IGES Institute for Global Environment
財団法人 地球環境戦略研究機関

Assessment of Sustainability of Recycling Using LCA: Challenges and Opportunities for Filling the Data Gap

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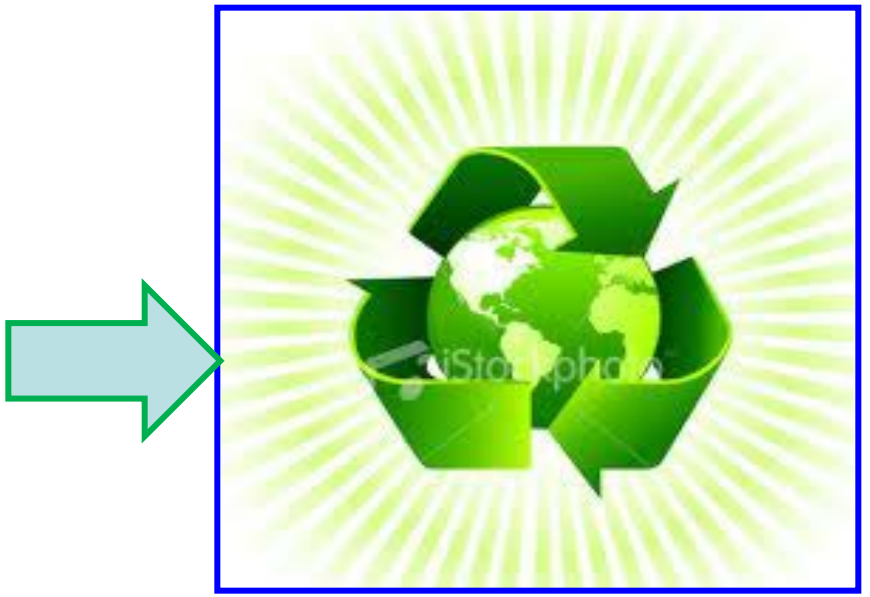
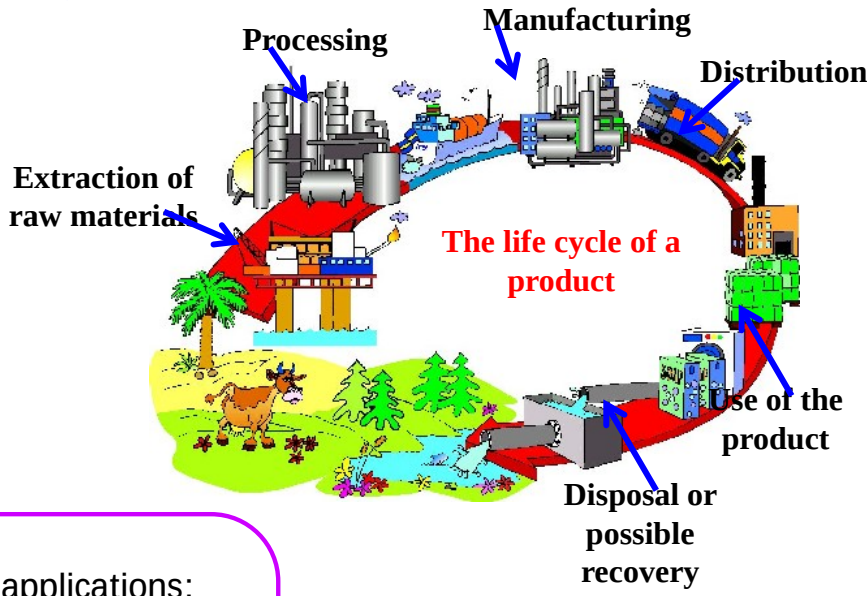
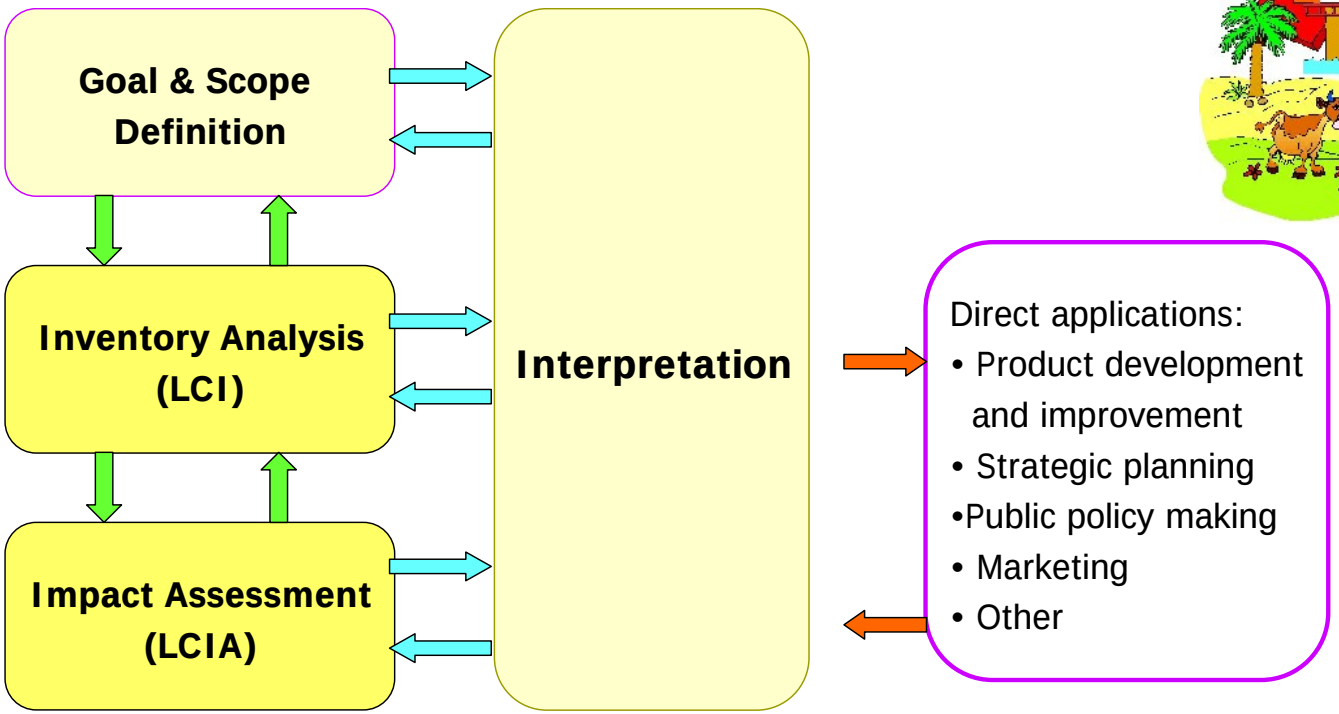


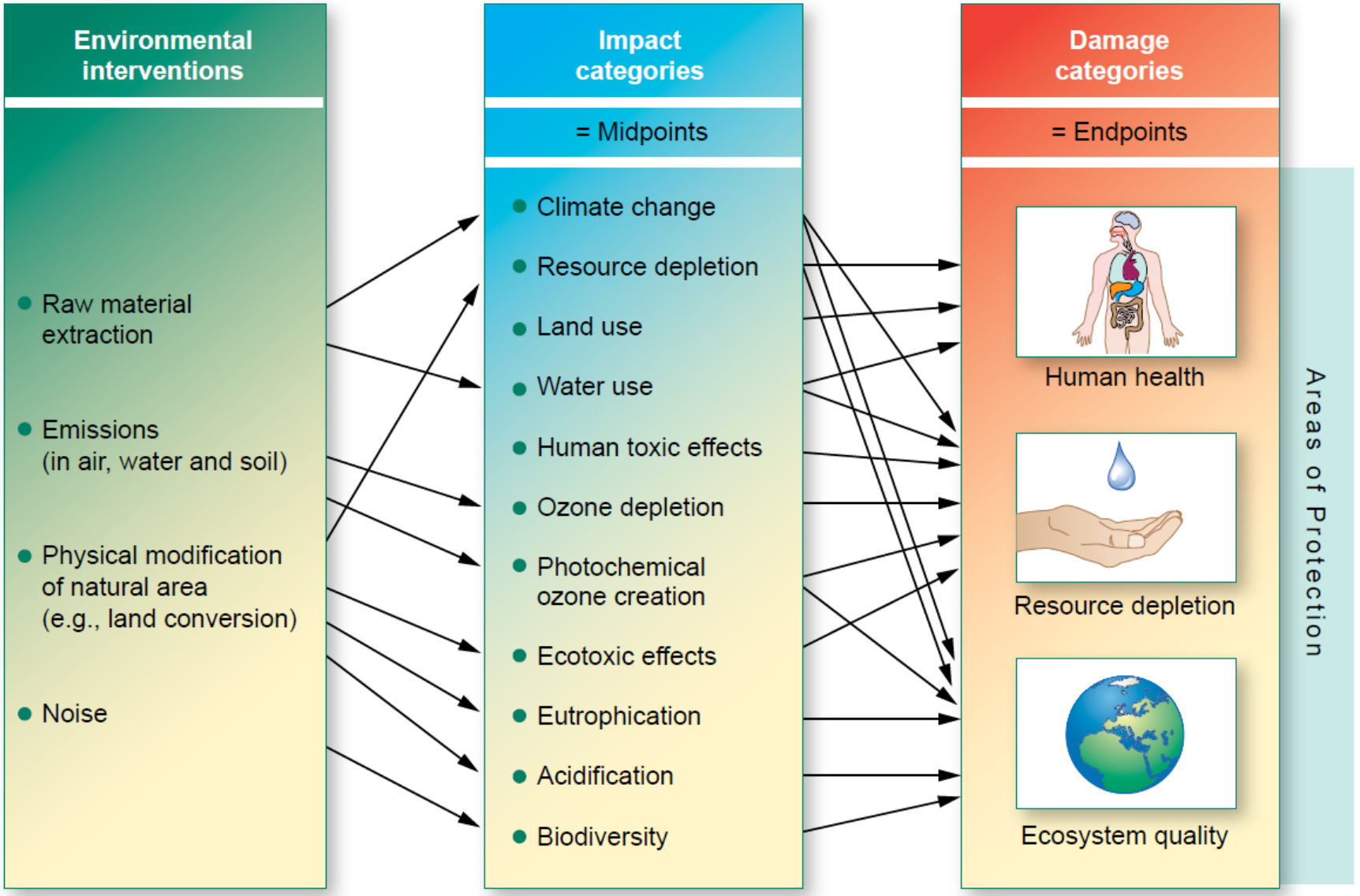
The concept of Life Cycle Assessment (LCA)

•LCA is “a technique for assessing the environmental impacts associated with a product, service at all stages in their life cycle – from extraction of resources, through the production and use of the product, reuse, recycling or final disposal”
(source: ISO 14040)





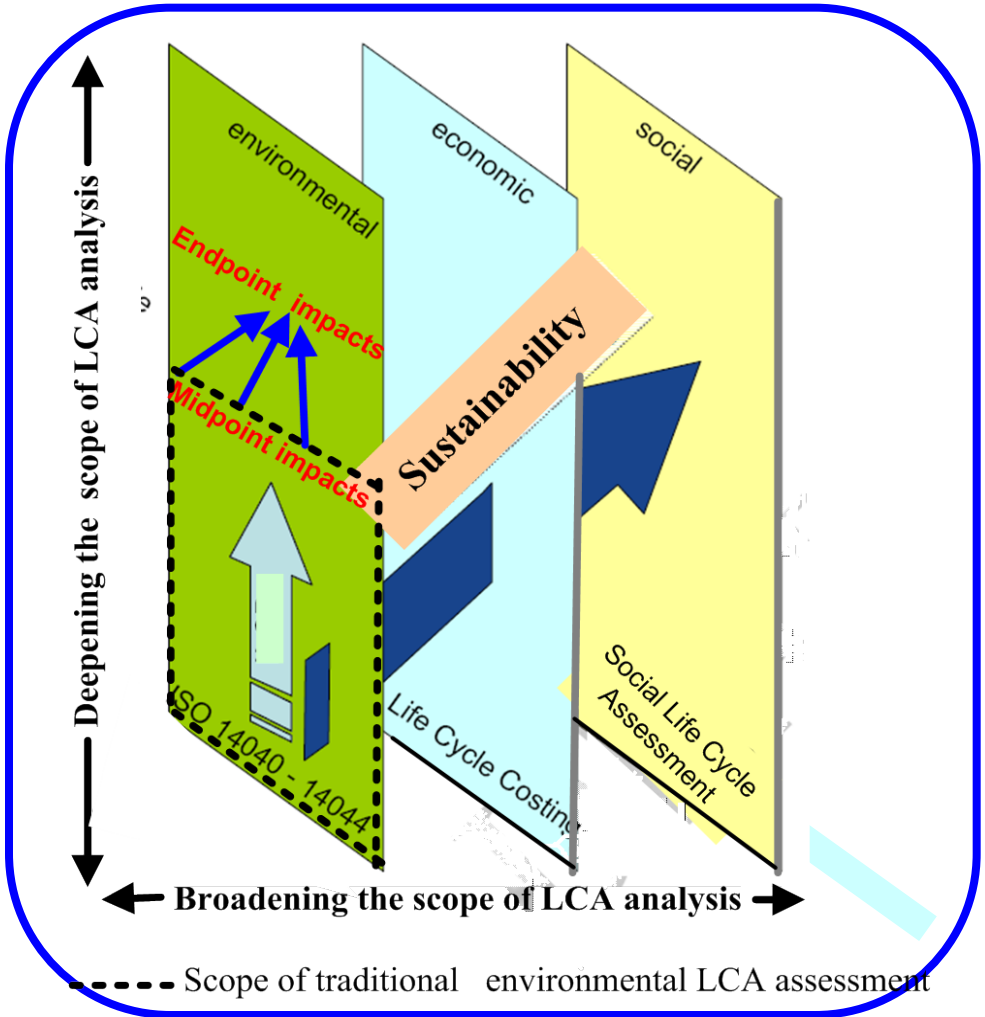
Life Cycle Assessment for environmental impacts



Soruce:UNEP/SETAC Life Cycle Initiative (2011)

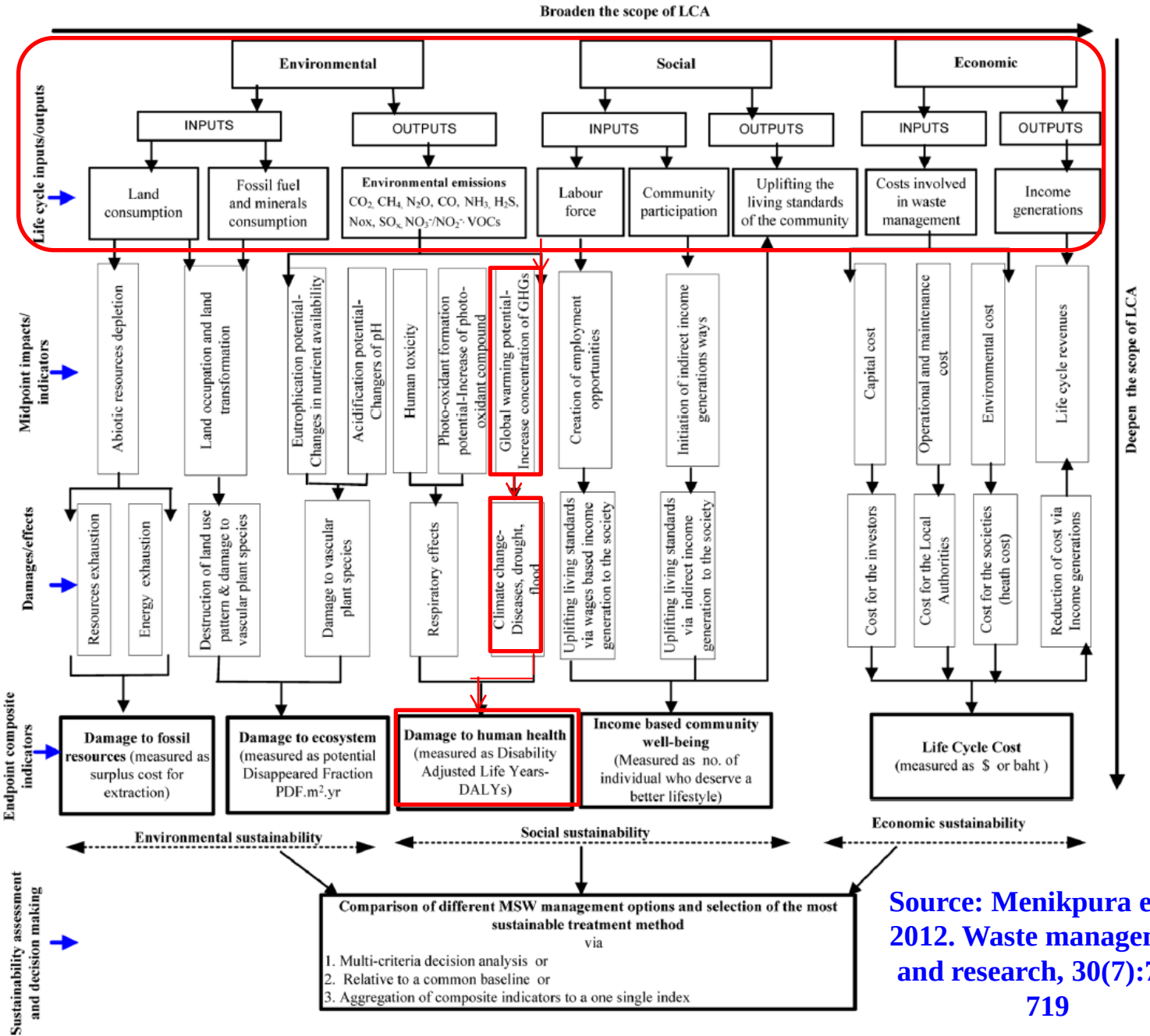
Application of LCA concept for sustainability assessment

- There is a growing interest in application of LCA as a sustainability tool



- "Broadening" and "deepening" of the scope of traditional LCA concept to a full scale "life cycle sustainability" assessment

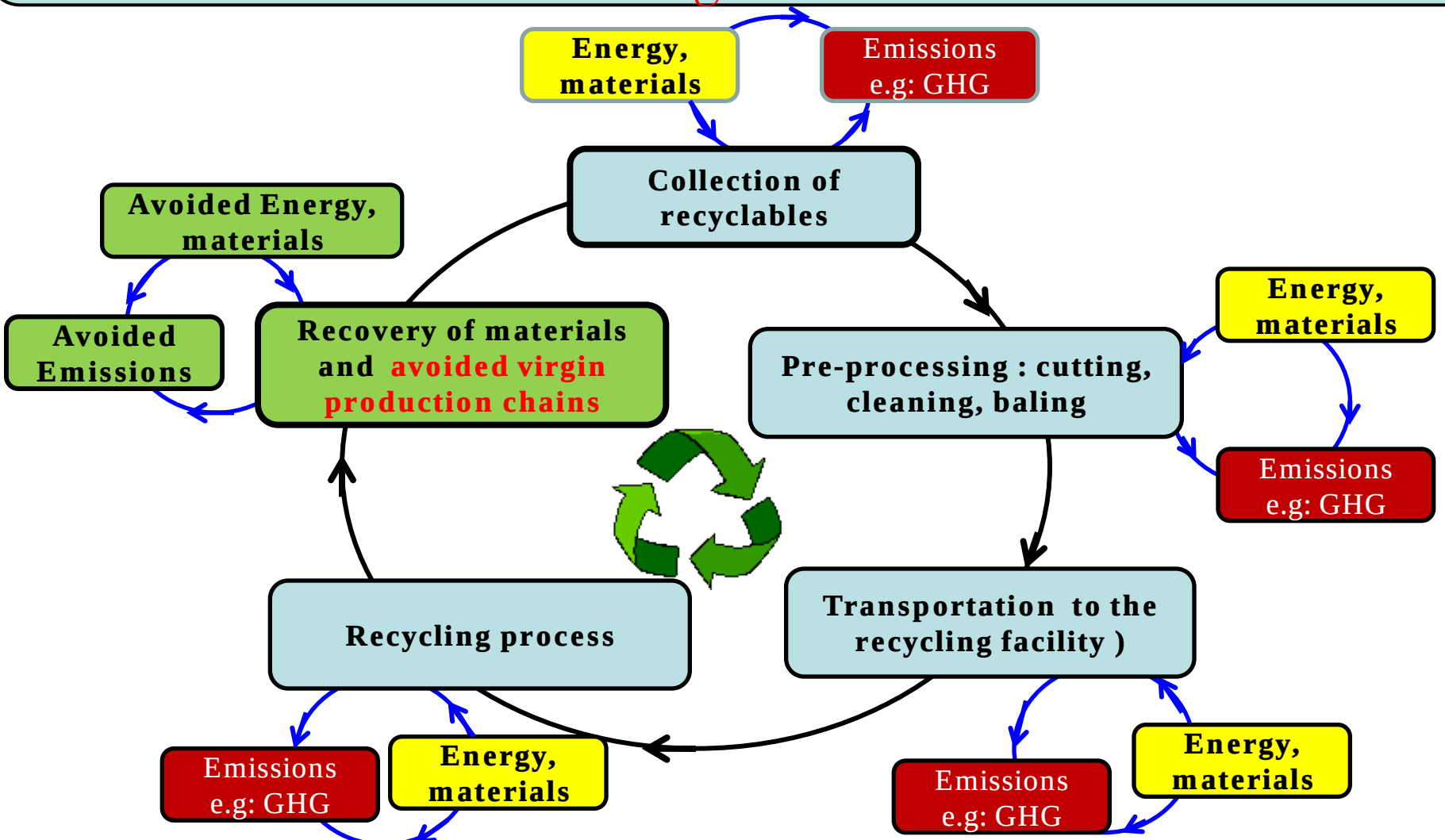
Framework for life cycle sustainability assessment



Source: Menikpura et al., 2012. Waste management and research, 30(7):708-719

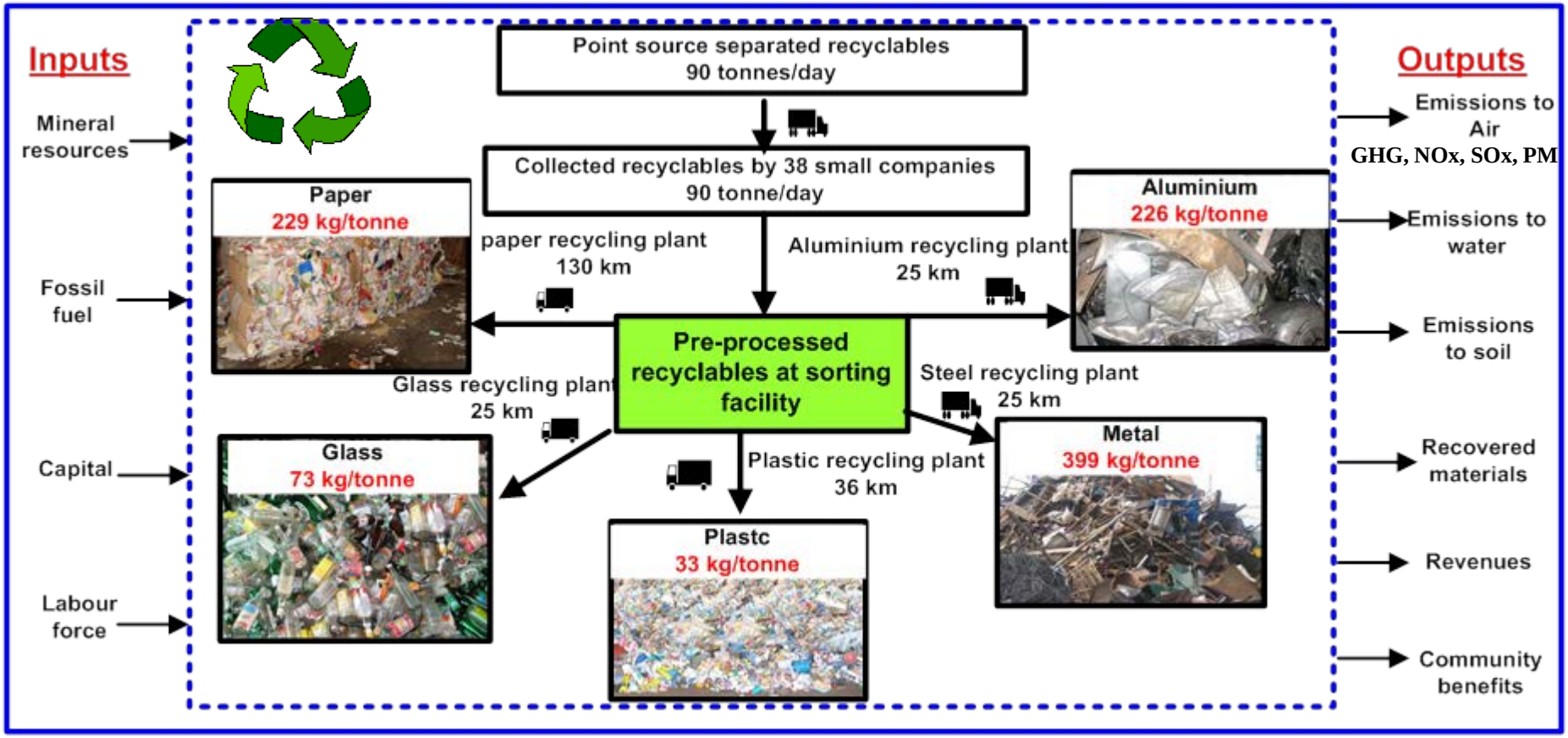
Life cycle assessment of recycling

•All processes are required significant amount of energy and materials and result in environmental impacts due to consumption of resources and emission of toxic gases

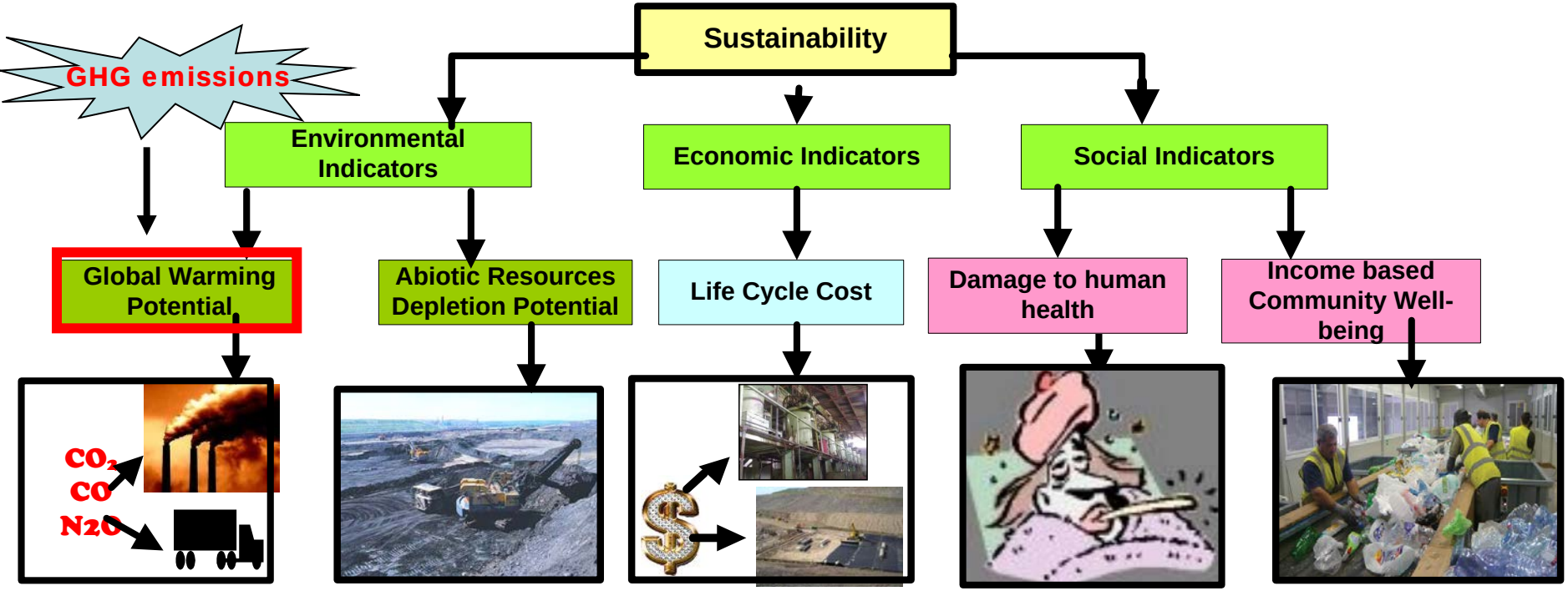


Life cycle input/output based sustainability

Key input and output of recycling scheme



Life cycle input/output based indicators for assessing sustainability of recycling



Data required for sustainability assessment of recycling

Phase I
Waste generated at household

Generation rate?
Composition?
Total waste?

Phase II
Transportation
household to collection points

Total recyclables?
Energy ?
Cost ?
Labour ?
Emissions ?

Intermediate collection points

Phase III
Intermediate processing

Composition?
Energy ?
Cost ?
Labour ?
Emissions?

Phase IV
Transportation
Intermediate collection to dismantling facility

Total recyclables?
Energy ?
Cost ?
Labour ?
Emissions?

Sorting/dismantling/mechanical separation facilities

Phase V
Dismantling/ mechanical separation

Composition?
Energy ?
Cost ?
Labour ?
Emissions?

Phase VI
Long distance transportation

Phase VII
Recycling

Total amount?
Energy ?
Cost ?
Labour ?
Emissions?

Plastics | Ferrous metals | Aluminium | Glass | Paper

Domestic recycling | International recycling

Domestic recycling | International recycling

Waste input?
Energy ?
Recovered materials?
Emissions?
Cost ? Revenue?
Labour ?

Route I | Route 2

Route I | Route 2

Challengers in data gathering

- Massive amount of data is required for sustainability assessment using LCA
- Lack of awareness about usefulness of recording data accurately and maintain the data quality
- Lack of understanding about highest priority data required to assess the key sustainability issues
- Lack of interest of all the level of stakeholders on recoding data
- Key stakeholders such as privet sector/recycling companies are not willing to share the data to maintain confidentiality
- Data collection is costly and requires significant use of resources
- Local authorities as well as recycling companies may find it difficult to prioritize data collection over other more urgent needs
- There is no country specific database on virgin resource production to compare the effectiveness of recycling
- Lack of understanding on importance of data sharing, publishing and translating to use internationally
- Financial obstacles on accessing data, often a major barrier among researchers who need to purchase data at high cost

Opportunities for filling the gap

- There is a growing interest on LCA as a tool for providing information to manufacturers, suppliers, customers, policy−makers and other stakeholders
- Recently, LCA has been connected to "national sustainability agenda" in many countries
- There are improvements of research and development programs on sustainability indicator development and quantitative sustainability assessment
- Many developing countries in the position to develop national "life cycle inventory" data bases e.g. Thai National Life Cycle Inventory Database
- Awareness raising via MRV approach is growing and that would facilitate

  -Wide participation in the consistent and transparent data collection

  -Data recoding using simple, web-based tool

  -Improving reliability and availability of information and data

  -Contribution national and international organizations on managing, processing and making volumes of data available in user-friendly ways

THANK YOU VERY MUCH FOR YOUR ATTENTION

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