed fund 1,999,800 USD
- 8,400,000 USD co-financing required (UNDP in-kind for project M&E, Govt, JICA, and others)

Long and short term objectives

- 1.Reduction of the use and release of chemicals listed under Stockholm (POPs) and Minamata Conventions (Mercury);
- 2.Improve the efficiency of energy and of the use natural resources;
- 3.Reduction of green house gas (GHG) as co-benefits in the industrial sectors and sub-sectors supported by the project.



Long term objectives

- 1.To create the enabling environment for the application of GC in Vietnam;
- 2.To introduce GC applications and benefit to decision makers, public and industrial sectors/sub-sectors;
- 3.To demonstrate GC actions or technologies aimed at reducing the use and /or releases of POPs and mercury in two manufacturing sectors



Short term objectives

Baseline situation on GC in Vietnam

Baseline – general considerations

Green Chemistry approach not fully implemented in Vietnam

Gaps on the regulated list of chemical still persist

MSDS and labels of imported products often incomplete

Many industrial sectors still fragmented in small scale factories (SMEs)

POPs or POPs precursors very likely still imported

Baseline: Key strategies and plans related to green chemistry

Vietnam Green Growth strategy

- May provide a positive entry point for green chemistry development even though the concept might still be unfamiliar to many stakeholders.

Sustainable Development Strategy for 2011-2020

- Priorities are to achieve sustainable economic development; Implement Green Growth through a step by step approach; and develop clean and renewable energy and implement sustainable production and consumption.

National Action Plan (NAP) on Green Growth (2014 – 2020)

- (a) Reducing GHG emissions and promoting the use of clean and renewable energy;
- (b) Green production; and
- (c) Green lifestyle and promotion of sustainable consumption.

Baseline: Policy and regulation gaps

List of restricted chemicals

- Some POPs not yet listed among the restricted chemicals: need of an amendment (ongoing under POPS and Sound Harmful Chemicals Management Project)

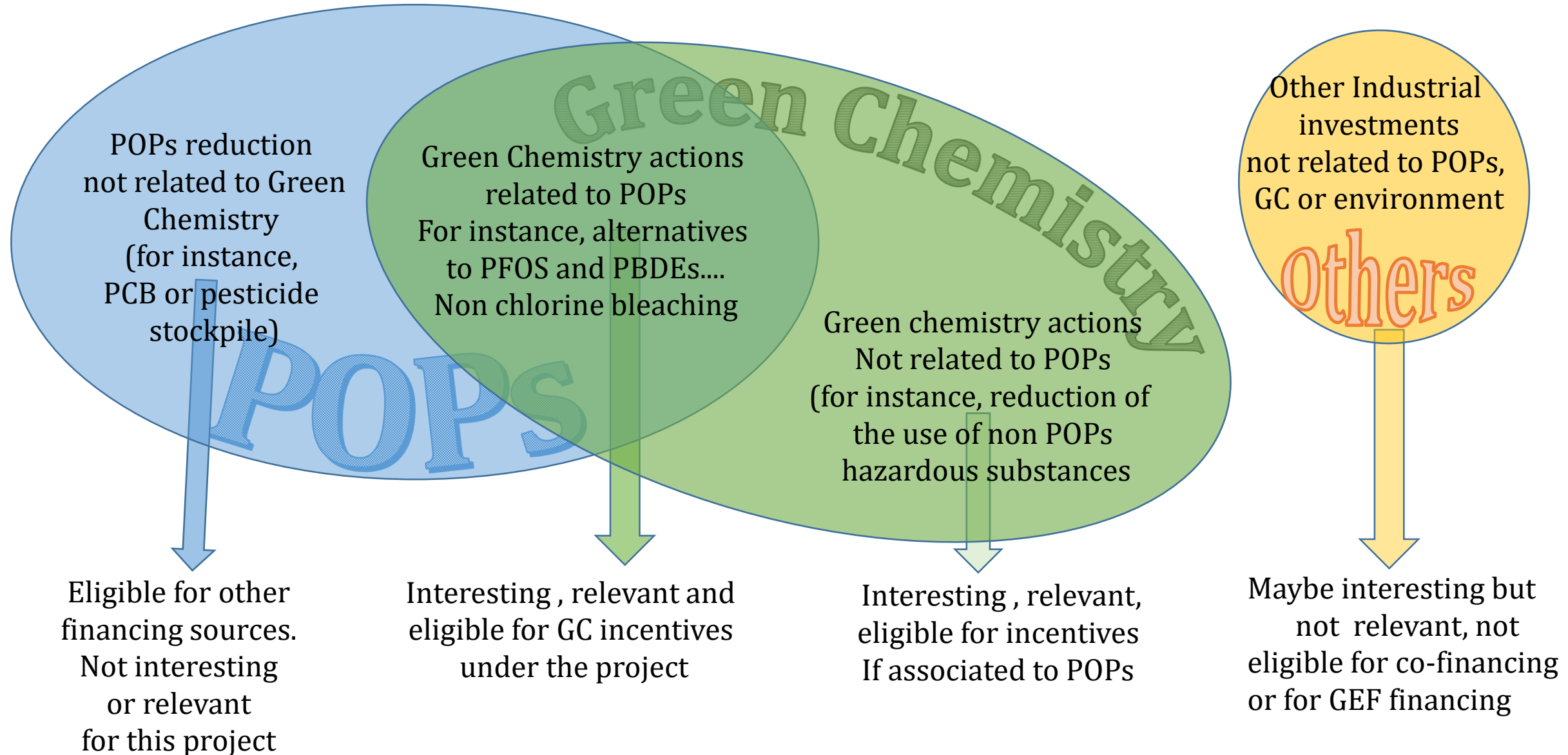
Labels and Safety Data Sheets for Mixtures

- Very little enforcement of the requirement for Safety Data Sheets for commercial mixtures
- Very often the content of these mixtures is unknown, therefore industries may buy mixtures containing hazardous chemicals without being aware of that.

BAT / BEP implementation

- There are no mechanism for BAT / BEP verification and enforcement in Vietnam

Linkage between POPs and GC



Selected sectors and related POP substances



Electro- chrome plating

- (PFOS)

Plastic

- (PBDE, U-POP emission to air)

Textile

- (U-POPs, Deca-PBDE)

Pulp and Paper

- (U-POPs)

Solvents and Paint

- (SCCP, deca-PBDE, Mercury)

Pesticides

- (DDT, Lindane, Endosulfan, Mercury)



PROPOSAL

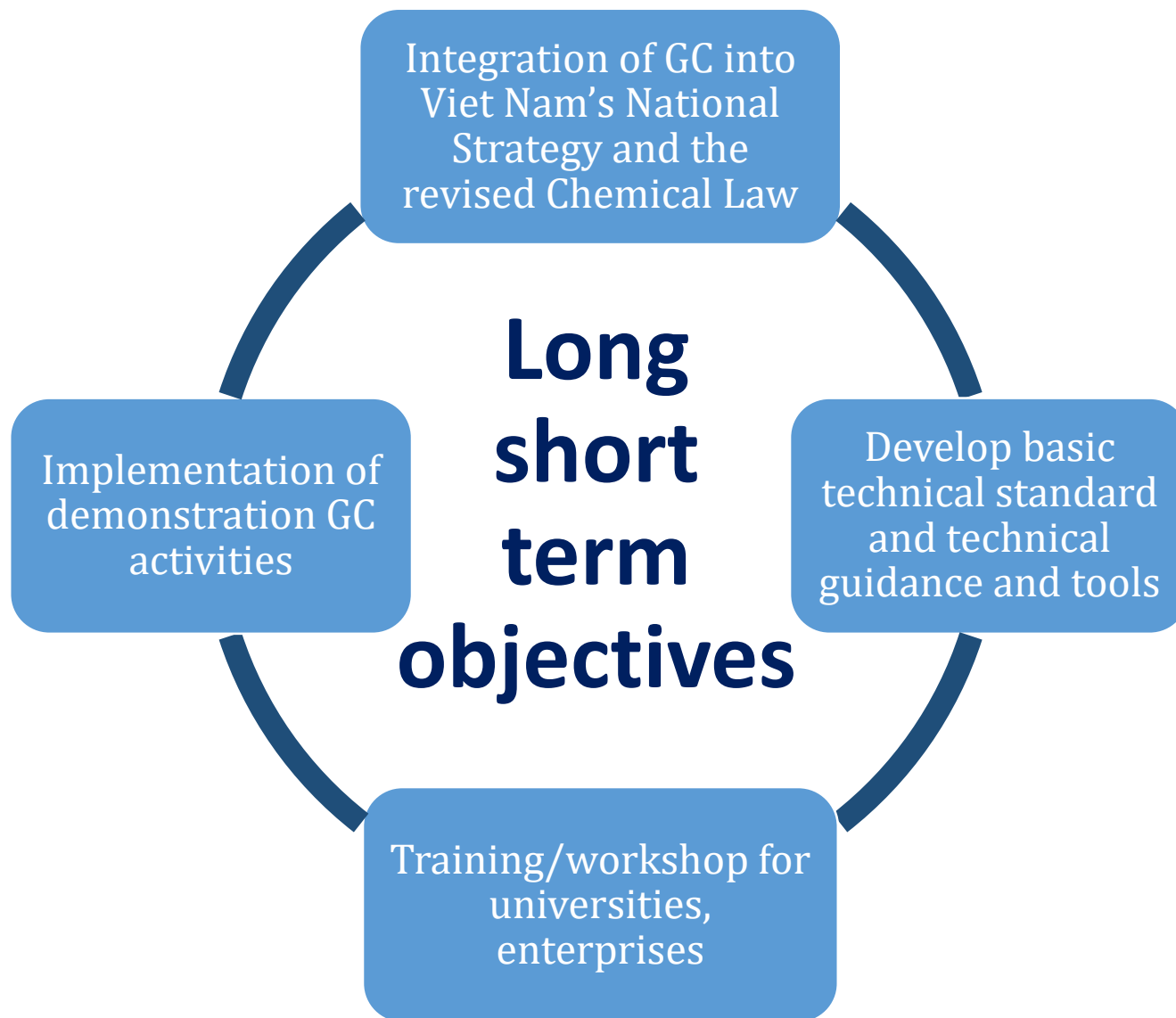
TO APPLY

GC

PRINCIPLES



Tools & Practical supports



Results

1. Developing the Enabling Environment for Green Chemistry in Vietnam

- Training of individuals and Training of Trainers performed. (at least 20 persons trained to be trainer) balanced among genders.
- Green Chemistry Incentive Scheme designed and adopted
- A network of GC expert established, with proper balance among genders

Results

2. Promote Awareness on Green Chemistry and the benefits of the application of Green Chemistry and its guiding principles

- Green chemistry awareness raising material, prepared for each relevant sector taking into account specific needs for women and TV broadcasted in coordination with Vietnam Television.
- Two awareness raising workshop with the participation of at least 60 representatives from all the industrial sectors carried out with a proper balance among genders
- CSR initiative designed and implemented by at least one industrial sector.
- MOIT TC Green Chemistry training, based on extra-curricular lectures, implemented and started at the MOIT technology Center , ensuring equal opportunity to access job and trainings
- One exhibition including workshop on GC technologies with bilateral support completed.

Results

3. Introduce Green Chemistry approaches into priority sectors and at least 2 entities

- Plan for reducing PFOs from selected industries with cost-effectiveness analysis and targets
- Plan for reducing POP-PBDEs and PBBs from selected industries with cost-effectiveness analysis and target
- Plan for reducing U-POPs- from selected industries with cost-effectiveness analysis and target
- At least **1 ton of POPs** (C-PBDE, PFOS, SCCP, pesticides) and **2 kg of Mercury** reduced from selected industries
- **15 g TEq/y of U-POPs** reduced from selected industries. Equal opportunity given to male and female experts in the GC and POPs area.

Results

TRAINING WORKSHOP: Green chemistry and corporate social responsibility

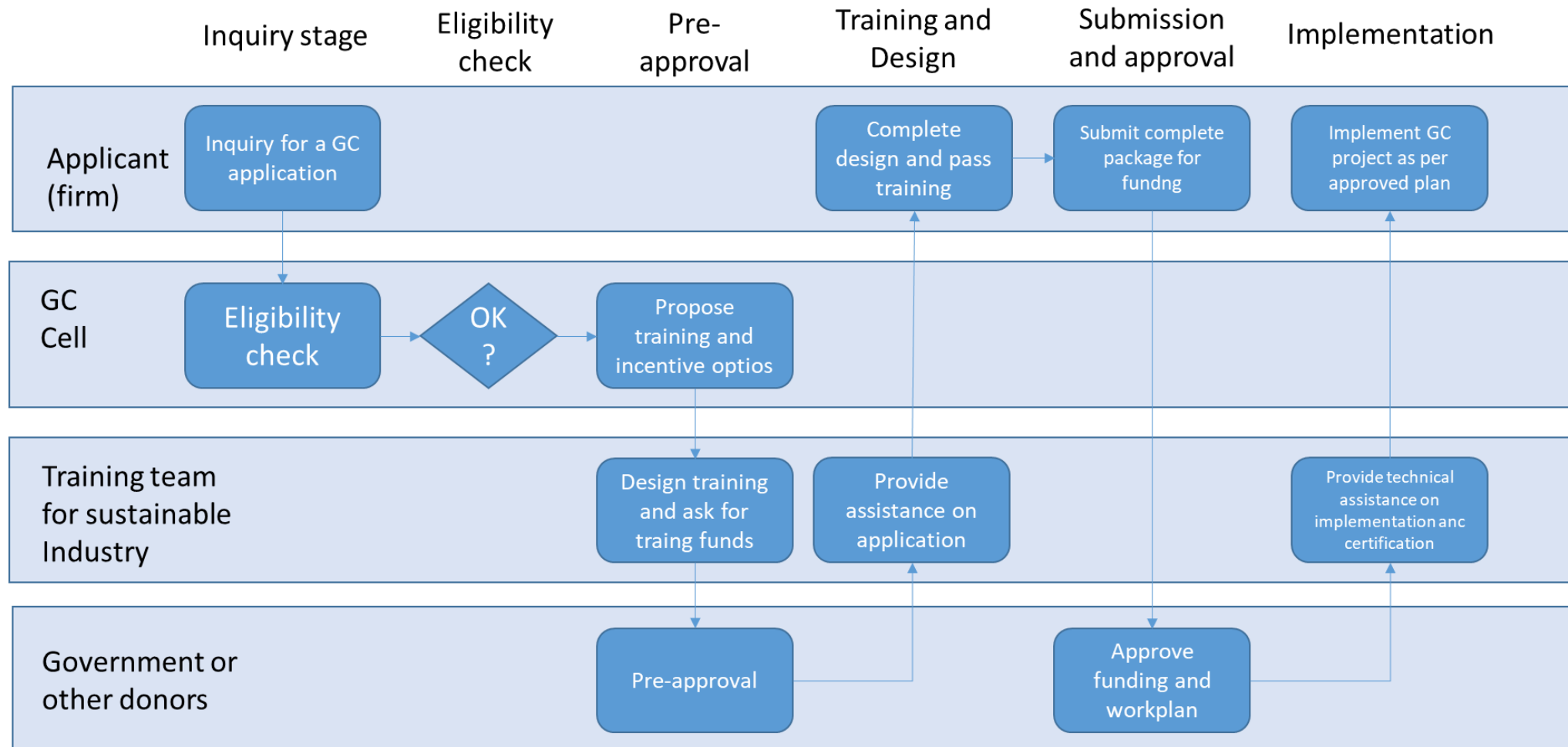
Emphasize the role of businesses in applying green chemistry in Vietnam, raising awareness, and promoting corporate social responsibility initiatives.

Studies show that the prevention of waste formation is better and the cost is much lower than the costs of treating or disposing of waste after it has been created. Besides, creating a lot of waste makes companies / businesses have to face many environmental costs, social costs, and overcome the public health consequences.



Proposed incentive mechanism for GC

(Based on Cost Benefit Analysis and international case studies)





Results

TRAINING WORKSHOP: Agrochemical and Plant Protection Packing management – Awareness raising

The workshop discussed the current situation of pesticide use, data on POPs residues in many provinces in Vietnam. There were 438,032 kg of pesticide packages and bottles are collected, not significantly compared with the 66.1 thousand tons of used pesticides (only 6.6% collected).

Proposed treatment such as a method of washing pesticide packaging 3 times before disposal, or to increase corporate tax, sanctioning mechanism



Demonstration at Plato

BEFORE GC

In 2018, Plato was has operated the following electroplating processes using Cr^{6+} and the mist suppressant based on PFOS:

- Ni-Cr electroplating on plastics;
- Ni-Cr Electroplating on metals and Technology;
- Hard Chromium Electroplating;
- Zinc Electroplating (with Cr^{6+} Passivation)).

The estimated PFOs consumption in 2018 was: Chrome Mist RF 4000 l x 143g/l = 572 kg/year

The consumption of CrO_3 2018 was in the order of 5.1 to 5.3 tons.

AFTER GC

Prevention of the use of PFOS and Cr^{6+} ,

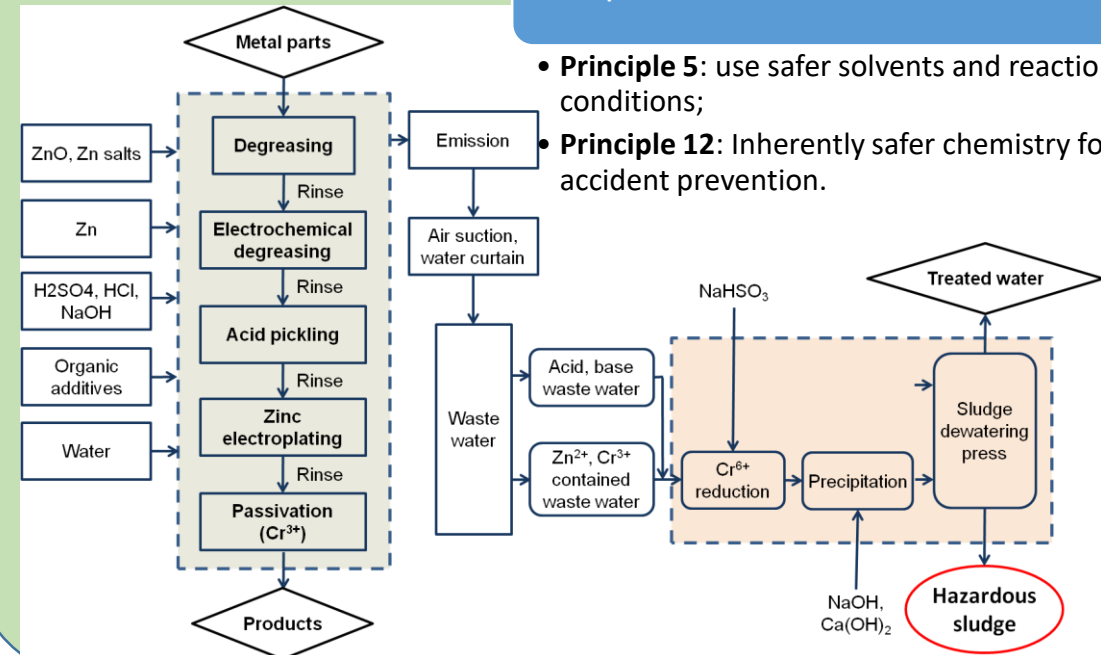
Reduction of 30-35% of water use,

40% less waste water generated,

The waste water will not contain anymore Cu, Ni, Cr.

Compliant with GC 5 and 12

- **Principle 5:** use safer solvents and reaction conditions;
- **Principle 12:** Inherently safer chemistry for accident prevention.





Results

Electro- chrome
Plating Plato Factory
completed the
production line

Demonstration at Nishu Paint

Before GC

Use of SCCP (Cereclor s52) for the production of chlorinated rubber protective paint.

Line for fireproof paint which currently uses solvents, but not POPs.

The management estimated, for the year 2018, a use of SCCP (Cereclor s52) amounting to 2.9 tons.

After GC

Replacement of SCCP with non-POP chemicals.

gradually replace the solvent-based paint with water-based paint production.

Compliant with the following Green Chemistry principle:

- Principle 4: Designing safer chemicals. Chemical products should be designed to achieve their desired function while being as non-toxic as possible.
- Principle 5: use safer solvents and reaction conditions;
- Principle 12: Inherently safer chemistry for accident prevention.



Green chemistry applied at the Nishu Painting factory

Nishu replaced the chemical using the short-chain chlorinated paraffin solvents C10-13 (SCCP) in the paint formulation with two other types: C14-17 medium chain chlorinated paraffin and long chain, powder form.

CONCLUSION

POP

Two plants accepted to phase out POPs

- Plato (Electroplating): 572 kg PFOS/năm
- Nishu (Paint): 2900 kg SCCP/năm

Hg

No plants use Hg.

Hg emits through electricity and fuel consumption.

Sai Gon Paper emits the most Hg at 5368 g Hg/year

U-POP

Mainly from the processing of recycled materials with insufficient pollution treatment

- Electroplating: recycled aluminum (0,26 – 2,32 gTEQ/year)
- Paper: recycled paper (0,13 – 3,08 gTEQ/year)
- Plastic: recycled plastic
- Others: electricity, Gas, Oil (<0,015 gTEQ/year)

CO₂

Emission from using electricity, fuel

Maximum in Alutec (Electroplating) 2,5 x 10⁶ tons CO₂/year (due to use gas)

PLATO

NISHU

From Cr⁶⁺ to Cr³⁺



Alternative, no use SCCP, water based

REDUCTION

POP	3472 kg/year;	✓
U-POP	102,19 µg/year;	
Hg	7,98 g /year	
CO₂	923,11 ton/year	✓



THANK YOU

FOR YOUR KIND ATTENTION

The slide features a decorative background with various colored shapes: a large blue teardrop at the top left, a small purple circle, a pink circle, a blue circle, and a blue teardrop at the bottom left. There are also horizontal bars in blue and pink at the top and bottom right corners.

The GEF-fund of e-waste project: Environmentally Sound Management of the Life Cycle of WEEE in China

Foreign Environmental Cooperation Center, Ministry of Ecology and
Environment, P.R.C

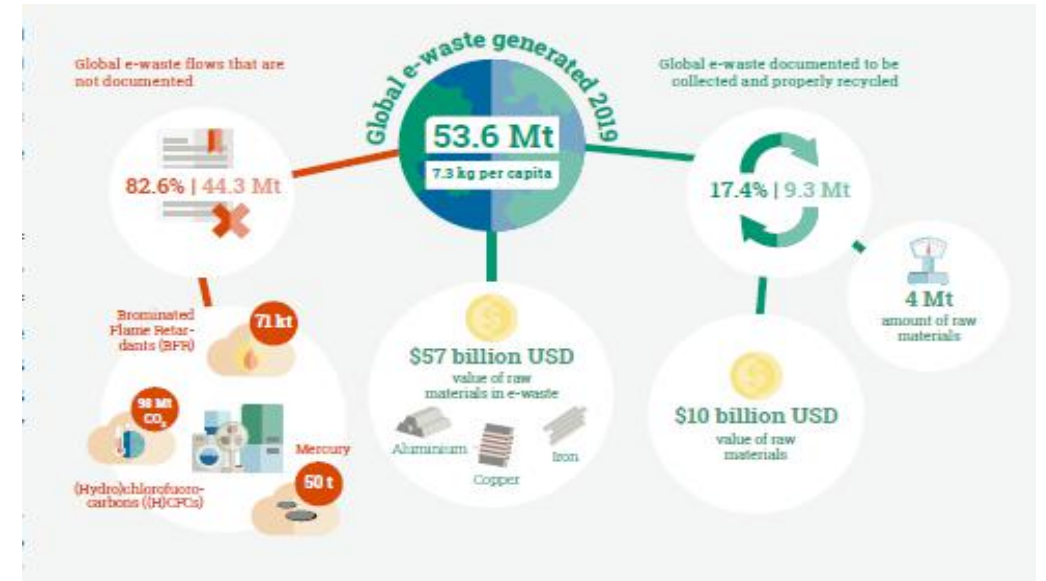
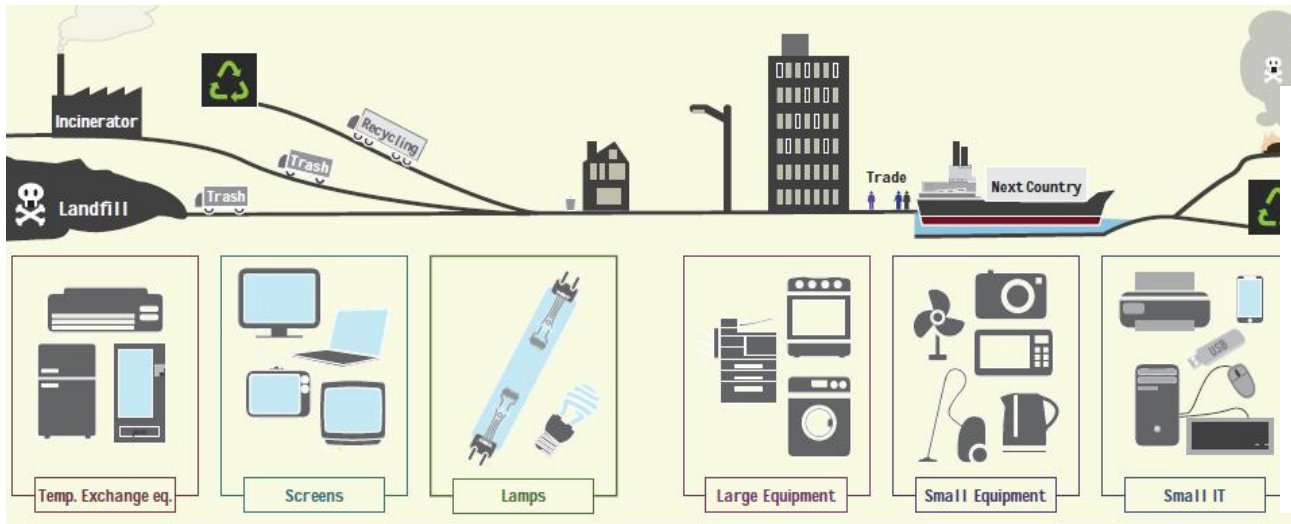
Division of Stockholm Convention
Gao Peng/Senior Program Manager

March 2021

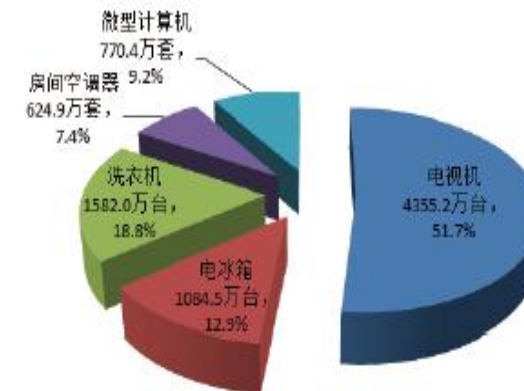
Background :

E-waste is a term used to cover all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intent of re-use. It is also referred to as WEEE (Waste Electrical and Electronic Equipment), electronic waste or e-scrap in different regions.

E-waste includes a wide range of products, almost any household or business item with circuitry or electrical components with power or battery supply.



Data from: The third edition of the [Global E-waste Monitor 2020](#) by the [Global E-waste Statistics Partnership](#), provides comprehensive insight to address the global e-waste challenge.

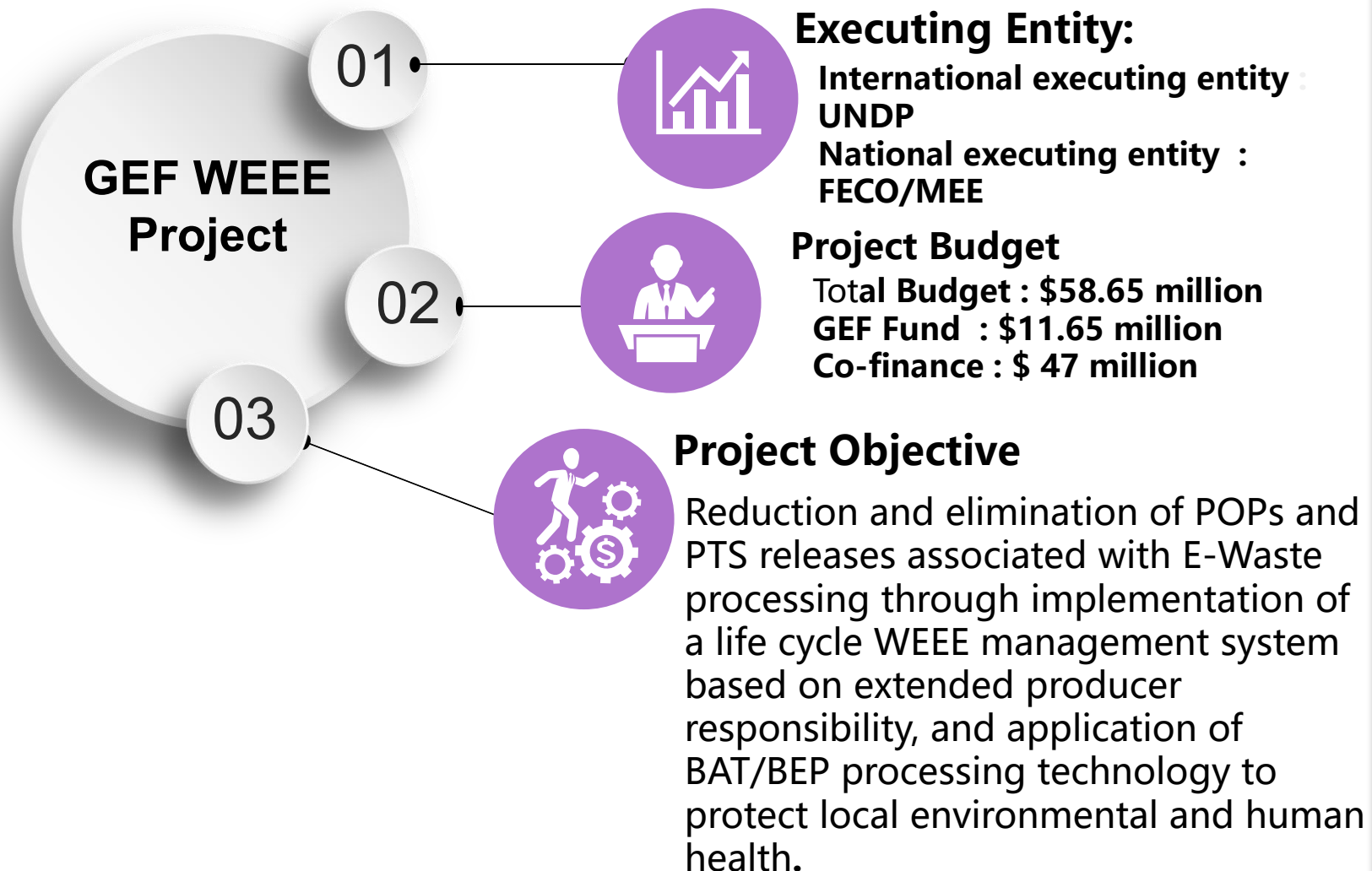


E-waste: 84 million units (5 types of E-waste) in 2019, increased of 3.9%.

CRT glass: 247,000 tons
WPCB: 67,000 tons
Waste Plastics: 459,000 tons.

Data from: MEE, China

GEF Project: e-waste management in China

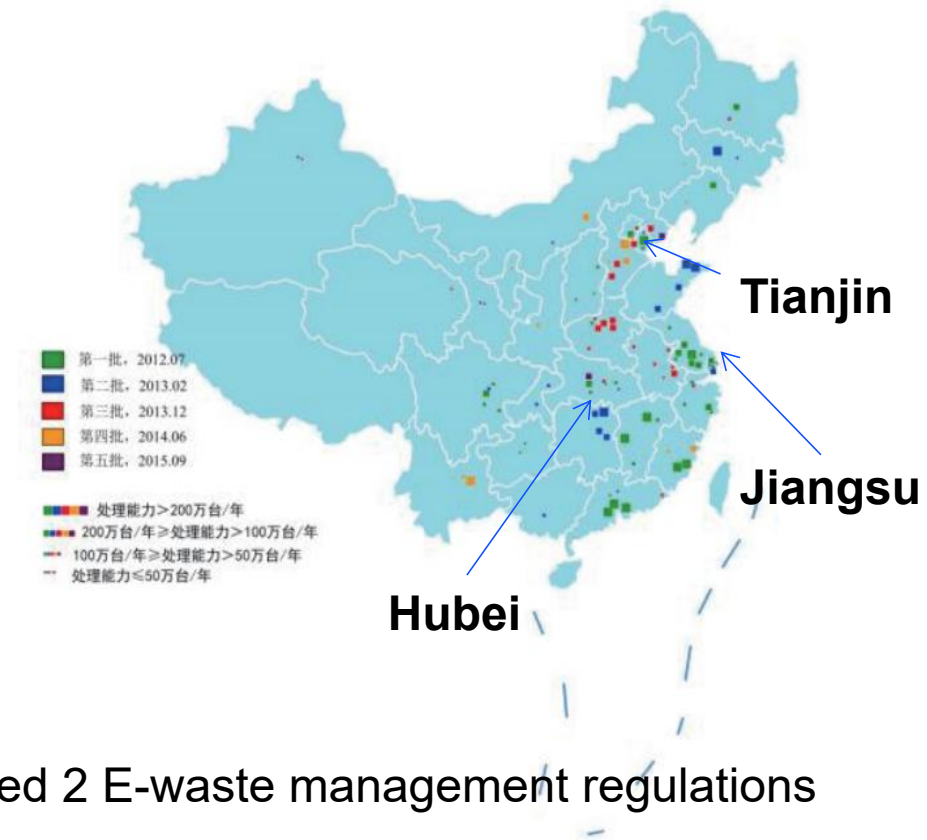
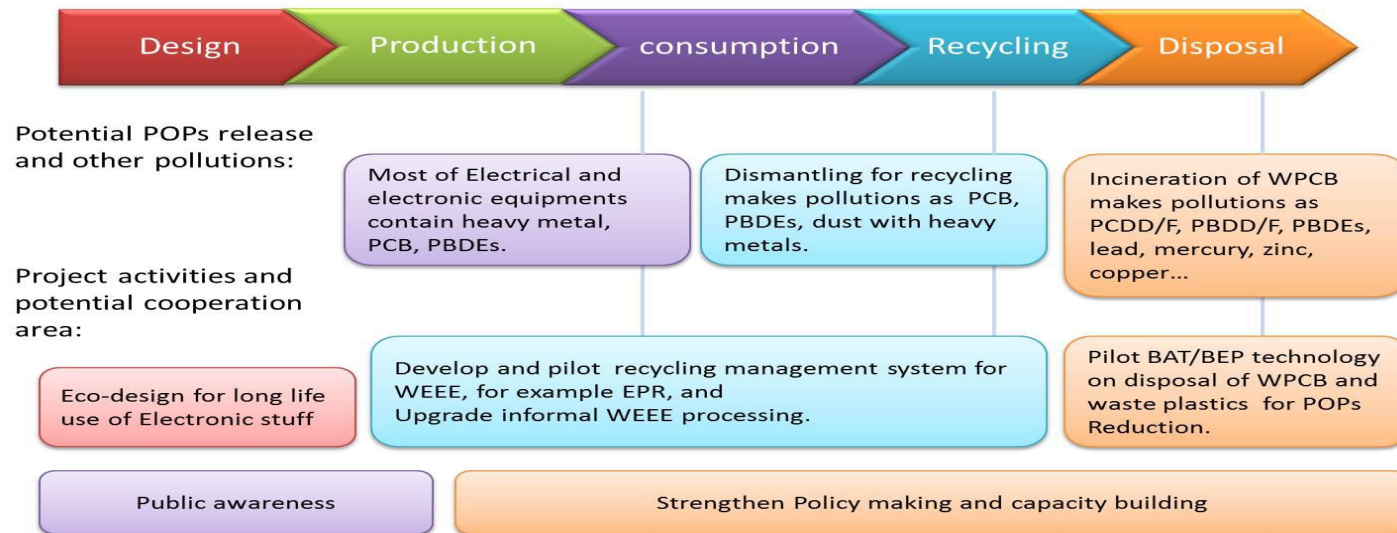


Project period: May 2014 - October 2019



GEF Project: e-waste management in China

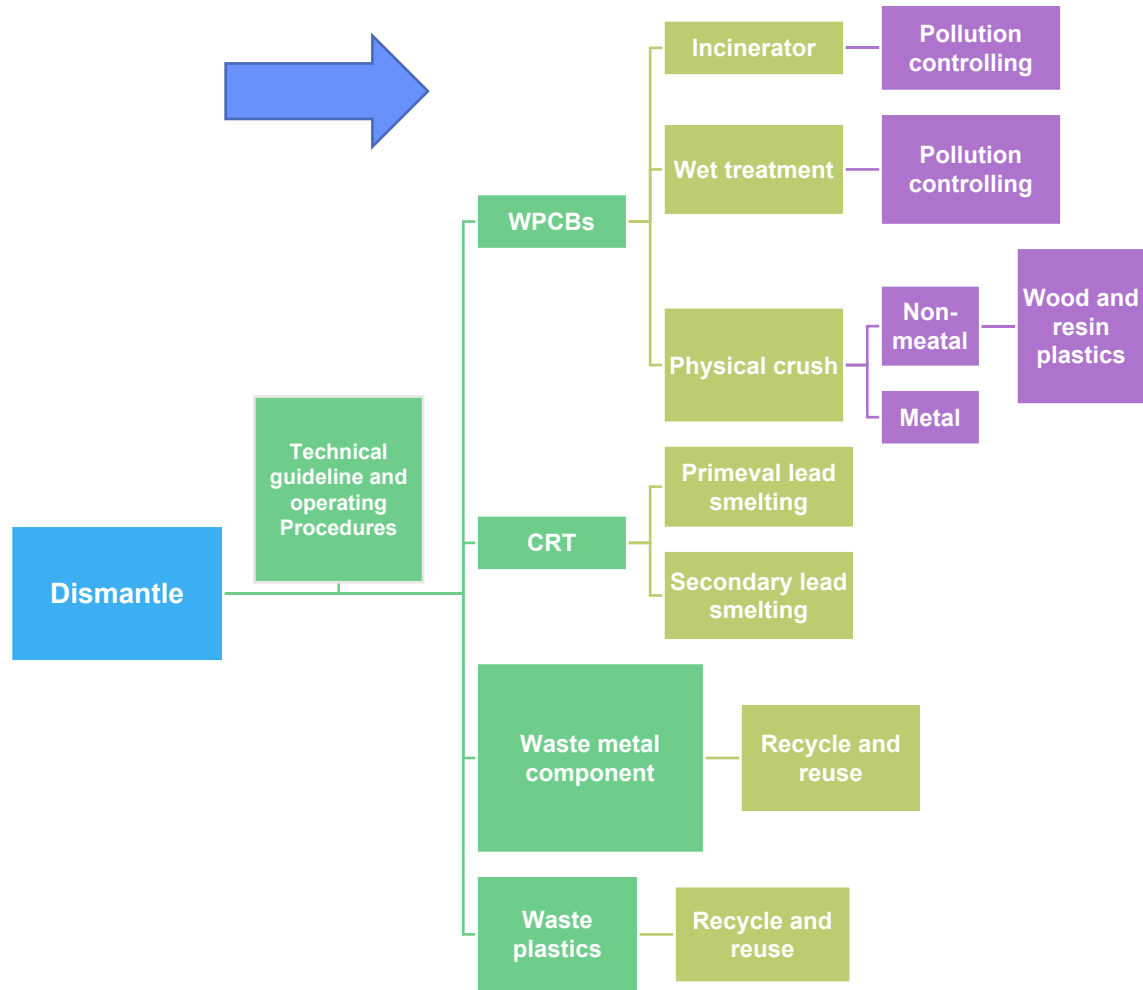
Project framework



Project Outcome:

- ✓ Draft 6 E-waste management Policy recommendations & Published 2 E-waste management regulations at provincial;
- ✓ Demonstration on dismantling **64 million units of WEEE** in 3 provinces;
- ✓ About **284,000 tons of PBDE-contained waste** plastic been safety reuse;
- ✓ Over **15,000 tons of CRT-leaded glasses** been safety reuse;
- ✓ Demonstration on 2 types of Treatment on **Waste printed circuit board(WPCB)**;
- ✓ Draft guidelines on **6 types of EEE** on Eco-design and Produce 1 eco-design laptop (**Lenovo K43c-80**);
- ✓ About **679 E-waste management officers** and **65,000 E-waste workers** been trained.

Demonstration on Dismantling & Disposal



Material Flow



National legislation:

- **Law:**

- 1) Cleaner Production Promotion Law of the People's Republic of China (Revised in 2012)
- 2) Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste (Revised in 2020)

- **Regulation**

- 1) Regulations for the Administration of Recycling and Disposal of WEEE in 2011
- 2) Disposal Catalogue of WEEE (5 types in 2011 and 9 types added in 2014)
- 3) Guidelines for Dismantle and Audit of WEEE (in 2015 and revised in 2019)

Demonstration on Disposal

Waste Printed Circuit Board (WPCB):

Source: Deubzer et al. 2019

- A small proportion by weight: 3%
- The most complex structure
- The highest point of environment risk
- Highest economic value: 50% in total

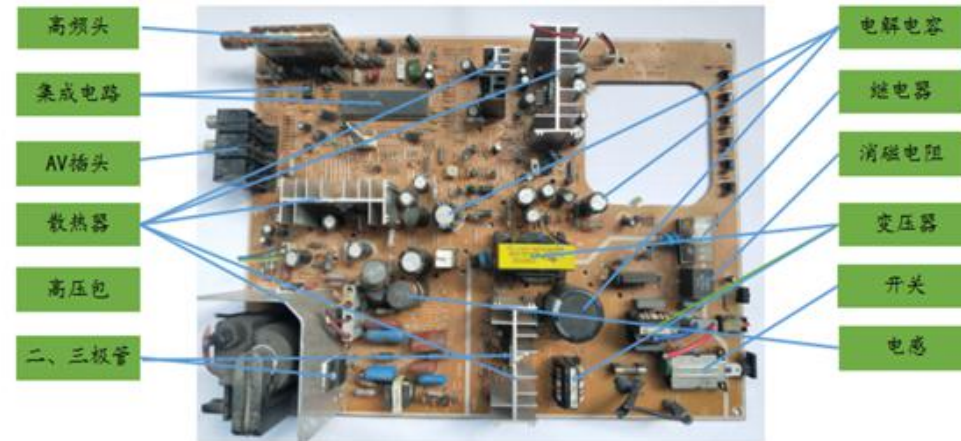
Metal

- Cu: 20% Fe: 8% Ni: 2% Sn: 4% Pb: 2%
Al: 2% Zn: 1% Sb: 0.4%
- Ag: 1000g/t Au: 500g/t Pd: 50g/t

Non-metal

- Epoxy resin

CRT电视机线路板A面



WPCB from TV



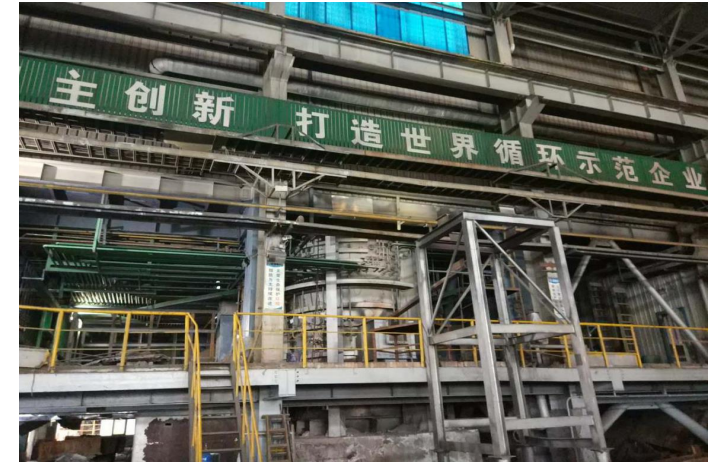
Smelting Furnace



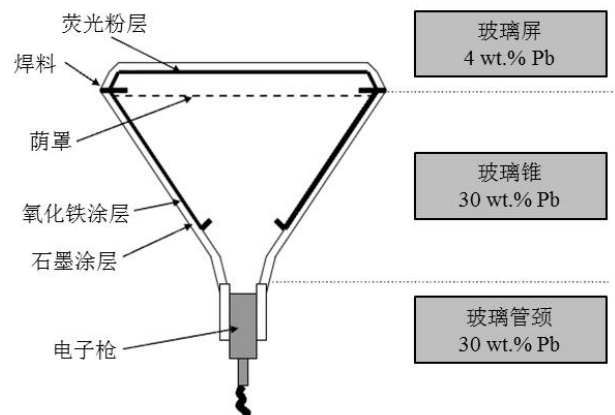
Physical Crushing

Demonstration on Disposal

CRT Leaded-Glass



The smelting furnace of a lead smelting enterprise



	CRT glass /tons	Lead/ tons	Profit /RMB per ton
Primeval lead smelting	5000	850	1700
Secondary lead smelting	10000	1500	350

Demonstration on Eco-design

Eco-design Laptop:



Type: Zhaoyang K43c-80

外文名称	Limitation in PoPs Directive	Testing result of E50-80
Tetrabromodiphenyl ether C12H6Br4O	1000ppm	ND(5ppm)
Pentabromodiphenyl ether C12H5Br5O	1000ppm	ND(5ppm)
Hexabromodiphenyl ether C12H4Br6O	1000ppm	ND(5ppm)
Heptabromodiphenyl ether C12H3Br7O	1000ppm	ND(5ppm)
Hexabromobiphenyl	0	ND(0)
Polychlorinated Biphenyls (PCB)	0	ND(0)
Polychlorinated naphthalenes (*)	0	ND(0)
Hexachlorobenzene	0	ND(0)
Pentachlorobenzene	0	ND(0)
Hexachlorobutadiene	1000ppm	100ppm
Alkanes C10-C13, chloro (short-chain chlorinated paraffins) (SCCPs)	100ppm	ND(5ppm)
HBCDD	1000ppm	ND(5ppm)
Perfluorooctane sulfonic acid and its derivatives (PFOS)	0	ND(0)
DDT (1,1,1-trichloro-2,2-bis(4-chloro-phenyl)ethane)	0	ND(0)
Chlordane	0	ND(0)
Hexachlorocyclohexanes, including lindane	0	ND(0)
Dieldrin	0	ND(0)
Endrin	0	ND(0)
Heptachlor	0	ND(0)
Chlordecone	0	ND(0)
Aldrin	0	ND(0)
Mirex	0	ND(0)
Toxaphene	0	ND(0)
Endosulfan	0	ND(0)

All Chemicals
in use:

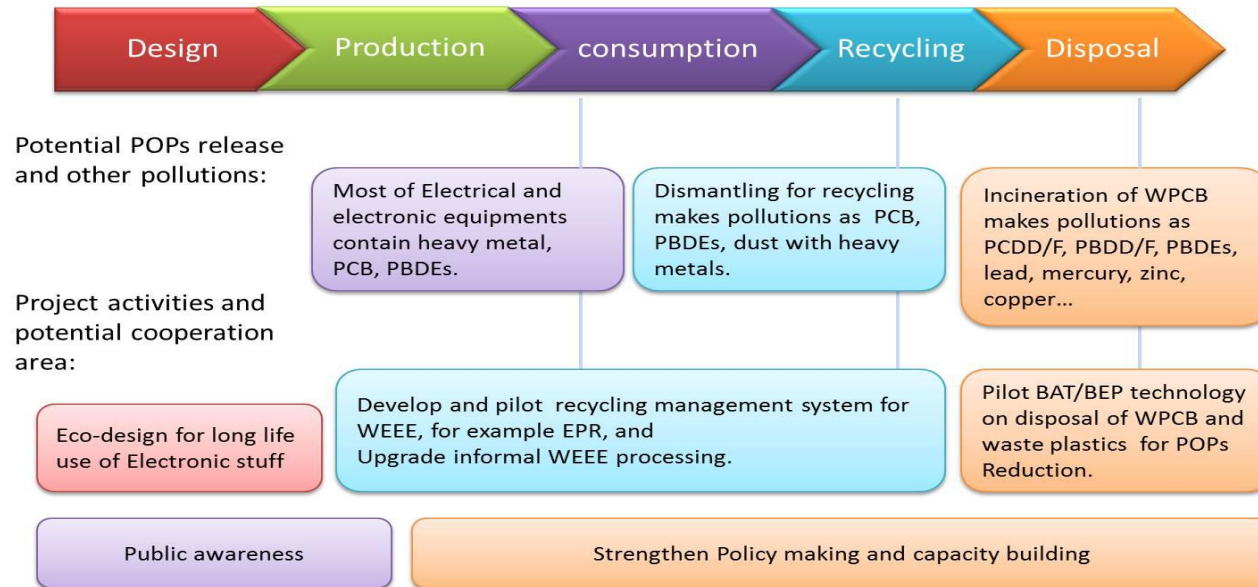
97.9%



- The weight of the components **reduced involved 446.6g**, accounting for **26.6% of the total weight** of the whole laptop;
- Based on the 2018 sales, the total weight of the components to reduce POPs flame retardants contained reached **3.9 tons**.

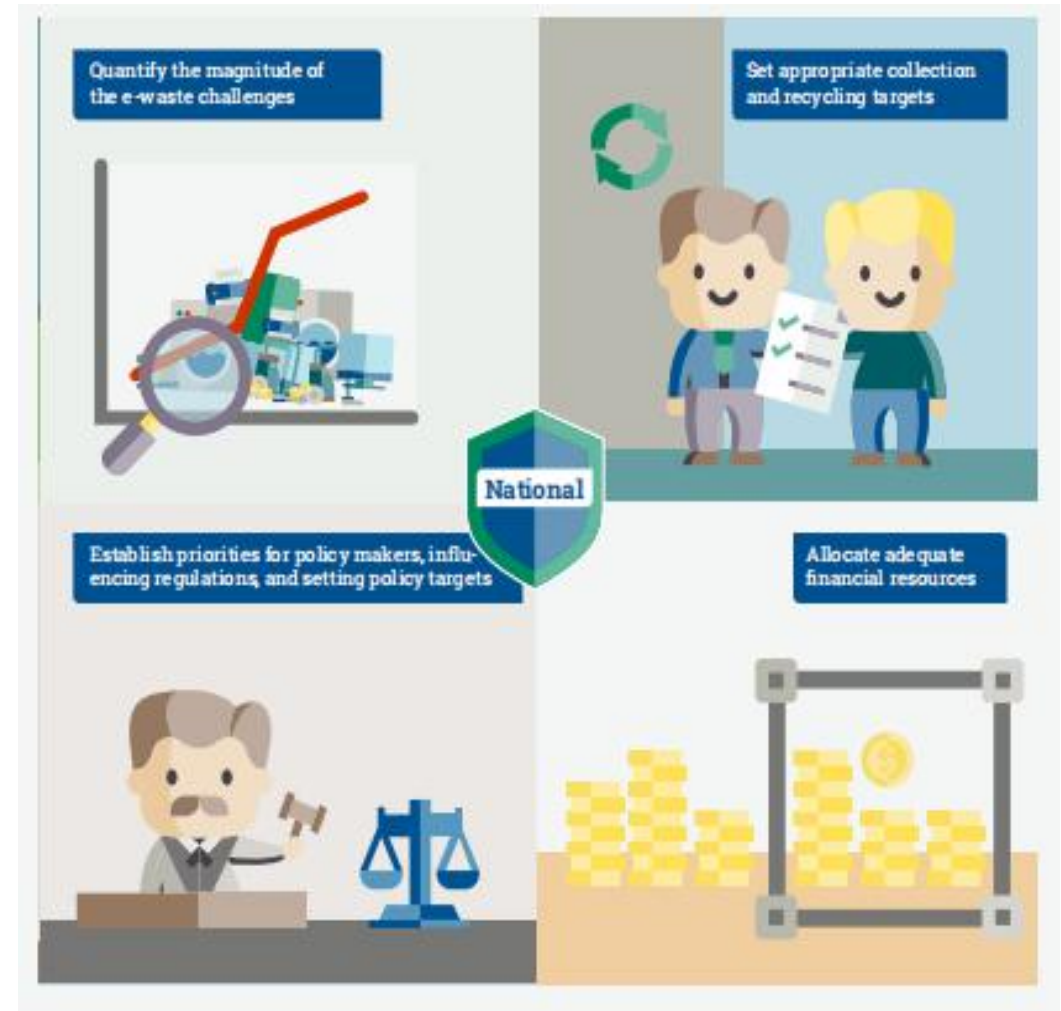
Conclusion:

Project framework



Learn & Experience

- Based on National Policy: WEEE Fund Subsidy System
- Reachable technology: Dismantle and Treatment
- Eco-design: A real sold Laptop
- Communication: Information exchanged



Next Step:

- More types of E-waste involved: from 5 to 9
- Eco-design: Reduce using chemicals and more types of EEEs
- Green Supply Chains: in EEE industry, Battery industry and Packaging industry



Thank You For Your Attention!

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POPs action: <http://www.china-pops.org>




H&M Group

Towards Toxic Free Fashion

UNDP “Chemicals and waste management
beyond 2020”

Ylva Weissbach H&M Group Sustainability Business Expert, Chemicals



Leading the change
100% fair and equal
100% circular and
climate positive

Why is safe chemicals input important

- H&M Group aim towards fully circular products
- By 2030 we aim to source only sustainable sourced or recycled materials.
- Safe chemical input is key to reach our goals



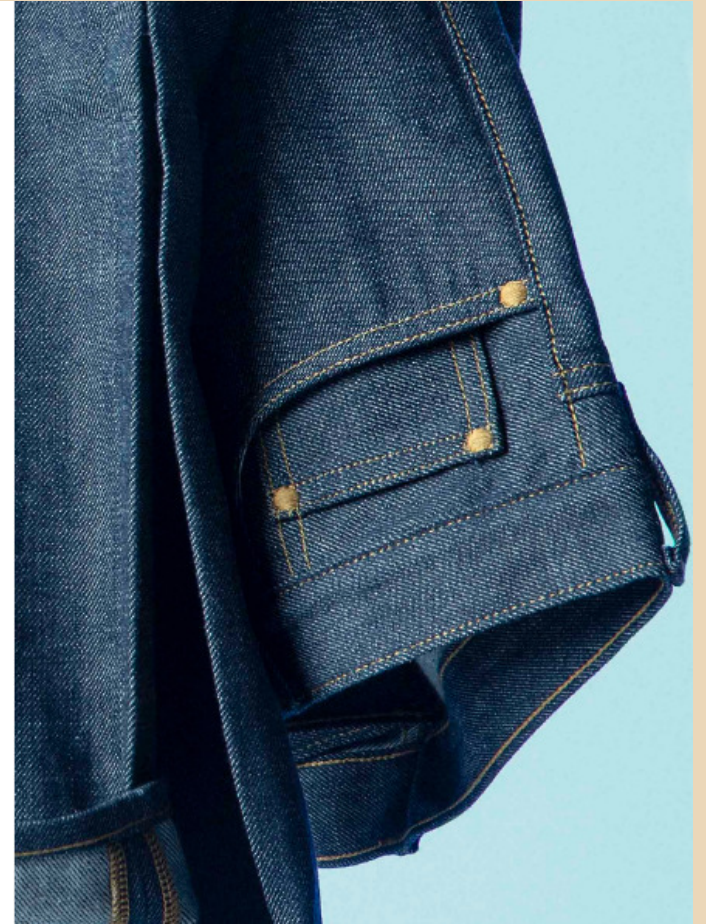
H&M Group Chemical Vision

Lead the change
towards a toxic free
fashion future

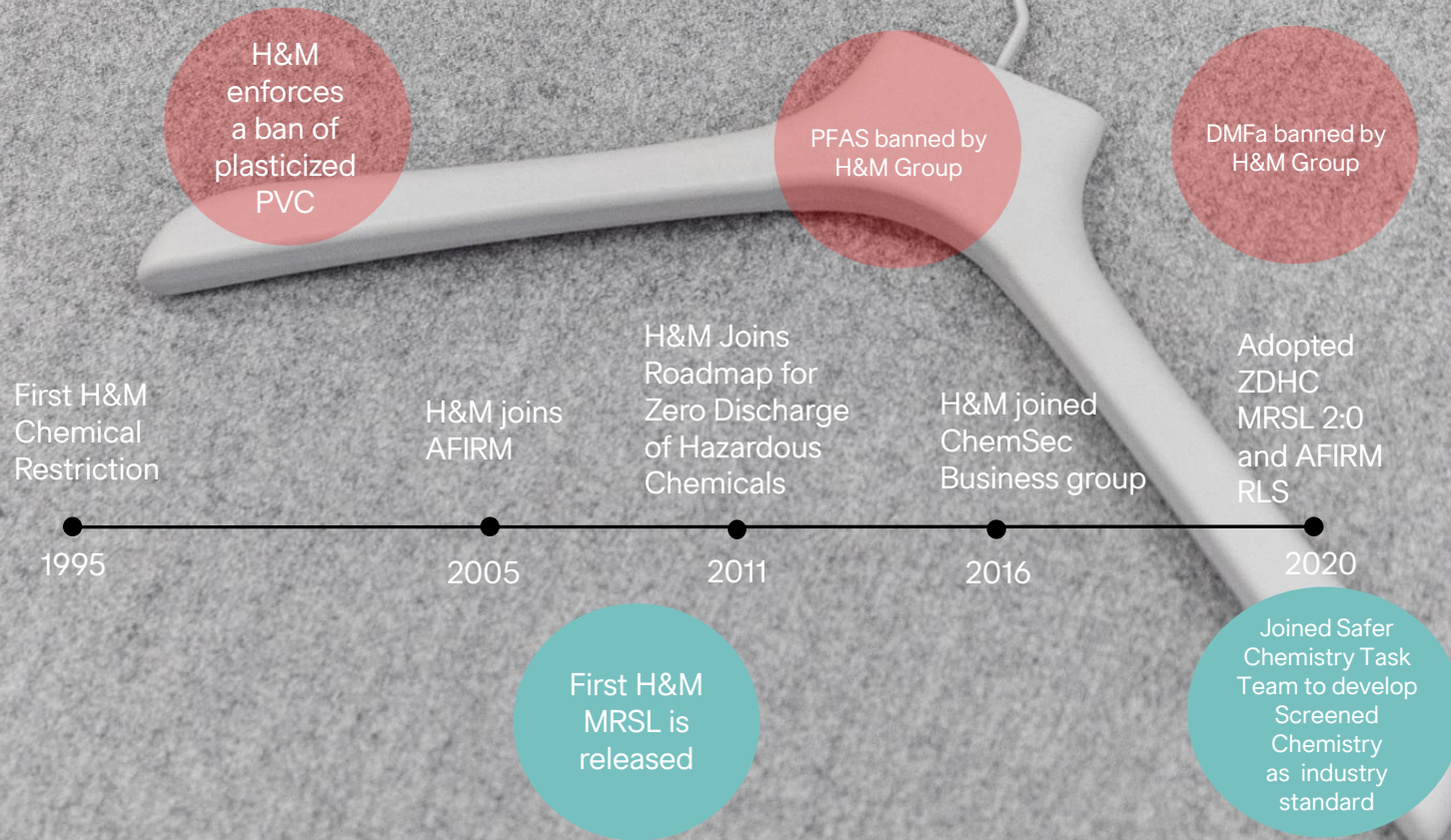


H&M Group Chemical Roadmap

- Traceability of input chemicals
 - Policy Engagement towards progressive chemical management
 - Transparency by sharing information
 - Zero Discharge of hazardous chemicals
 - Circular and climate positive
 - Collaboration by developing and using common tools
-
- **Best Available Chemicals by promoting the innovation and development of better chemicals and technologies**



Together towards a toxic free fashion future



Challenge to promote better & safer chemistry

- Safety Data Sheet
- PFAS-free
- Aniline-free
- Formaldehyde free



- Information in SDS not enough since it does not give information about ALL ingredients in a transparent way
- What does the PFAS free product actually contain?
- How can we evaluate this information in a trustworthy way?
- How can it be compared with other options?

Restrictions are not future proof

- Legal restrictions is based on present knowledge only.
- Not enough to secure innovative and new chemical products, materials and processes.



We need more information to make the right decisions



<https://atlasinvesto.blogg.se/2018/december/arets-sista-pusselbit.html>

Globally harmonized chemical regulations are preferable for simplicity, clarity and compliance.

Increased transparency in the Safety Data Sheet based on GHS (Globally Harmonized System of Classification and Labelling of Chemicals), including contaminations and ingredients at levels below 1000 ppm,

Screened Chemistry

Our preferred methodology to be able to promote better and safer chemistry :

- 3rd party verified and based on full material disclosure
- Assesses both health and environment hazards.
- Scoring system accessible for all supply chain partners
- Drives development of safer alternatives to support circularity goals

ZDHC Brands Converge their Screened Chemistry Programmes

NOVEMBER 14, 2019

ZDHC announces the convergence of Levi Strauss & Co., NIKE, Inc., H&M and C&A approaches to screened chemistry (Screened Chemistry).

Summary

- Safe chemical input is key
- Legislation is not enough
- Globally harmonised chemical regulations are preferable.
- Increased transparency in the SDS enables hazard assessment
- Screened chemistry is our preferred third party methodology that enables us to take decisions on what is “safer”
- Securing safe input chemistry is key for a circular textiles economy.



<https://www.sysav.se/en/siptex/>

H&M Group next steps for "safer / screened chemicals"



- Collaboration with other brands
- Scale the use of "safer chemistry" gradually towards our 2030 goals
- Engage in Public Affairs to promote progressive chemicals management

Thank you!

Sustainable Chemistry Management in the Home Furnishings supply chain

UNDP Green chemistry webinar, 4 March 2021

Peter Adler
Chemicals Leader,
IKEA Purchasing



IKEA basic stats FY20

IKEA sales locations

500 +

60+

Markets

IKEA co-worker
(in thousands)

217

2017	2018	2019
194	208	211

IKEA retail sales
(in billions)

39.6

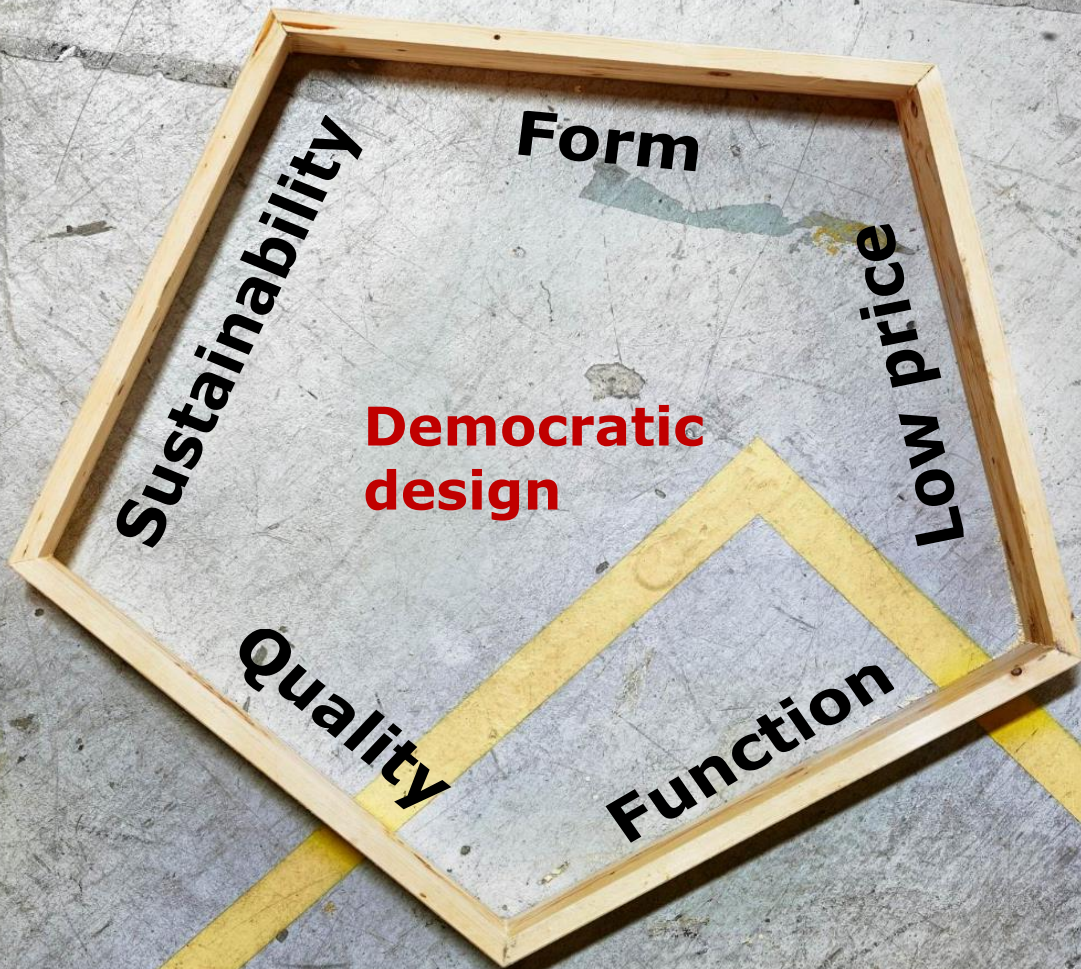
2017	2018	2019
38.3	38.8	41.3



A photograph of three children jumping on a dark blue sofa in a living room. The child in the foreground is wearing a dark blue long-sleeved shirt and light grey pants, and is captured mid-jump with one leg raised. Two other children, wearing light-colored shirts and jeans, are also jumping behind them. The background shows a modern interior with a white wall and a piece of abstract art.

**To create a better
everyday life for
the many people**

**to offer a wide range of well-designed, functional home furnishings
products at prices so low that as many people as possible will be able to
afford them.**





The IKEA Chemical Strategy

“All people have the right to safe and healthy products that are free from harmful chemicals”





The IKEA Chemical Strategy

Our goal: Avoid harmful effects to health and environment – throughout the whole lifecycle

- Raw material
- Production process of final product
- Transport and distribution
- Product use
- End-of-life





The IKEA Chemical Strategy

Strategic objectives

- Increased transparency
- Chemical risk assessments on all materials
- Phase out substances and materials that could cause harm
- Suppliers that share our values
- Increased awareness about our work on chemicals





How we do it

Chemical requirements

- Customer health and safety
- Working environment
- Outside environment
- The Class approach

Spec. no: IOS-MAT-0010
Date: 2018-06-20
Version no: AA-10911-14

Specification Chemical compounds and substances



IKEA of Sweden AB

Issued by
Ralph Nussbaum
Laws & Standards Specialist,
Requirement Development

Signature
RN

Authorised by
Vladimir Brakjovic
Development Manager,
IKEA of Sweden

Signature
Brakjovic

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Spec. no: IOS-MAT-0054
Date: 2018-11-14
Version no: AA-92520-11

Specification



IKEA of Sweden AB

Issued by
Olga Bar
Product i
Specialis
Develop



Specification Plastic food-contact materials – chemical requirements

Spec. no: IOS-MAT-0103
Date: 2017-11-15
Version no: AA-1180066-5

Issued by
Eva Jarevik
Product Requirements &
Compliance /Product Laws
& Standards specialist

Signature
EJ

Authorised by
Vladimir Brakjovic,
Manager,
Product Requirements
& Compliance/
IKEA of Sweden

Signature
Brakjovic

Replaces:
AA-1180066-4

Plastic food-contact materials – chemical requirements

About this specification

This specification describes IKEA requirements, including requirements on testing and documentation, applicable for IKEA articles that contain plastic where the plastic comes in contact with food.

This specification applies to all plastic articles and materials which are intended or foreseeable to be used for the preparation, serving, consumption and storage of food and beverages.

The purpose is to ensure that IKEA articles, under normal and foreseeable conditions of use, do not transfer their constituents to foodstuffs in quantities that could:

- endanger human health.
- bring about an unacceptable change in the composition of the foodstuffs or deteriorate their smell, taste, or colour.

All requirements in this specification apply to all surfaces and materials to be in contact with food. This includes, for example, the inside of lids, and gaskets/sealing that may be in contact with food.

This specification does not apply to parts of an article for which there is no foreseeable contact with food.

All references to standards, legislations and recommendation documents shall always be seen as referring to the latest updated version, including any amendments.

Relationship with other specifications

In some cases, the requirements in this specification concern the same substance as chemical requirements given in other specifications in PDQC. In that case, the strictest requirement shall apply, i.e. both requirements shall be fulfilled.

This document is connected to IOS-TM-0024, *Test methods for sensory analysis on organic food-contact materials*, and to IOS-TM-0025, *Test conditions for food-contact plastic materials, other polymeric and organic materials*.

© Inter



IKEA principle

Basically all IKEA articles sold all over the World shall comply with the strictest Health, Safety and Environmental requirements on any of the sales markets.



Class approach

A general ban on for example:

1. CMR substances category 1A or 1B
2. Substances of Very High Concern, SVHC
3. Organotin compounds
4. All phthalates in children's articles and food-contact articles
5. PFAS in textiles, paper, chemical products
6. Ban all brominated flame retardants, SCCP/MCCP/LCCP, TEPA, TDCP TCEP – ban unless approved for other flame retardants.

Some exceptions, mostly for electrical materials.



A close-up photograph of a dark, textured fabric surface, possibly a jacket or umbrella, covered with numerous small, glistening water droplets. The droplets are of various sizes and are scattered across the entire frame, creating a sense of freshness and texture. The lighting is soft, highlighting the wet surface and the individual droplets.

**PFAS – banned in textile
since 2015**

Class approach

Per- and polyfluoroalkyl substances (PFAS)	<p>Substances which in their molecule contain a perfluorinated carbon chain with at least two carbon atoms ($-C_nF_{2n}-$, where $n \geq 2$) and bonding to optional atoms or groups of atoms.</p> <p>Note: includes polymers/co-polymers, e.g. PTFE and fluoroalkyl acrylate co-polymers.</p>
---------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



**Phthalates – banned all
phthalates (diesters of 1,2-
benzenedicarboxylic acid) in
children's products since
2006 and in food-contact
products since 2009**

Class approach

Organotin compounds

A group of compounds composed of the metal tin covalently bonded with an organic molecule/radical, for instance butyl, octyl or phenyl. (These radicals are collectively known as alkyls and aryls.) The tin is in the tetravalent state – Sn (IV). Organotin compounds may also be known as tinorganic compounds.

Each kind of organotin, e.g. dibutyltin (DBT), is actually several different substances. DBT, MBT, TBT, DOT etc. are positive ions, cations, and they can have many different negative counter-ions (anions), e.g. chloride, oxide, laurate.

Note: The limit values in the requirements refer to the alkyl-/aryl-tin cation, without the counter-ion.

An example list of organotin compounds, those that are included in standard tests, is given in *Appendix C*.

Note: that organic salts of divalent tin (Sn (II)), stannous salts, are not organotins compounds. Example: tin (di) octoate (tin 2-ethylhexanoate) is not banned. In this substance the octoate (ethylhexanoate) is the anion; it is not the same substance as dioctyltin, where the octyl is part of the cation.

Class approach

Flame retardants:

1. Ban all brominated flame retardants, SCCP/MCCP/LCCP, TEPA, TDCP TCEP
2. Approval needed for all other flame retardant use
3. Except some harmless substances that can have FR effect:
 - Chalk
 - Graphite
 - Kaolin
 - Talcum
 - ~~Melamine~~ ... To balance the class approach ...
4. Some exceptions, mostly for electrical materials.

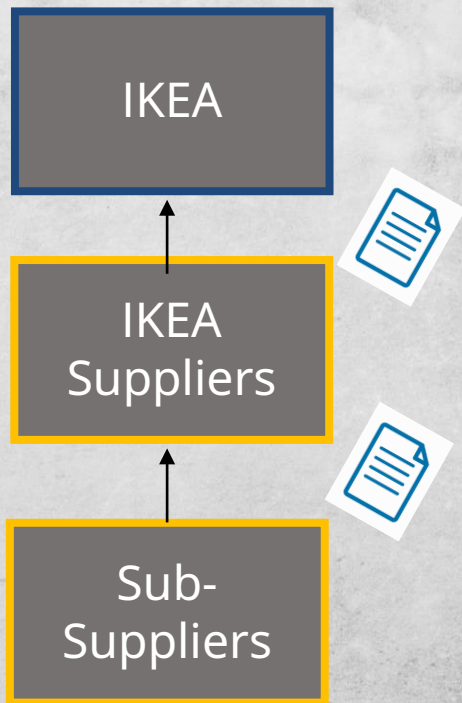


More transparency

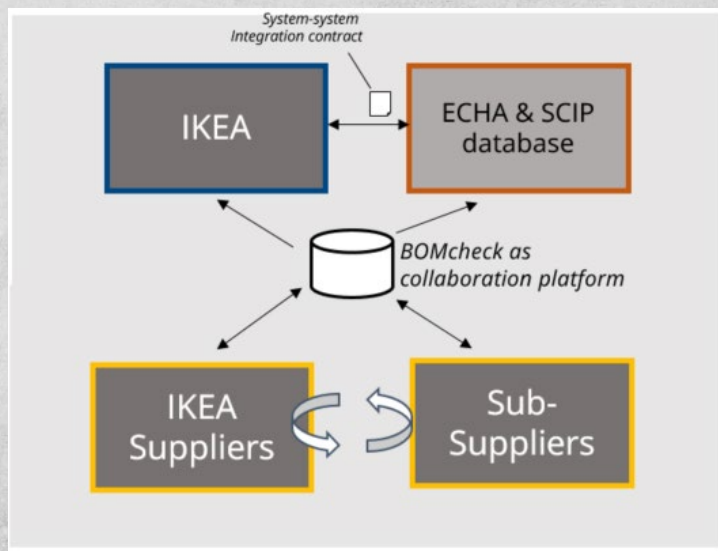


Managing SVHC (electrical articles)

From this:



To this:



BOS for toys

The following substances shall be reported in the BOS:

- All hazardous substances intentionally added at any step in the supply chain with a resulting level in the final material above 100 mg/kg;
- All known hazardous impurities;
- All biocides, with the exception only of biocides that fulfil all the following conditions:
 - the biocides come from a chemical product that is used at a concentration not above 2.0 % as an ingredient to formulate the final material,
 - the biocides are not CMR substances category 1A and 1B.
 - the sum of all such biocides is not above 5 mg/kg in the final material;
- All non-hazardous chemical substances above or equal to 1.0 %.

Policy recommendations

1. Group substances and avoid regrettable substitutions
2. Coordinated chemical regulations, test methods and reporting requirements
3. Align with circular and climate policy initiatives



Coordinate

The EU is World's top environmental legislation and consumer product safety power.

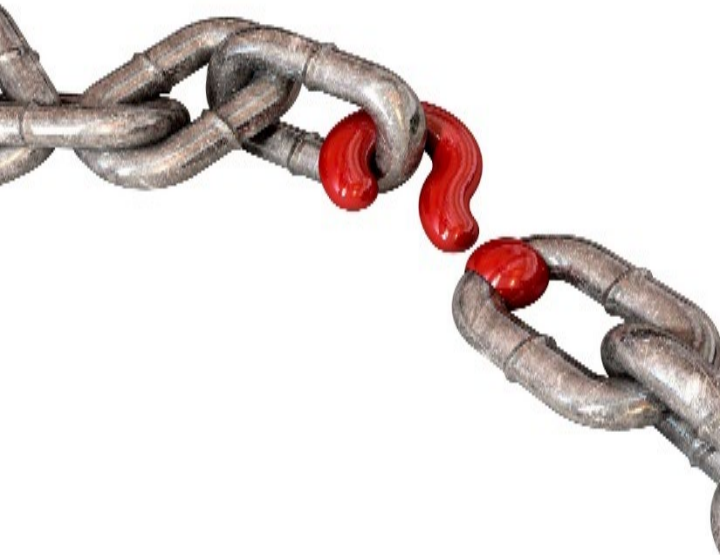
Use it!



Coordinate

- “China RoHS”, “Korea RoHS”, “Turkey RoHS”, “California RoHS”, ...
- “China REACH”, “Turkey REACH”, ...
- Food contact, “China 10/2011”
- EN 71-3 and other EN 71 standards have their copies/versions all over the World





How to secure the supply chain?

IKEA supplier to:

- Identify IKEA chemical requirements and verification method (e.g. self declaration from material supplier; or SD + test report)
- Communicate the requirements back up the supply chain
- Evaluate sub-suppliers and materials
- Secure process control in production





Testing

- During product development
- Before first delivery and then continuously
- In case of audits
- Spot checks
- Testing after claims

VOC emissions test

Result of the emission of Volatile Organic Compounds (VOCs)

Compound	CAS Number	003 Concentration after 5 h ($\mu\text{g}/\text{m}^3$)	003 Concentration after 24 h ($\mu\text{g}/\text{m}^3$)	003 Concentration after 48 h ($\mu\text{g}/\text{m}^3$)	Information
Trimethyl silanol	1066-40-6	2	4	2	<C6
C6 (Hexane)	110-54-3	<1	<1	<1	b
Acetic acid	64-19-7	4	5	3	b d
Propanoic acid	79-09-4	9	9	4	b d
Butanoic acid	107-92-6	3	4	2	b d
m/p-Xylene	108-38-3/106-42-3	1	<1	<1	b h
alpha-Pinene	80-56-8	8	<1	<1	b d f
2,2,4,6,6-Pentamethyl heptane	13475-82-6	6	<1	<1	b

Compound	CAS Number	003 Concentration after 5 h ($\mu\text{g}/\text{m}^3$)	003 Concentration after 24 h ($\mu\text{g}/\text{m}^3$)	003 Concentration after 48 h ($\mu\text{g}/\text{m}^3$)	Information
C10 (Decane)	124-18-5	3	<1	<1	b
3-Carene	13466-78-9	9	<1	<1	b d f
D-Limonene	5989-27-5	2	<1	<1	b d f
C11 (Undecane)	1120-21-4	9	3	<1	b
3,6-Dimethyl decane (2,2,4,6,6-Pentamethyl heptane)	17312-53-7	21	9	3	b
Nonanal	124-19-6	12	5	1	b d
Sum other carboxylic acid esters (Dodecanoic acid methyl ester)	/	2	1	<1	/
C12 (Dodecane)	112-40-3	13	9	7	b
Decanal	112-31-2	1	3	1	b d
Sum other iso/cyclo-alkanes (2,2,4,6,6-Pentamethyl heptane)	/	211	128	86	/
Hexyl benzene (Toluene)	1077-16-3	8	6	4	/
C13 (Tridecane)	629-50-5	6	5	5	b
2,2'-Isopropylidenebis(tetrahydrofuran) (Toluene)	89686-69-1	29	28	24	/
C14 (Tetradecane)	629-59-4	3	3	3	b
2,6-Bis(1,1-dimethylethyl)-2,5-cyclohexadiene-1,4-dione (Toluene)	719-22-2	3	4	4	/
2,5-Di-tert-butylphenol (Toluene)	5875-45-6	1	4	2	/
(5-Decyl)benzene (Toluene)	4537-11-5	2	2	2	/
Formamide	75-12-7	<1	<1	<1	a g
Phenol	108-95-2	<1	<1	<1	a b d
Sum of all detected compounds:		368	232	153	/
Sum of VVOC (<C6):		2	4	2	/

Sum of VVOC (<C6):	2	4	2	/
Sum of VOC (C6-C16):	366	228	151	/
Sum of SVOC (>C16):	<1	<1	<1	/
Sum of all C6-C9 aromatic hydrocarbons:	1	<1	<1	/
Sum of chlorinated volatile organic compounds:	<1	<1	<1	/
Sum of the cyclic siloxanes D4, D5 and D6:	<1	<1	<1	/
TVOC (toluene equivalent):	396	245	165	/

(The compounds shown in subscript were used for the semi-quantification)

Information: (a) Toxic substance: CMR Cat. 1A or 1B, STOT RE 1, STOT SE 1, or Acute Tox Cat. 1-3; (b) EU LCI list; (c) Safe sampling volume too low, underestimation likely; (d) Odor relevant; (e) Compound boiling point exceeds thermal limit of the TD, underestimation likely; (f) Terpene, possibly wood-related; (g) CMR Cat. 1A or 1B; (h) All C6-C9 Aromatic substance according to IOS-MAT-0054/IOS-MAT-0195/IOS-PRG-0010/IOS-MAT-0012; (i) Chlorinated solvent; (<C6) VVOC compound; (>C16) SVOC compound.

Evaluation according to IOS-MAT-0054: AA-92520-12

Requirements	003 Conclusion
Sum of VOC $\leq 1.2\text{mg}/\text{m}^3$ after 48 h	OK
Sum of VOC $\leq 0.6\text{mg}/\text{m}^3$ after 28 days (if need)	/
Each individual CMR substance cat.1A and 1B $\leq 10\text{ }\mu\text{g}/\text{m}^3$ after 48 h	OK
Sum of all CMR substance cat.1A and 1B $\leq 50\text{ }\mu\text{g}/\text{m}^3$ after 48 h	OK
Each individual T-Substance(excl. CMR cat. 1A and 1B) $\leq 30\text{ }\mu\text{g}/\text{m}^3$ after 48 h	OK
Sum of all C6-C9 aromatic hydrocarbons $\leq 100\text{ }\mu\text{g}/\text{m}^3$ after 48 h	OK
Residual Phenol $\leq 10\text{ }\mu\text{g}/\text{m}^3$ after 48 h	OK
n-Hexane $\leq 10\text{ }\mu\text{g}/\text{m}^3$ after 48 h	OK
Formamide $\leq 10\text{ }\mu\text{g}/\text{m}^3$ after 48 h	OK
Individual chlorinated substances $\leq 10\text{ }\mu\text{g}/\text{m}^3$ after 48 h	OK
Sum of chlorinated volatile organic compounds $\leq 20\text{ }\mu\text{g}/\text{m}^3$ after 48 h	OK

("OK" = assessed as compliant)



Substitution of harmful chemicals



Pest control

- Phytosanitary Certificates for natural materials, wood, in many countries.
- Methyl bromide is the usual expectation from authorities ...
- IKEA working to change to heat treatment or combined oxygen depletion and heat.
- Working with the International Plant Protection Convention





Identify and prioritize

- Hazard: Health + Environment
- Exposure potential (risk)
- Impact – How big volume of products/ materials?



Phase out considerations

- Is the substance needed?
- Are there alternative materials?
- Or are there alternative substances?
- Are the alternatives really safer?
- If no – is it worth it?

A background photograph of a man with a beard playing an acoustic guitar and a young girl with curly hair sitting on stone steps. The man is wearing a dark blue shirt and shorts, and the girl is wearing a blue and white patterned shirt and blue sneakers. They are outdoors, with a red wall and a coiled rope on the left and colorful flags hanging on the right. The text is overlaid on a semi-transparent dark rectangle in the center.

***Most things
still remain
to be done.
A glorious
future!***

- Ingvar Kamprad