

Research on environmental, economic, and social impacts of resource circulation systems in Asia

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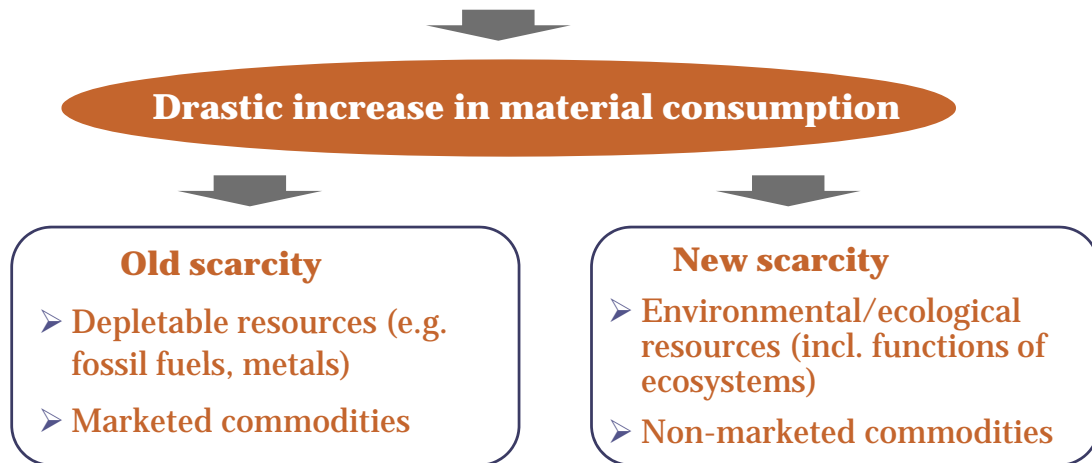
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Outline of the presentation

1. Background
2. Research questions
3. Methodology
4. Expected outputs
5. Overall time schedule

Emerging resource constraint issues in Asia

- ◆ Rapid economic growth in Asia
- ◆ Necessity of meeting basic needs of the poor



Regional resource circulation system

- Stable resource circulation system must be established to decouple resource consumption and economic growth.
- Regional resource circulation with regional cooperation will be an effective solution:
 - Recyclable trades without regional policy coordination often undermine effectiveness of domestic resource circulation system.
 - Recyclable trades without regional policy coordination has caused environmental problems due to inappropriate recycling activities in the recipient countries.
 - Banning recyclable trades may aggravate resource constraints in recipient countries.

Research objectives

To provide useful information to formulate effective resource circulation policy options which will mitigate resource constraints with satisfying environmental and social constraints.

- **Resource constraints:** vulnerability of economy against resource scarcity and consequent resource price fluctuation
- **Environmental constraints:** shortage of waste disposal sites, environmental problems due to emissions of pollutants including GHGs from life cycle of products
- **Social constraints:** provide means of livelihood to the poor engaging informal recycling activities with addressing environmental and health problems of informal recycling in developing countries

Research gap

Previous studies on resource circulation in Asia tend to focus on survey of inappropriate recycling and recyclable trades, or data collection concerning hidden material flows.



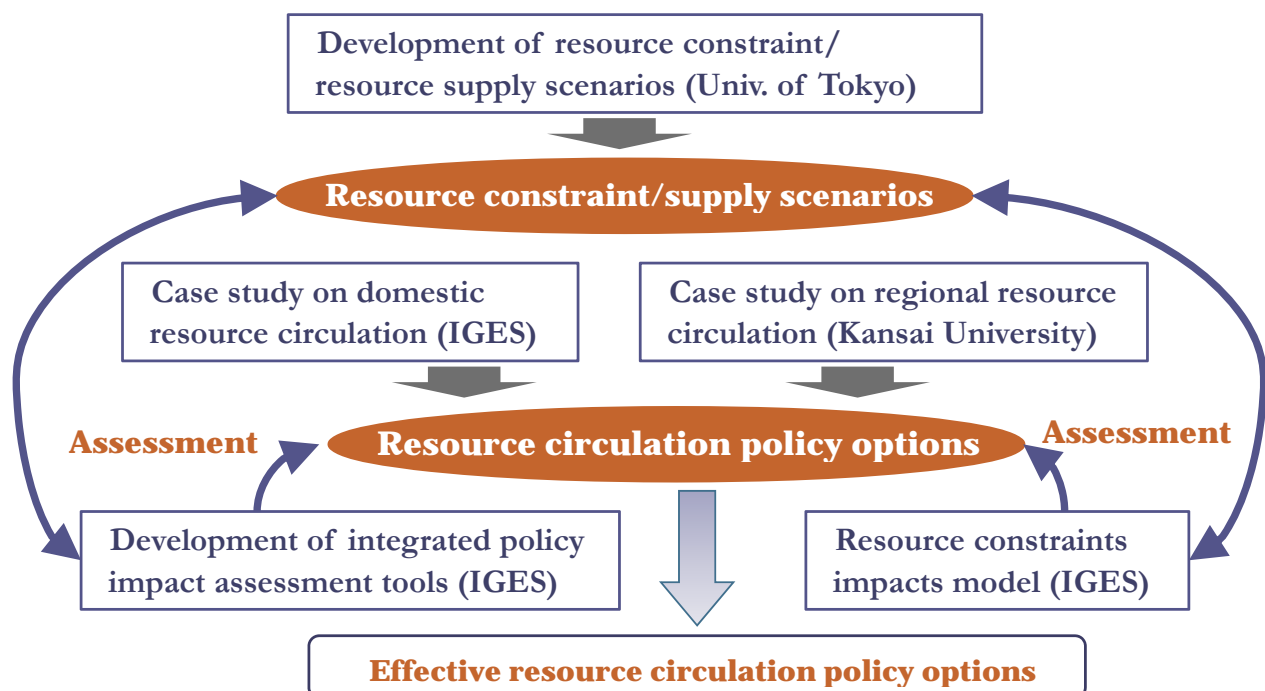
There is a need to conduct environmental economic study that can reflect economic dynamics such as changes in resource demand or those in industrial structure between developed and developing countries.

Ministry of the Environment, Japan commissioned this 3-year research project to fill this gap.

Research questions

1. **How effective are domestic and regional resource circulation policies in coping with resource constraints?**
 - Mitigation of negative economic impacts
 - Mitigation of negative environmental impacts due to inappropriate resource circulation (e.g. informal recycling)
2. **How resource constraints affect function of domestic and regional resource circulation systems?**
 - Related material flow may be affected by price changes due to resource constraints.
3. **How deployment of green technologies will be affected by resource constraints?**
 - For example, massive introduction of electric vehicle may be constrained by availability of lithium.

Research structure



Resource constraints/supply scenarios

1. Material Flow Analysis (MFA) of recyclables

- Estimation of potential generation of recyclable resources
- Control variables: life of products, recycling rates

2. Flow-stock analysis of natural resources reflecting mineral resources production scenario and relevant price information

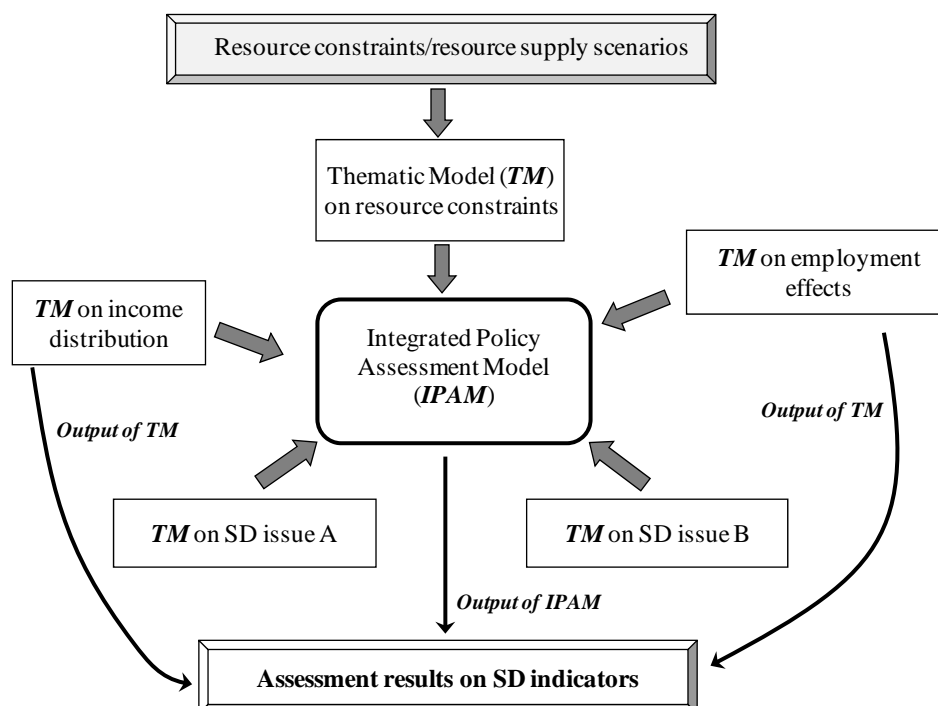
- Estimation of potential production of natural resources
- Control variables: product price and demand

3. Demand and supply analysis

- Analyse the relation between demand-supply balance and resource prices

Try to cover; iron, copper, gold, platinum, lead, lithium, and waste plastic, but MFA may be applicable partially.

Integrated policy impact assessment tools



Core CGE model

IPAM (Integrated Policy Assessment Model)

- Responsible for economic impact assessment reflecting international and inter-sectoral economic linkages (in particular economic growth performance).
- If impacts of environmental and/or poverty/distributional status on economic activities can be modelled, IPAM is responsible.
- If environmental and/or poverty/distributional impacts reflecting international and inter-sectoral economic linkages can be modelled, IPAM is responsible.

A multi-regional computable general equilibrium (CGE) model is an appropriate tool. To reflect economic growth aspects properly, forward-looking dynamic model is highly desirable.

Resource constraints and employment issues in CGE

1. How to reflect resource constraints?

- Treat resources (metals, etc.) as factor endowments
- Modify production functions of relevant sectors
- Raw water and treated water are different commodities. Raw water is production factor of agriculture, water utility and some water-intensive industries. Treated water is output of water utility and consumer good.

2. How to reflect employment effects?

- Based on econometric analysis?
- Introduce rural-urban migration model?

Econometric analysis of impacts of resource constraints

1. Correlation between resource supply constraints/resource prices and economic performance in terms of production of major sectors, labour and capital inputs, and resource inputs.
 - Serve as a resource constraint impact assessment model.
 - Provide parameter values to CGE-based IPAM.
2. Hidden (illegal) material flows may be reflected by scenarios
 - Conduct sensitivity analysis.

Case study on domestic resource circulation

1. Resource circulation/waste management policy options
 - Inputs from ongoing regional policy process such as Asia 3R Forum
 - Focus on specific recyclables; e-waste, iron scrap, end-of-life vehicle and waste plastic.
2. Assessment of policy options at the national level
 - Environmental impacts: waste disposal sites, GHG emissions
 - Social impacts: health and employment issues related to the informal recycling sector

Case study on regional resource circulation

1. Provide policy implications of regional resource circulation based on simulation of e-waste material flows and related environmental impacts under various policy options.
 - Estimate material flows of brand-new PC, used PC and scrap PC based on volume of shipments and trade statistics
 - Develop theoretical model to explain the material flow
 - Simulate material flows under various policy options such as banning e-waste trades for recycling purpose, banning used PC for reuse purpose and import tariff hikes for e-waste.
2. Conduct sensitivity analysis against changes in resource prices.

Expected outputs

- Resource constraint/resource supply scenario based on material flow-stock analysis
- Resource constraint impact assessment model based on econometric analysis
- National level case study of resource circulation/waste management policies
- Regional level e-waste case study of resource circulation/waste management policies
- Integrated policy impact assessment tools

Provide useful information to formulate effective resource circulation policy options

Overall time schedule

FY2009

- October 2009: Start of the research
- February 2010: 1st research workshop
- March 2010: Progress report for FY2009

FY2010

- Fall 2010: East Asia Summit (try to input intermediate results)
- February 2011: 2nd research workshop
- March 2011: Progress report for FY2010

FY2011

- Fall 2011: East Asia Summit (try to input draft final results)
- January 2012: Final research workshop
- February 2012: Final report

Thank you for your attention.

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