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Swiss Centre for Life Cycle Inventories

A joint initiative of the ETH domain and Swiss Federal Offices

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48th Discussion Forum, Dübendorf

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ecoinvent v3 – Internationalization of the data supply and international collaborations

ecoinvent as a global database

- ecoinvent started as a **Swiss** database
- **International supply chains** demanded international data collection
- Now the most used global database of known quality
- Growth can be **problematic**:
  - Data for different regions benefit from local expertise
  - International data collection ideally organized in a collaboration of regional data collection networks

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ecoinvent as a global database

- Collaboration with **CIRAIG** in **Canada** to build an LCI database for Québec
- Data are being **integrated** into the existing global supply chains provided by ecoinvent version 3
- Local data collection efforts can rely on **global background data** and grow organically into local process systems
- **Other collaborations** are in planning or are already submitting first datasets

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LCA in emerging economies

- Fast-growing **demand for LCA** and related techniques in emerging economies
- International users will benefit greatly from global supply chain data in several sectors
- LCA-based regulations in developed countries may cause international trade disputes

→ **Strong demand for local LCI data and expertise**

Local level of expertise in LC-based methods can be low, little experience with LCI data collection

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Cooperation of LCI initiatives

- Cooperation with several emerging economies to support LCI networks in developing countries, supported by the Swiss government (SECO)
- Use existing expertise of ecoinvent starting out as the Swiss LCI network
- The goal is to:
  - Build expertise on life cycle thinking and LCA
  - Create capacity for LCI data collection
  - Create background data for local (and global) studies
  - Grow into self-sustaining regional LCI competence centres

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Problems of starting LCI networks

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- Local **level of expertise** in life cycle-based methods can be low
  - Little experience with LCI data collection
- Lack of local environmental studies compared to developed countries, so **less basis for background data**
  - Local conditions can differ significantly from other regions
- Inventory **databases** need a certain “critical mass” to be useful
  - Gaps in process chains will introduce errors in the results

Building capacity

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- Experts and experienced practitioners needed
  - Workshops in India, Brazil, South Africa
  - Regular communication and discussion of problems
- Guidance for data creation necessary
  - Software tool with automatic pre-validation
  - Documents and videos to guide beginning data creators
- Informing and involving stakeholders

Data availability

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- Environmental studies are scarce
  - Industry often very motivated to share data
- Technological differences can be significant
- Cottage-scale industries, e.g. silk reeling
  - Significant differences from larger-scale operations
- Waste management
  - Existing waste treatment models not directly adaptable

Case study: Coal power

- Coal power constitutes ~ 70% of Indian generation

	Germany	India
Calorific value of burned coal	27.7 MJ/kg	15.7 MJ/kg
Emission abatement	Desulphurisation, denitrification, and dedusting operating in most power plants	In most power plants only dedusting
CO_2	92 g/MJ coal	96 g/MJ coal
NO_x	0.06 g/MJ coal	0.63 g/MJ coal
SO_2	0.07 g/MJ coal	0.89 g/MJ coal
$PM_{2.5}$	0.005 g/MJ coal	0.202 g/MJ coal
Net efficiency of power plant	36 %	32 %

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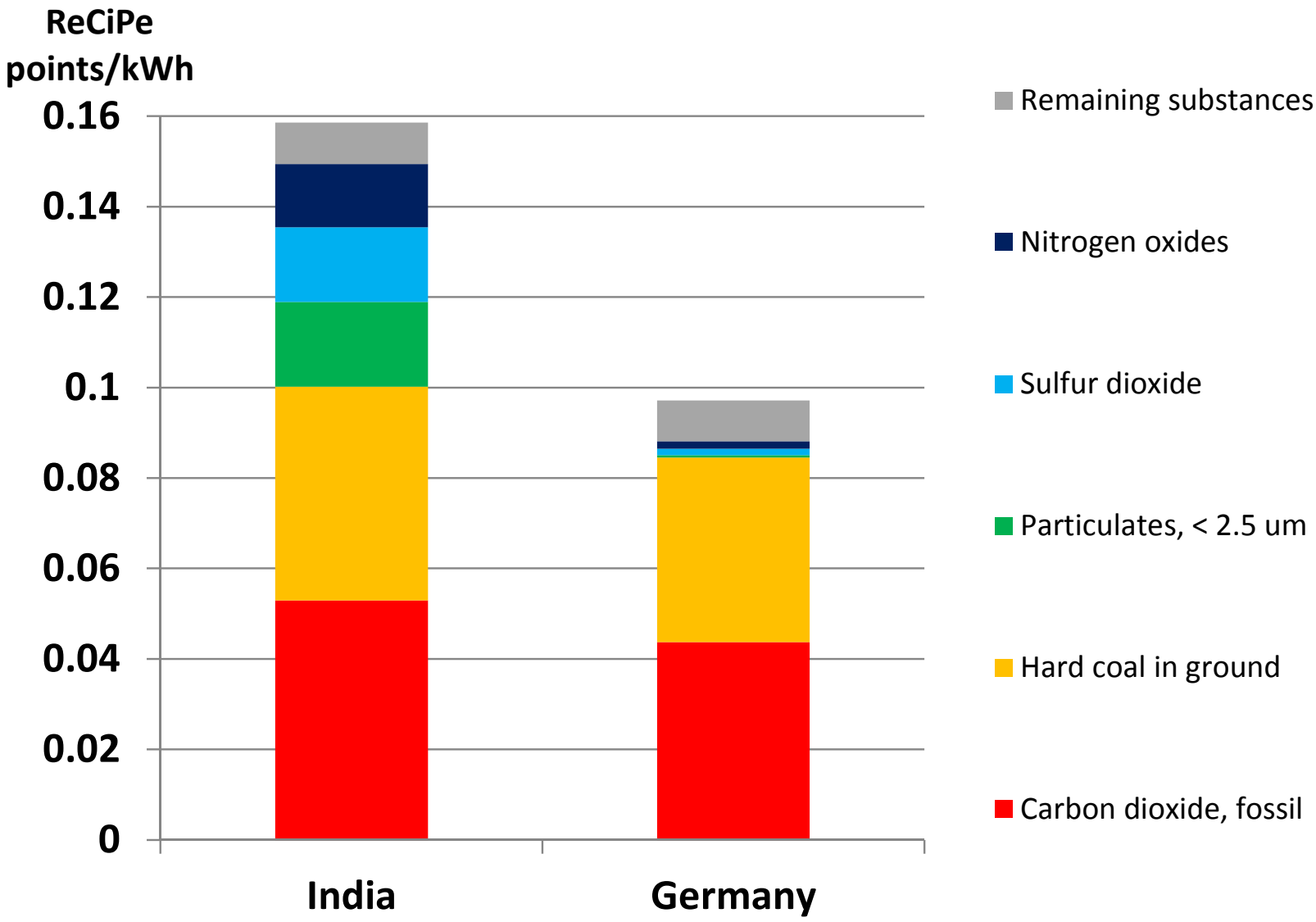
Case study: Coal power



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Case study: Coal power

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- Similarities
  - Dataset structure
  - Some values (efficiency, CO_2)
- Differences
- Existing datasets proved a helpful resource
  - Mathematical relations & Child datasets simplify changes

Coal power: Child datasets

- Start out as copy of the parent
- Values can be changed relative to the parent or overwritten completely
- Optional – independent datasets can serve the same function

	Exchange				electricity production,		
	Type	Name	Unit	Compartment	Amount	Variable Name	Mathematical Relation
	0 - Referenc...	electricity, high voltage	kWh		1		
	2 - ByProdu...	residue from cooling tower,...	kg		fx 0.000424...	amount_residue	ParentValue * 8
	2 - ByProdu...	hard coal ash, 0% water	kg		fx 0.056794	amount_ash	ParentValue * 1.2
	4 - ToEnviro...	Lead-210	kBq	air	9.66173170...		
	4 - ToEnviro...	Cobalt	kg	air	1.15031444...		
	4 - ToEnviro...	Selenium	kg	air	4.09224628...		
	4 - ToEnviro...	Propene	kg	air	2.95071439...		
	4 - ToEnviro...	Methane, dichloro-, HCC-30	kg	air	2.71338586...		
	4 - ToEnviro...	Strontium	kg	air	5.02695308...		

LCI database creation

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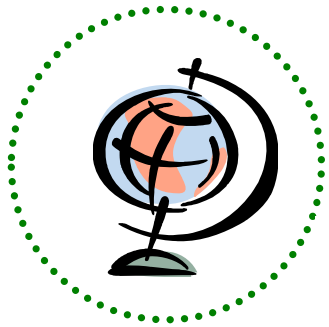
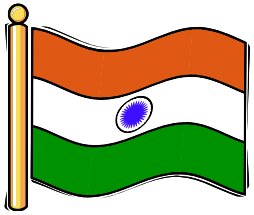
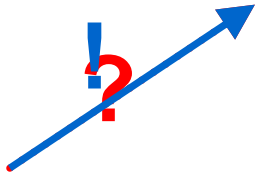
- Without background data, life cycle-based assessments are virtually impossible or highly flawed
  - Several critical sectors occur in virtually all life cycles
- Solution: Integrate into existing database
  - Framework of an existing dataset simplifies data collection for inexperienced users
  - Local datasets can fall back on global background data with higher uncertainty until local inputs become available
  - Updates integrated into supply chains automatically
  - Data collection results can be applied immediately for first screening results

Indirect linking in ecoinvent v3







Input

Indian dataset

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Conclusions

- The ecoinvent Centre is building a **network of collaboration partners**
- We wish to support other LCI initiatives by **offering** our **structure** and **experience**
- **Integrating** with existing data helps to **create datasets** and to reach **critical mass** for high quality database
- Transparent **unit-process** inventory modeling **facilitates** cooperation and data exchange

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Thank you for your attention!

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