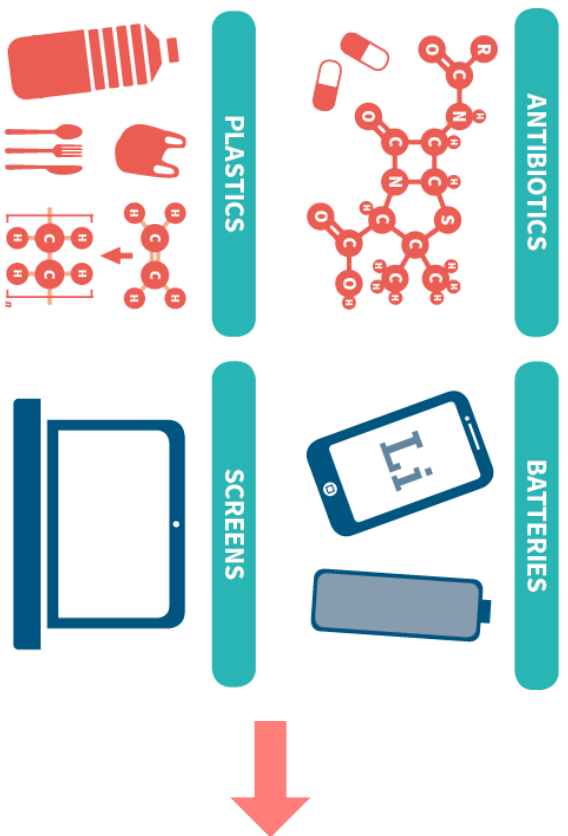




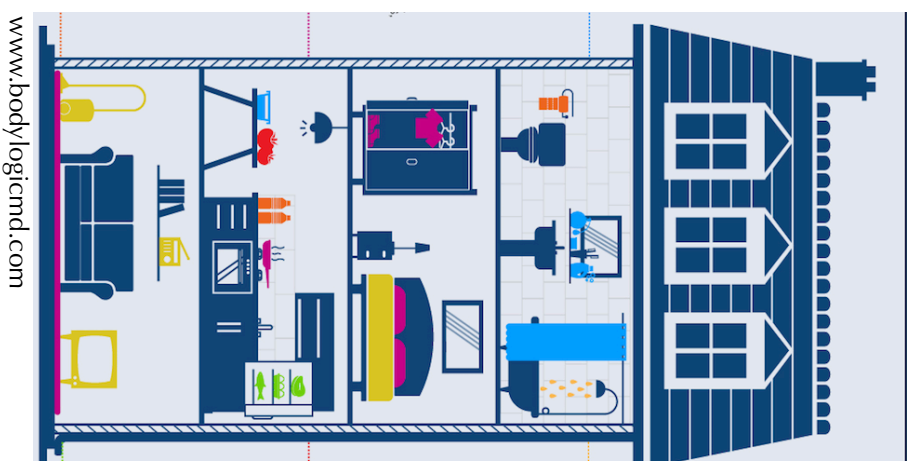
# Toward a Global Understanding of Chemical Pollution: A First Comprehensive Analysis of National and Regional Chemical Inventories

Zhanyun Wang, Glen W. Walker, Derek C. G. Muir and Kakuko Nagatani-Yoshida

# Motivation



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[www.bodylogicsmd.com](http://www.bodylogicsmd.com)

- Lead
- Phthalates
- Bisphenol-A
- PFASs
- Flame retardants
- Organophosphate pesticides
- Dioxins and PCBs



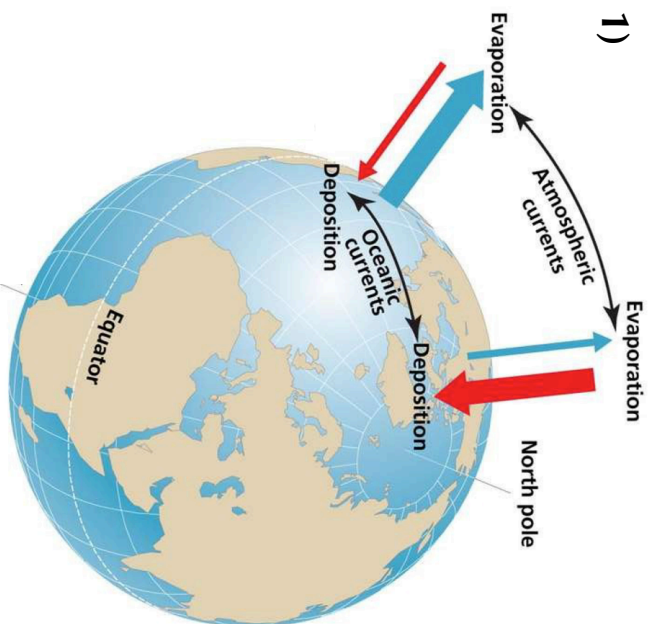
TSCA (US)  
 CEPA (Canada)  
 REACH (EU)  
 CSCL (Japan)  
 Etc. ...

# Motivation

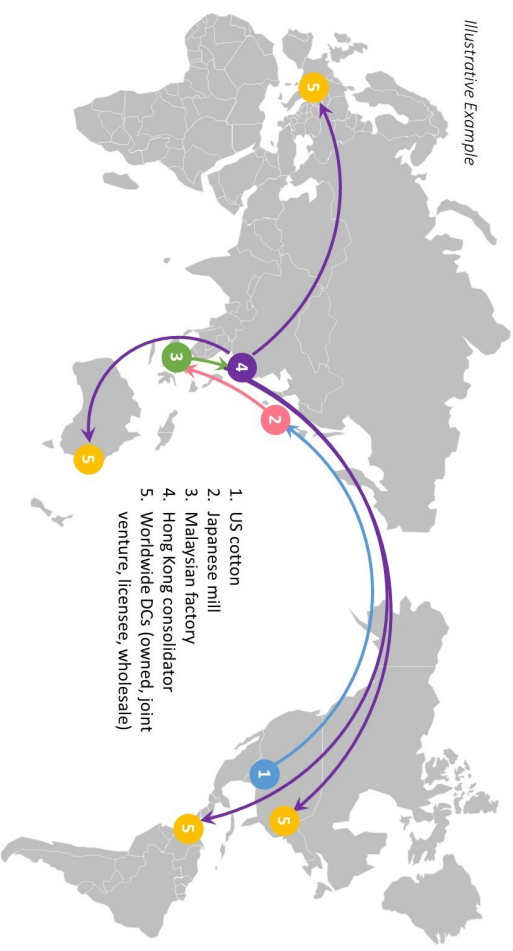
TSCA (US)  
 CEPA (Canada)  
 REACH (EU)  
 CSCL (Japan)  
 Etc. ...



They are very important, but may NOT be sufficient, e.g.



2)



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 Publishing as Benjamin Cummings

Steve Laughlin, <https://longitudes.upr.edu/transfoming-the-global-supply-chain/>

# Motivation

*Environ. Sci. Technol.*

2010

## Identifying New Persistent and Bioaccumulative Organics Among Chemicals in Commerce

PHILIP H. HOWARD<sup>\*,†</sup> AND DEREK C. G. MUIR<sup>†</sup>

## Prioritizing Chemicals and Data Requirements for Screening-Level Exposure and Risk Assessment

Jon A. Arnot,<sup>1\*</sup> Trevor N. Brown,<sup>1\*</sup> Frank Wanig,<sup>1</sup> Knut Breivik,<sup>2,3</sup> and Michael S. McLachlan<sup>4</sup>

2012

**ENVIRONMENTAL**  
Science & Technology

2012  
Policy Analysis  
pubs.acs.org/est

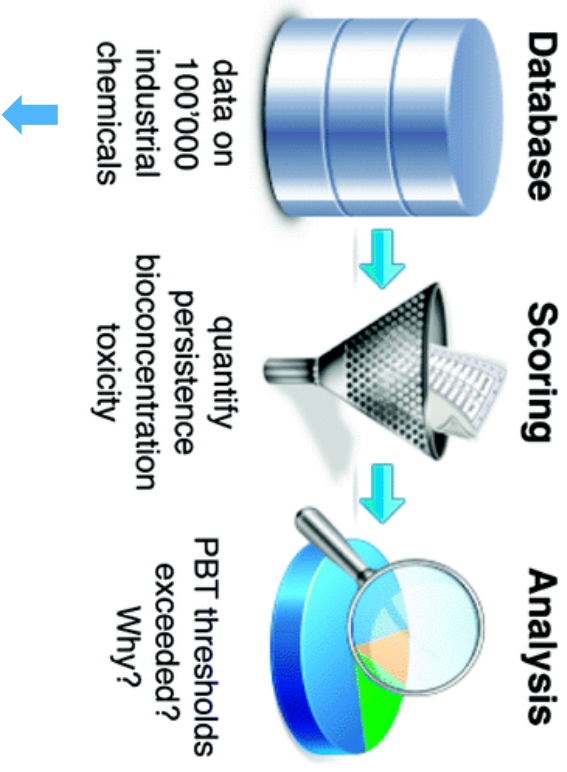
## Screening for PBT Chemicals among the "Existing" and "New" Chemicals of the EU

Sebastian Strempel, Martin Scheringer,<sup>\*</sup> Carla A. Ng, and Konrad Hungerbühler

etc. ...



www.esd.lfu.ethz.ch/

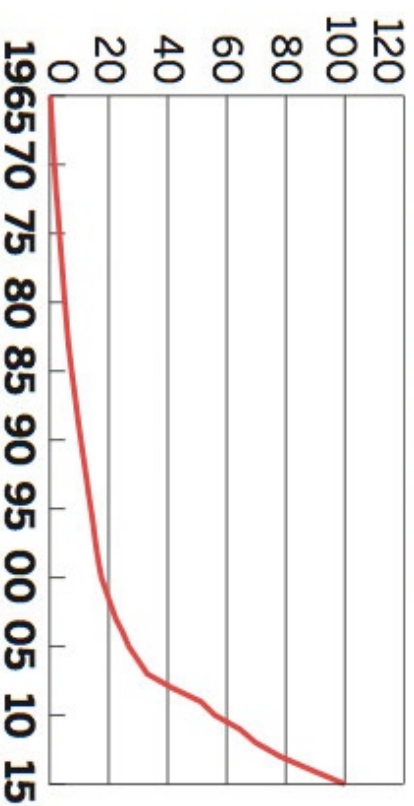


focused on the inventories in Canada, the EU, Japan and the US

(Strempel et al. ES&T 2012)

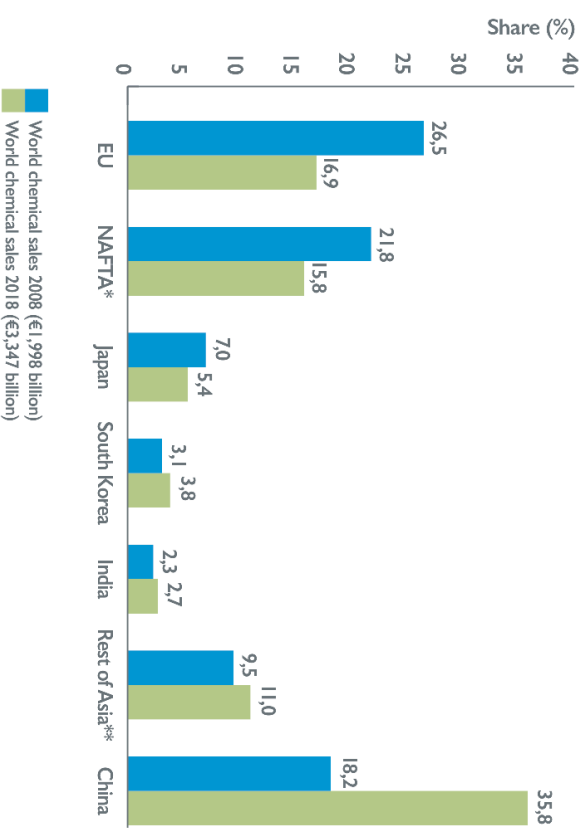
# Motivation

Cumulative substances, millions



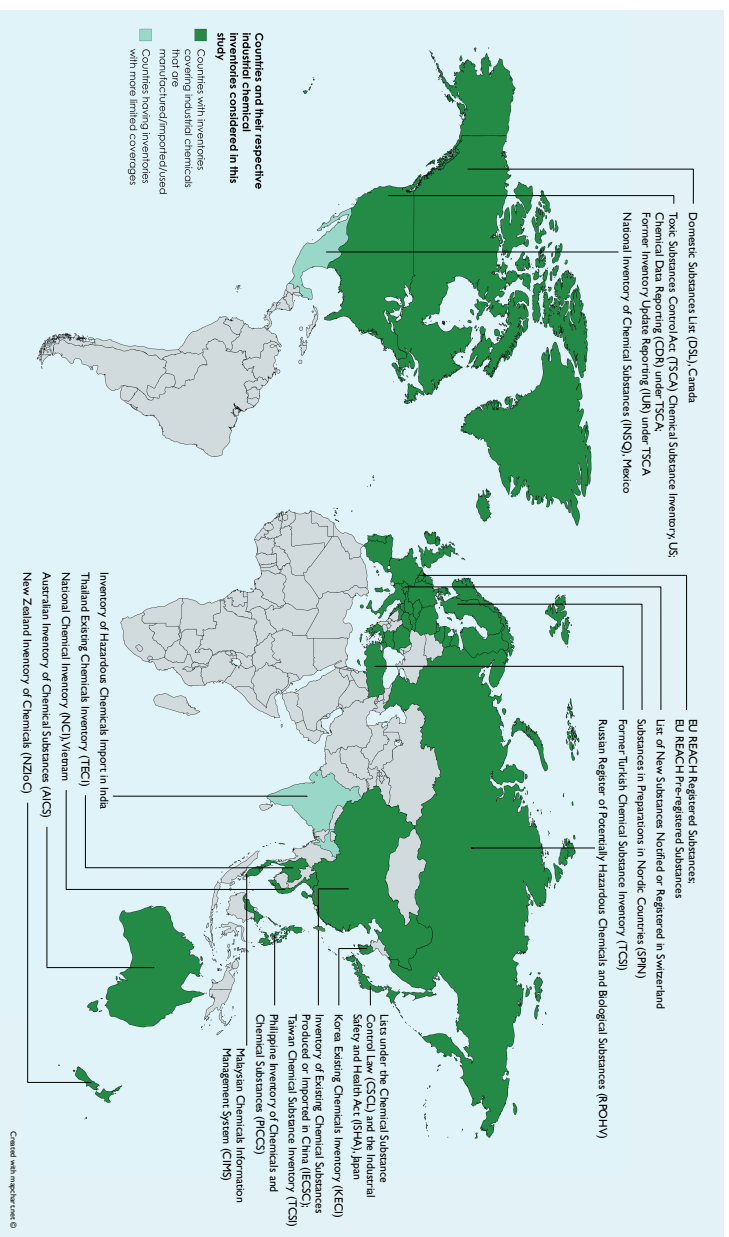
- To date, over 160 million chemicals and mixtures of chemicals have been registered under CAS.

→ A more comprehensive analysis of chemicals on the market is needed.



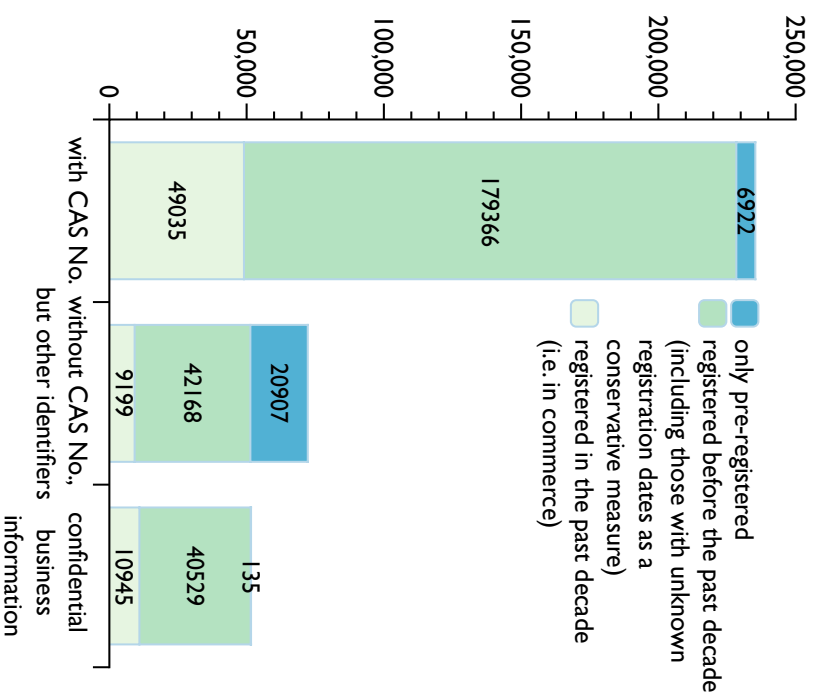
# The Study Scope

- 22 inventories from 19 countries and regions in different formats
- Most inventories have a focus on industrial chemicals
- 3 categories of commercial status
  - chemicals in commerce, i.e. registered between 2010-2019;
  - registered before 2010;
  - pre-registered



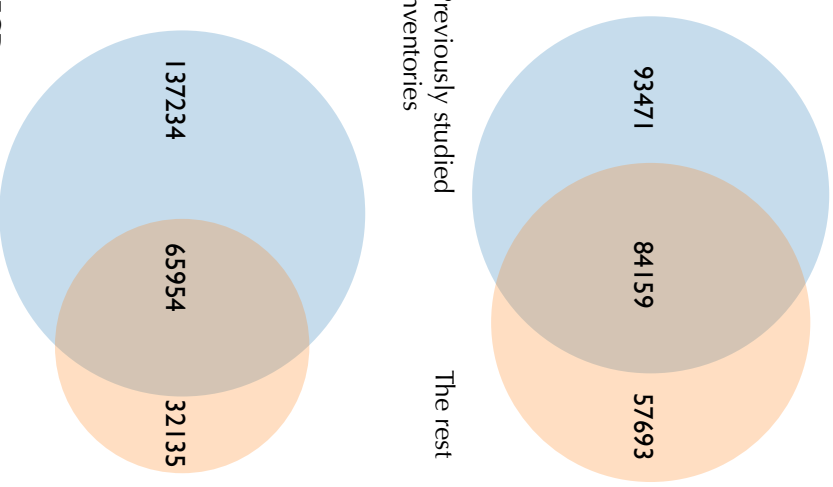
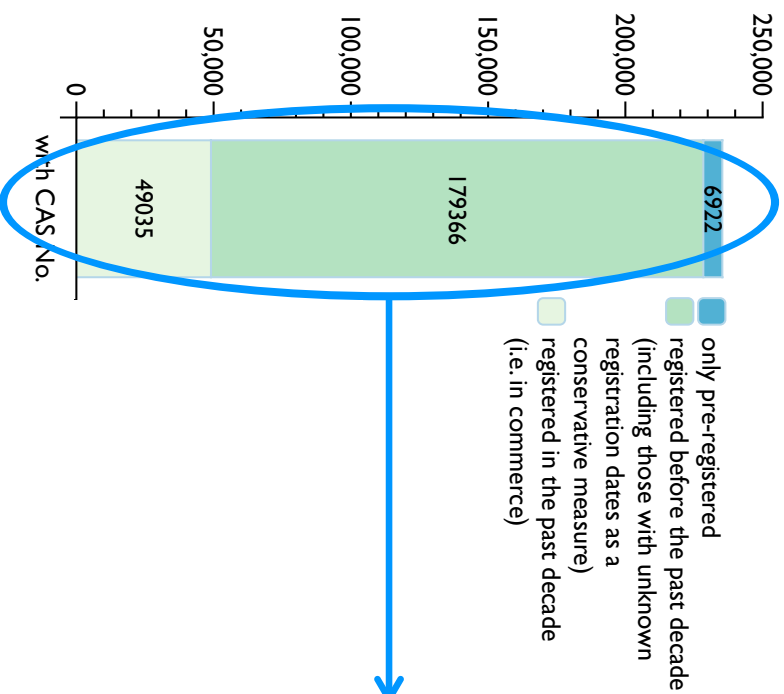
## Results (1) - Total Numbers of Chemicals Registered

- **>235,000 CAS + >120,000** chemicals (or mixtures) without assigned CAS



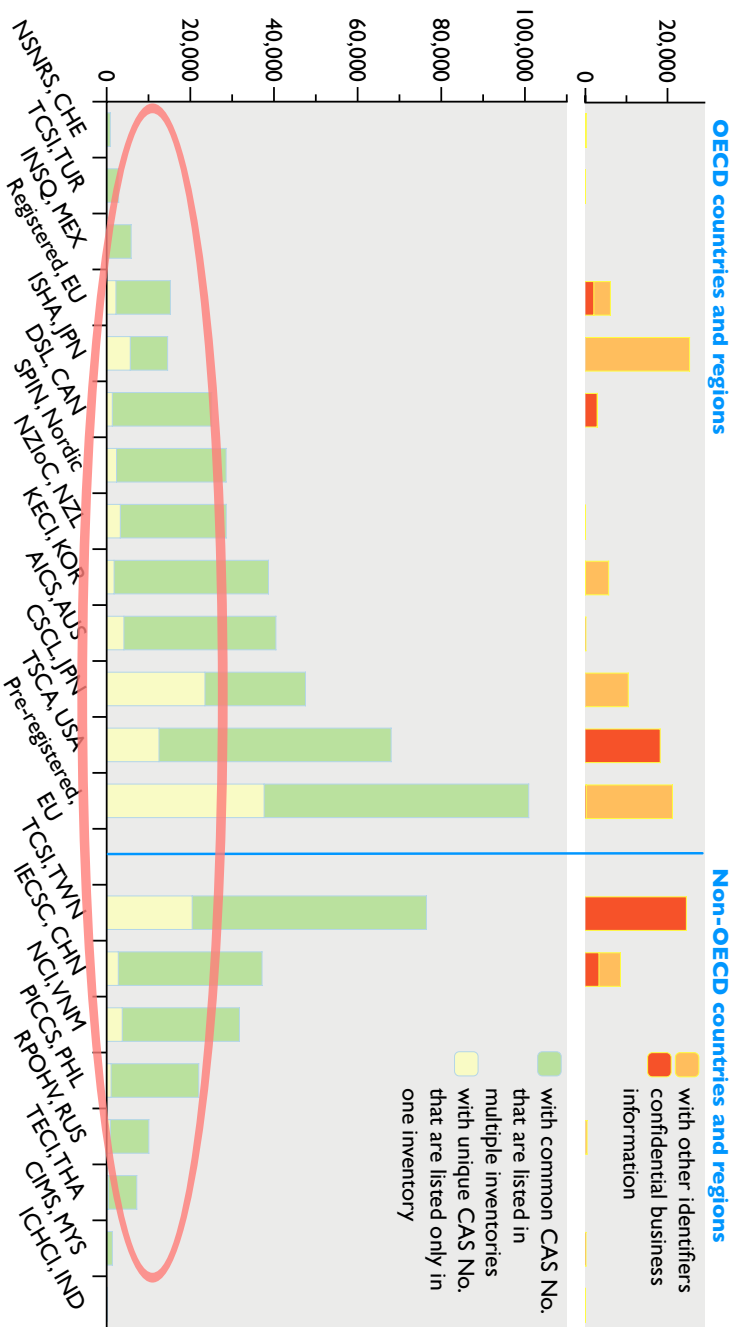
# Results (1) - Total Numbers of Chemicals Registered

- >235,000 CAS + >120,000 chemicals (or mixtures) without assigned CAS
- >57,000 CAS (ca. 25%) are included in the inventories that have not been studied
- >32,000 CAS are registered only in non-OECD countries.

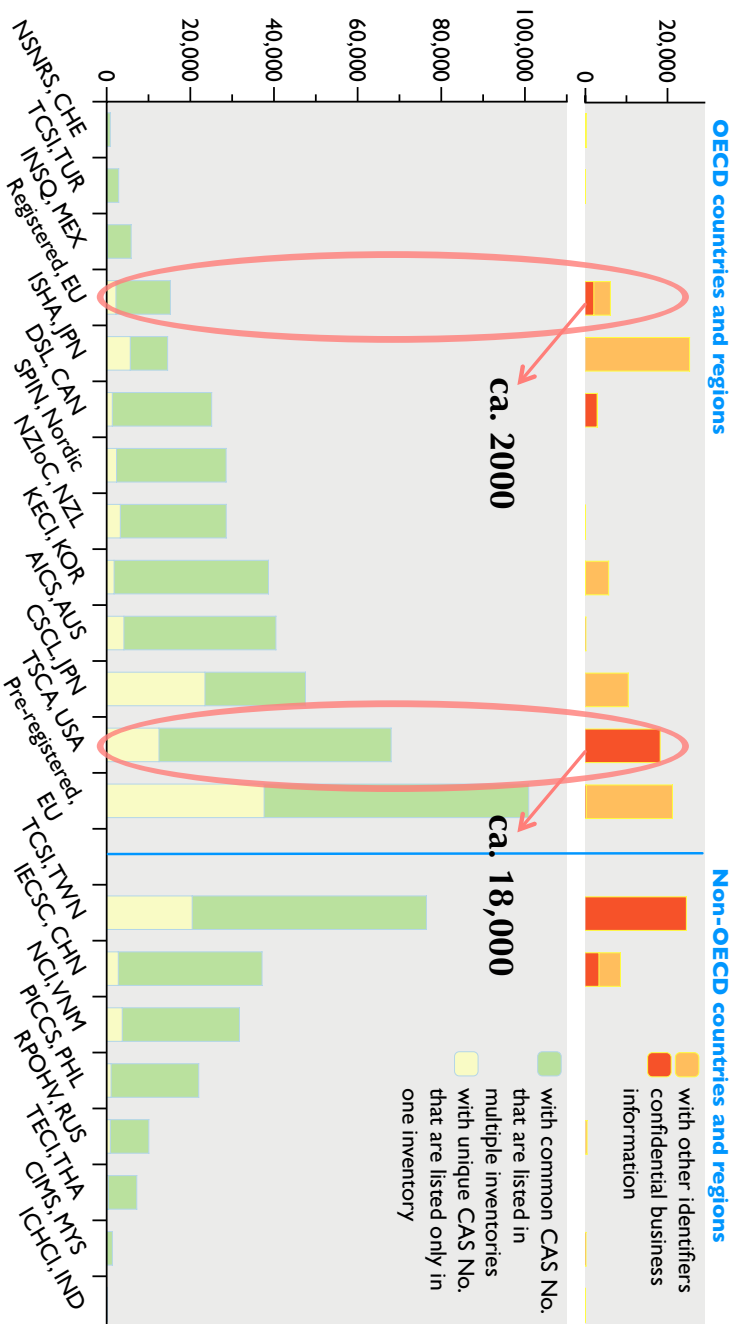




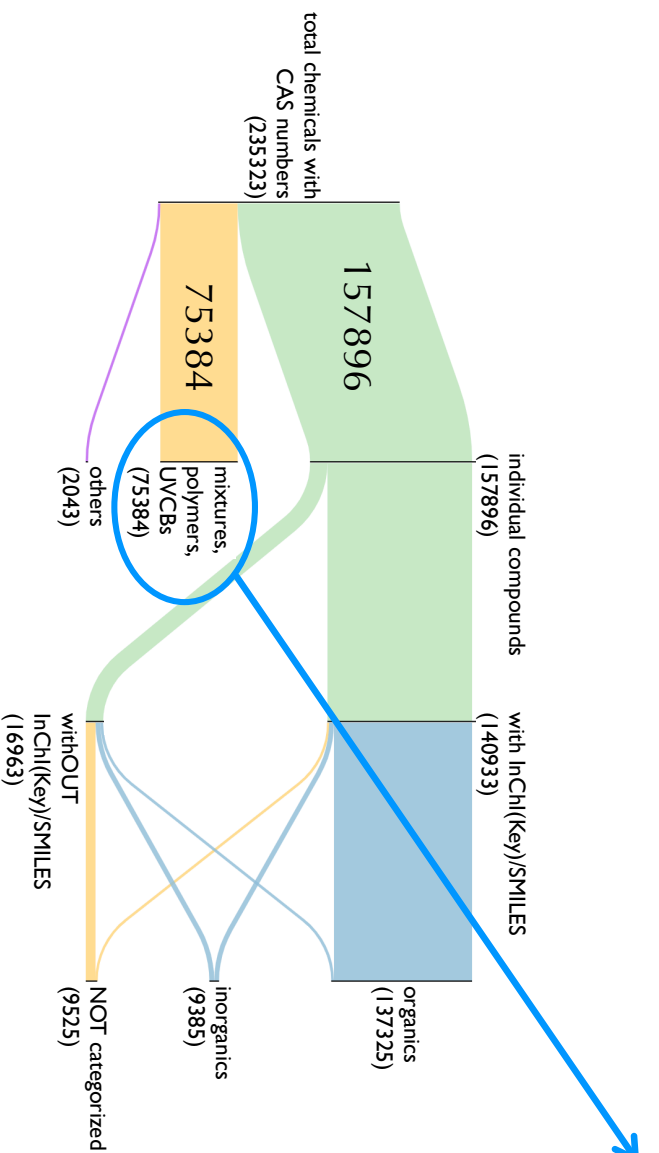
# Results (2) - Total Numbers of Chemicals at the Country level



# Results (2) - Total Numbers of Chemicals at the Country level



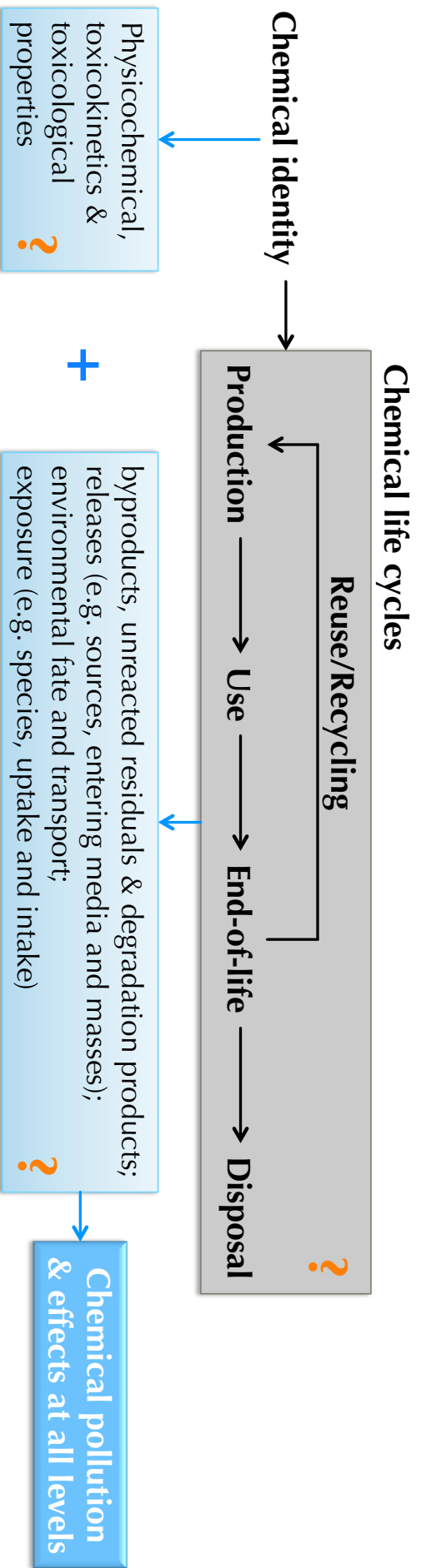
## Results (3) – An Overview of the Chemicals



- **Simple mixtures**, e.g.,  
CAS 1174918-67-2 → alkanes, C<sub>6-7</sub>-iso-
- **>17,000 with a process-based name**, e.g.,  
CAS 721399-22-0 → ethene, tetrafluoro-, oxidized, polymd., reduced, Me esters, reduced, methacrylates
- **>15,000 with fossil or bio-origins**, e.g.,  
CAS 64742-16-1 → petroleum resins;  
CAS 100298-94-0 → grass, ext.
- **>37,000 polymers**, e.g.,  
CAS 9009-54-5 → polyurethane foam

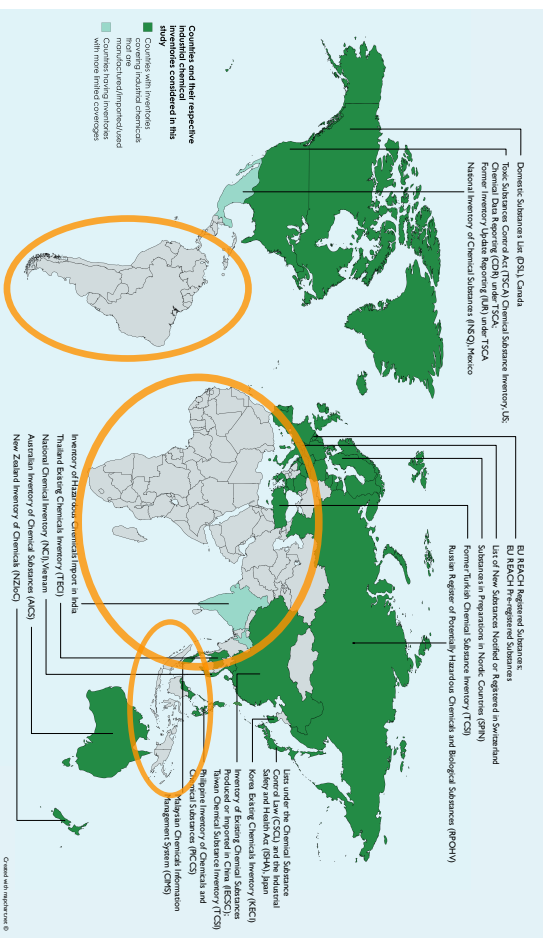
## Discussion (1)

- Understanding chemicals on the market is a first step toward a comprehensive global understanding, reduction and even prevention of chemical pollution.



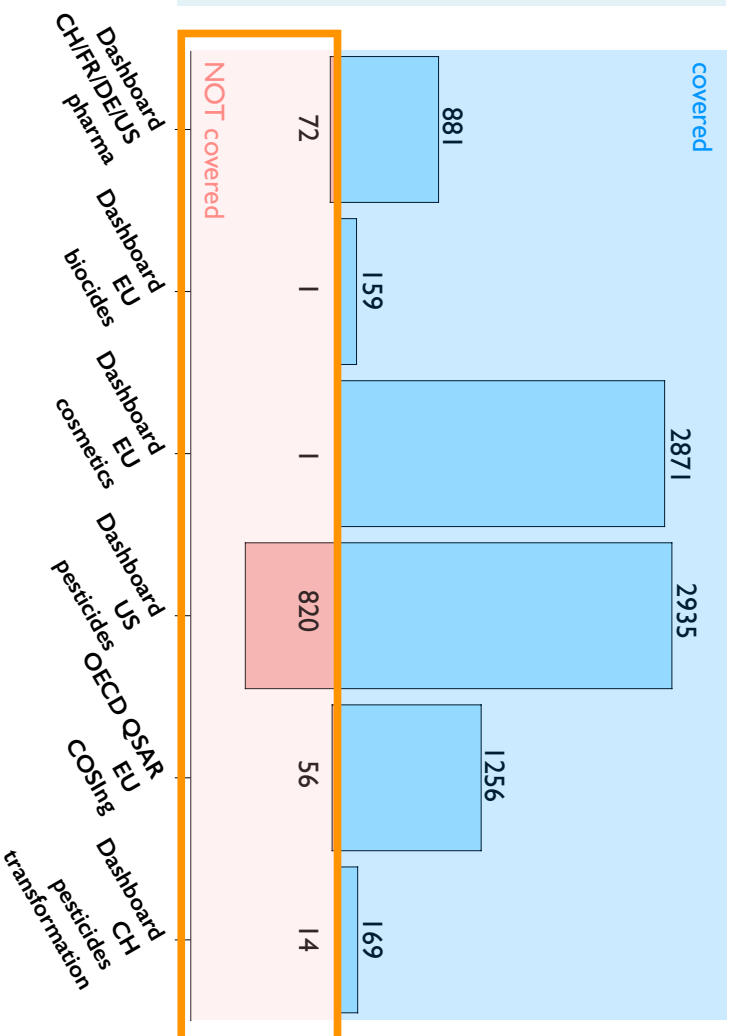
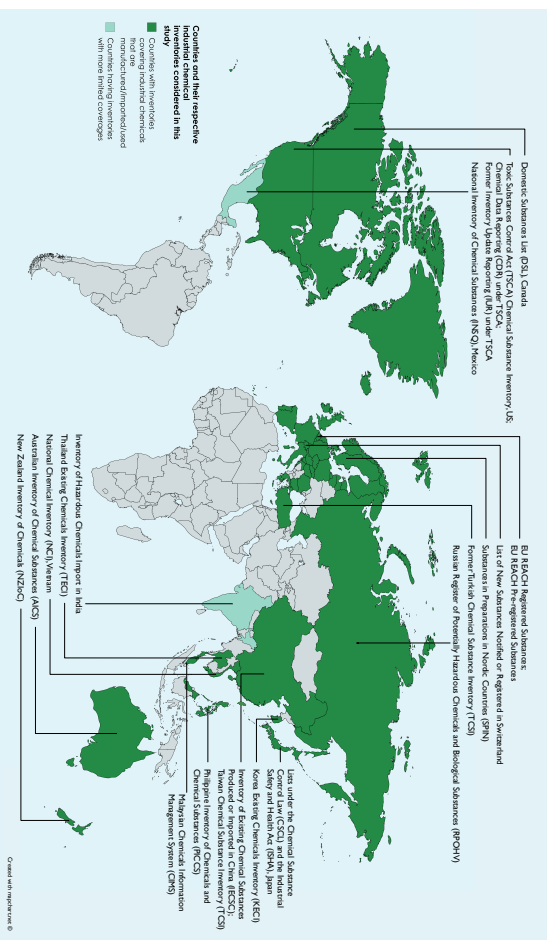
# Discussion (2)

- The scope of this study is still to a certain extent limited.



# Discussion (2)

- The scope of this study is still to a certain extent limited.



## Next Steps for Speeding Up the Progress

- **Coordinated efforts toward a comprehensive global understanding of chemical pollution**, e.g.
  - + standardized reporting of chemical information
  - + high-throughput and in silico tools for screening and prioritization
  - + mixture effects
  - + environmental and biomonitoring programs
- Developing **technical solutions addressing uncertainties in chemical identities**
- Establishing a **virtual global inventory** of all chemicals on the market
- Developing global best practices for national chemical inventories

## Take-Home Messages

- A much larger number of chemicals have been registered on the global market than reported.
    - The task for sound chemicals management is greater than what has been expected.
  - >32,000 chemicals have been registered only in developing countries, but may still be present in developed countries via global trade or long-range transport.
  - Currently, the chemical identity of >100,000 of chemicals remain unknown, due to confidential business information or being described in vague terms.
  - Understanding chemicals on the market is a first step toward a comprehensive global understanding, reduction and even prevention of chemical pollution.
- **Strong coordination and cooperation is needed for addressing chemical pollution!**



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Policy Analysis

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<https://pubs.acs.org/doi/pdf/10.1021/acs.est.9b06379>

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- Helene Wiesinger (ETHZ) for her efforts in retrieving relevant information from the OECD QSAR Toolbox;
- Lesley Debono (Australian Government Department of the Environment and Energy) for providing the VBA scripts that can be used to verify CASRN.
- The views and opinions expressed are those of the authors and do not necessarily reflect the views or official policies of their organizations and/or governments.

**Thank you very much for your attention!**

