

**Fraunhofer Institute for Solar Energy Systems ISE**

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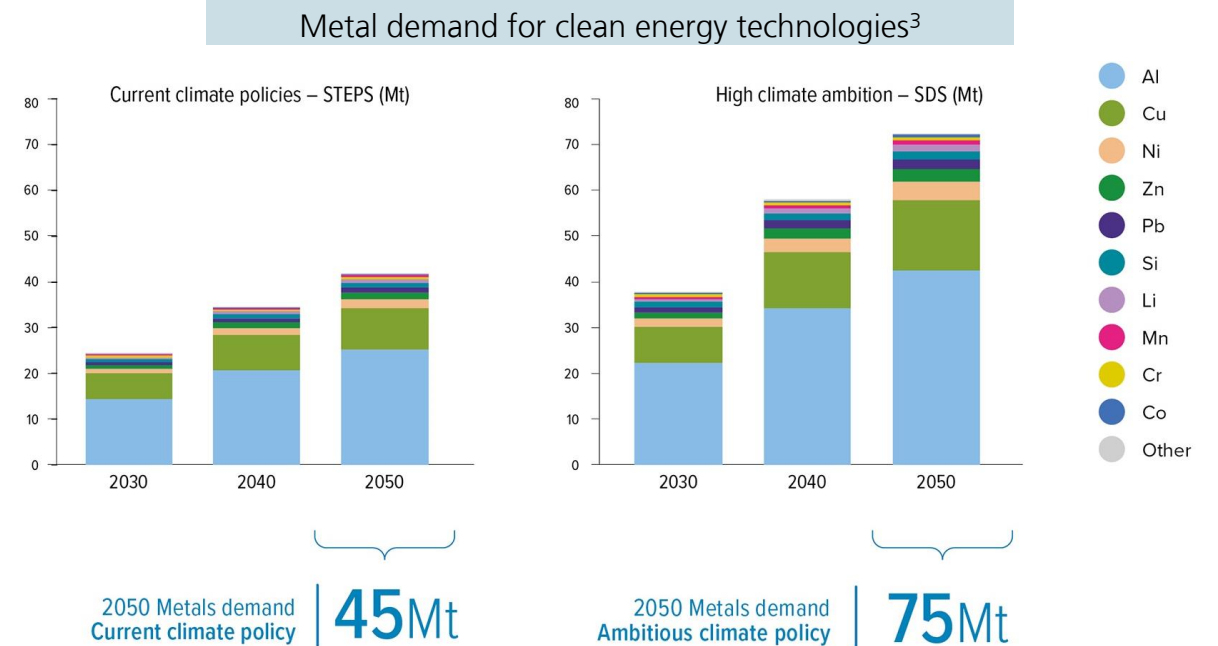
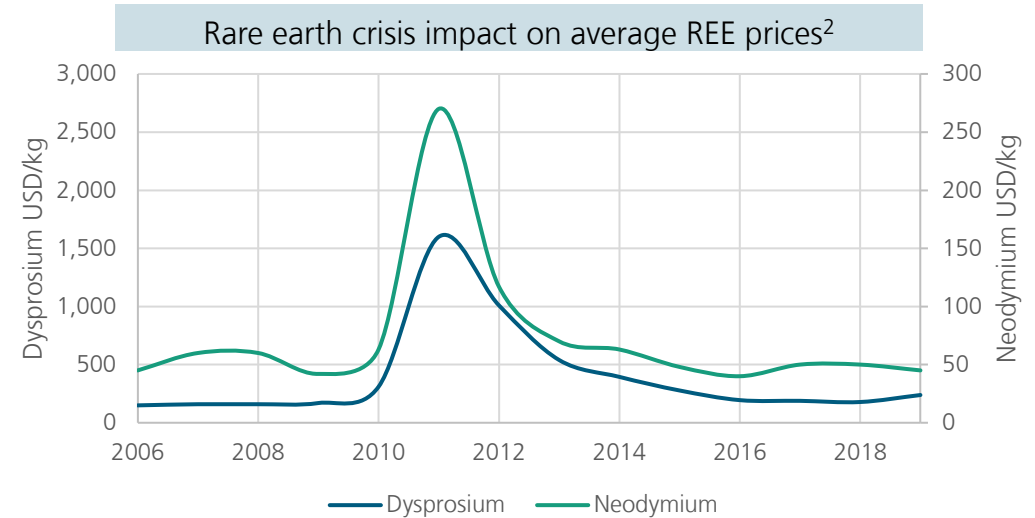
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**Criticality and social LCA for Perovskite:  
Does it make sense to harmonize?**

# Criticality assessment

## Definition and Background

„Raw material criticality is the field of study that evaluates the **economic and technical dependency** on a certain material, as well as the **probability of supply disruptions**, for a defined stakeholder group within a certain time frame.“<sup>1</sup>



<sup>1</sup> Schrijvers et al. In *Resources, Conservation & Recycling* (2020)

<sup>2</sup> U.S. Geological Survey (2006-2019)

<sup>3</sup> KU Leuven (2022)

# Criticality assessment

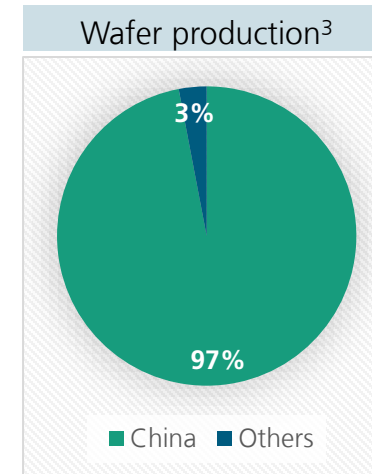
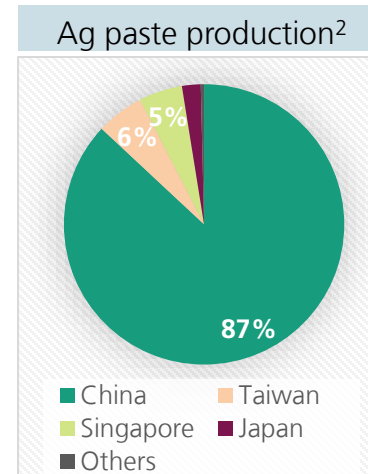
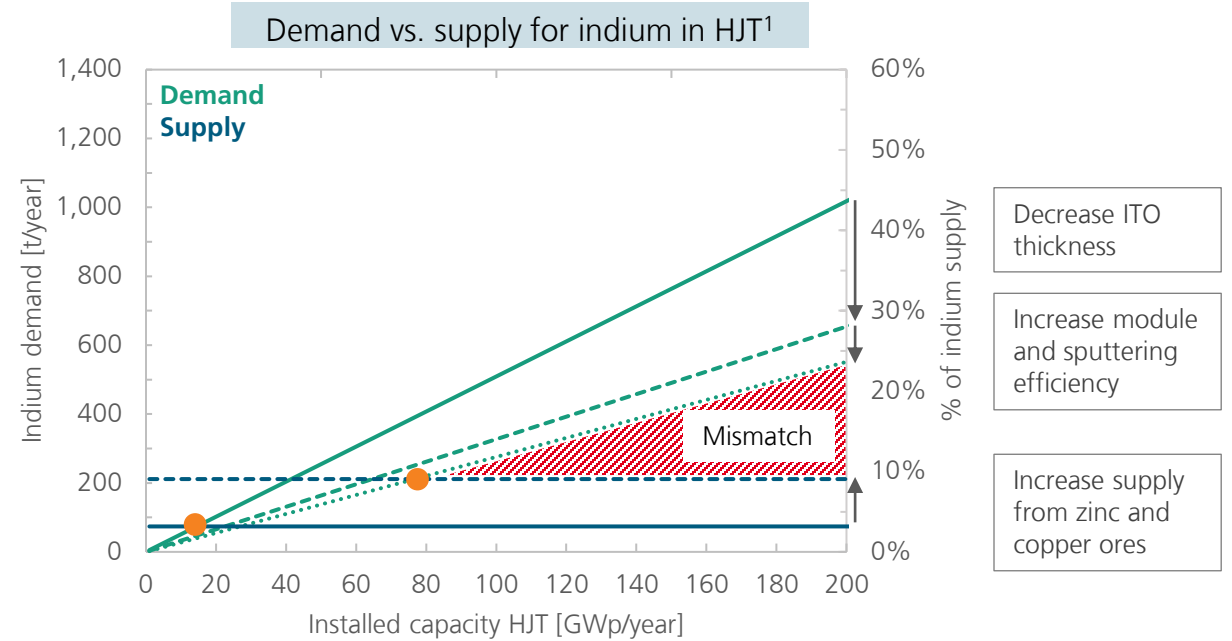
## Relevance for PV

### Demand vs. Supply:

- Red flags in PV, depending on upscaling targets:
  - PERC: Ag, Bi
  - SHJ: Ag, In, Bi
  - III-V: Ag, In, Ga, As
  - Perovskite: In, I, Cs, Au (provisional)
  - + Cu for grid

### Market concentration along the supply chain:

- High supply concentration for
  - Materials (e.g., poly-Si, Ag paste)
  - Components (e.g., wafer, cell)
  - Manufacturing equipment



<sup>1</sup> Gervais et al., In *EPJ Photovoltaics* (2022)

<sup>2</sup> Gervais et al., In *Resources, Conservation & Recycling* (2023, unpublished)

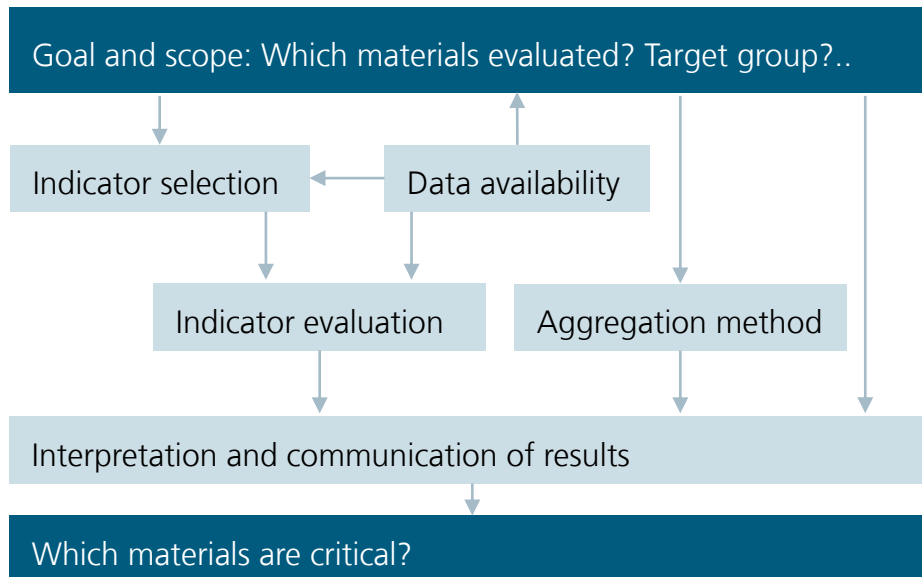
<sup>3</sup> IEA PVPS Trend Report (2022)

# Criticality assessment

## Methodology

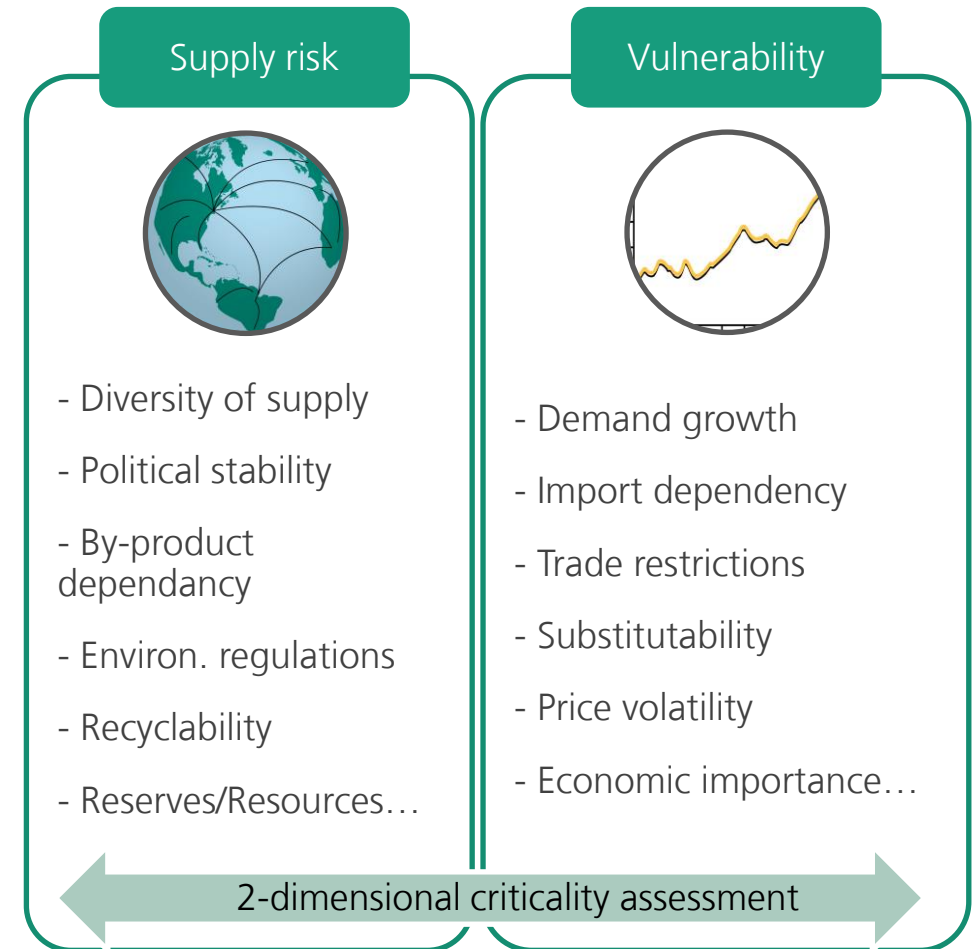
### No „correct“ method:

- Indicator selection and aggregation method tailored for specific user and time frame needs



Adapted from Schrijvers et al. In *Resources, Conservation & Recycling* (2020)

- Interest to exchange on criticality between EU projects?
- Does it make sense to harmonize our criticality methodologies (to an extent) to facilitate clear conclusions for perovskite?



# Responsible sourcing for PV

## Background

The New York Times

### *U.S. Bans Imports of Some Chinese Solar Materials Tied to Forced Labor*

Much of the world's polysilicon, used to make solar panels, comes from Xinjiang, where the United States has accused China of committing genocide through its repression of Uyghurs.

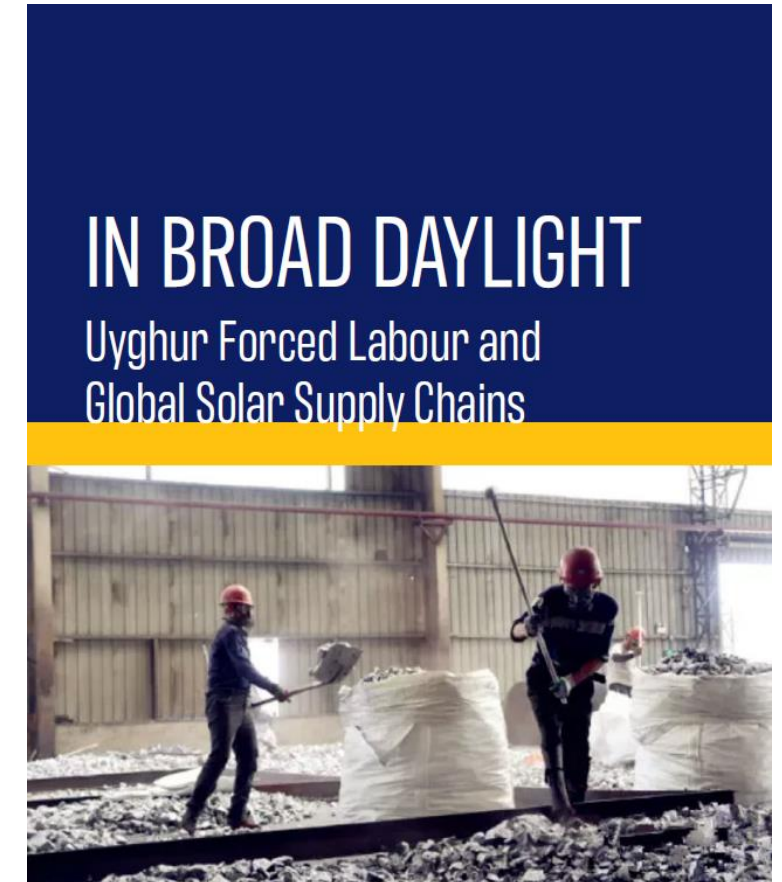
● Council of the EU Press release 1 December 2022 11:15

### Council adopts position on due diligence rules for large companies



SolarPower Europe

**SolarPower Europe Statement:  
Abiding by Human Rights Standards**



LAURA T. MURPHY & NYROLA ELIMÄ

Sheffield Hallam University  
Helena Kennedy Centre for International Justice

The New York Times (2021); Council of the EU (2022); Solar Power Europe (2021)

Murphy and Elimä (2021)

# Social LCA (S-LCA)

## Methodology

### Identification of potential social impacts along the supply chain

- Identify locations/activities where a social issue is likely to occur and evaluate the risk probability
- Use of dedicated databases (SHDB, PSILCA)
- Evaluation of social risks at country/sector/company level

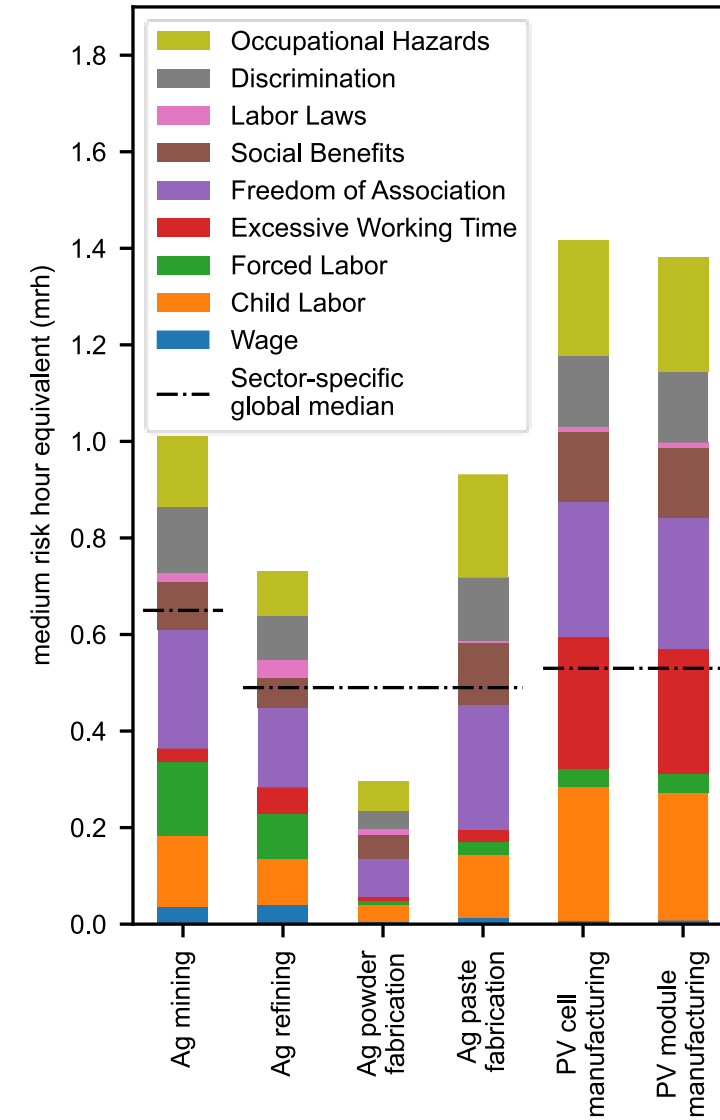
### Challenges

- Lack of data for the supply chain mapping of emerging technologies
- S-LCA methodology still relatively new

- Interest to exchange on social risks/sLCA between EU projects?

Examples of stakeholder and impact subcategories in s-LCA <sup>1</sup>	
Workers	Local community
Freedom of association	Cultural heritage
Child labor	Respect of indigenous rights
Fair salary	Local employment
Working hours	Access to material resources
Forced labor	Secure living conditions
...	...

Social risks along the silver supply chain<sup>2</sup>



<sup>1</sup> UNEP, Guidelines for Social Life Cycle Assessment of Products and Organizations (2020)

<sup>2</sup> Gervais et al., In Resources, Conservation & Recycling (2023, unpublished)



# Thank you for your attention!

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