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SUSTAINABILITY THROUGH CIRCULAR SUPPLY CHAIN FOR BIOMASS

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WHY IS CIRCULAR SUPPLY CHAIN IMPORTANT?

- ▶ A circular supply chain is important for many reasons, but primarily because:
 - **Saves business costs in the long run** – especially as materials become scarce and/or expensive
 - Focuses on **preventing as much biomass waste** as possible from going to landfill

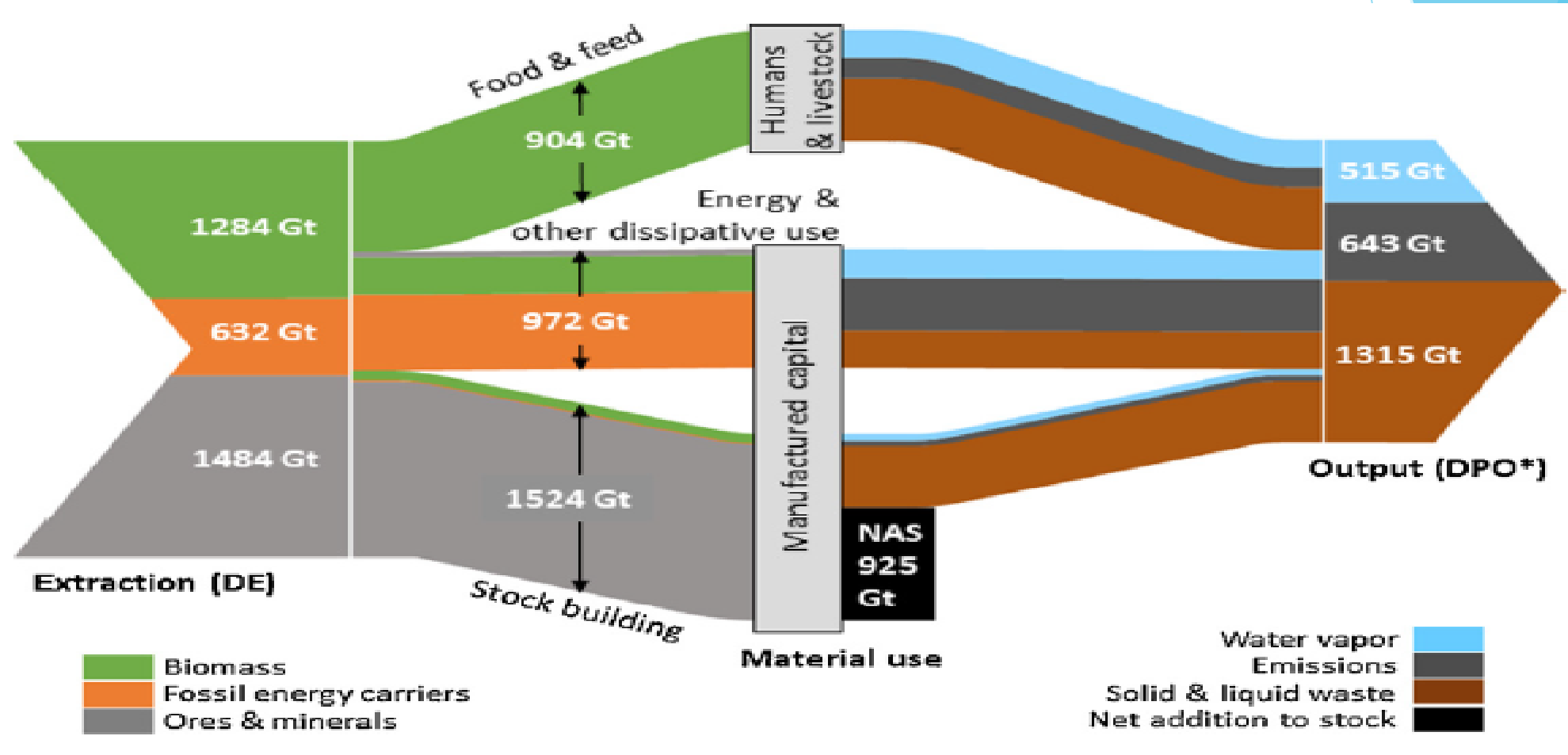
WHY IS CIRCULAR SUPPLY CHAIN IMPORTANT?

- ▶ **For manufacturers and sellers**, circular supply chain is a key part of a broader move towards recycling biomass and using more environmentally friendly practices.
- ▶ Businesses that have implemented circular supply chains often **couple circular supply with other sustainable practices, such as reducing energy consumption or using greener energy sources, and finding alternatives to single-use plastics.**

HOW DO CIRCULAR SUPPLY CHAINS BENEFIT BIOMASS BUSINESS?

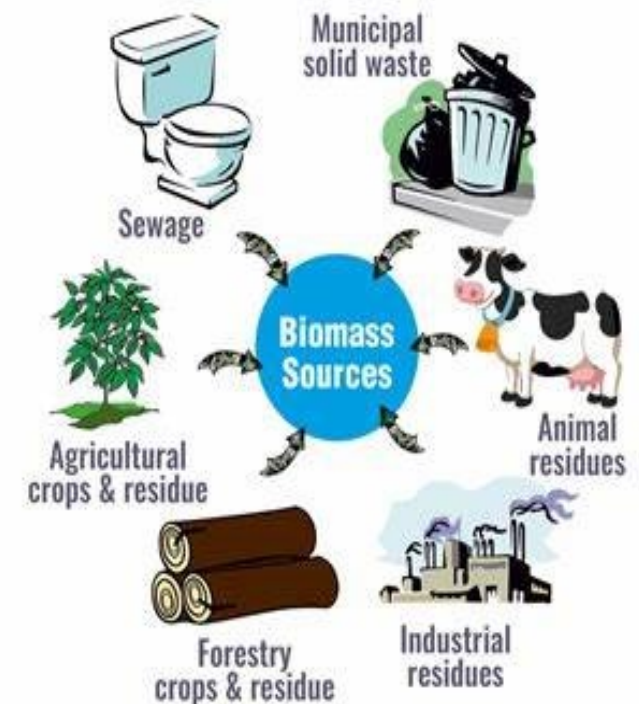
1. The circular supply chain **maximizes biomass utilization**
2. **Lower cost production** from circular supply means greater profit
3. Circular supply means **less reliance on volatile raw material supply**
4. You can **meet regulation and certification standards** with a circular supply chain
5. Circular supply chains **appeal to environmentally-conscious** consumers

CUMULATIVE FLOW OF BIOMASS AND OTHER MATERIALS THROUGH THE GLOBAL ECONOMY



BIOMASS, BIOFUEL AND BIOENERGY

- Biomass is organic material that comes from plants and animals, and **is a renewable source of energy**.
- Biomass can be **transformed into biofuels**, which are portable feedstock for use in the generation of bio-energy.
- **Based on FAO's Unified Bioenergy Terminology (FAO, 2004), bio-energy can be defined as energy obtained from biological and renewable sources (biomass); bio-energy may be derived in the form of heat or transformed into electricity for distribution.**
- **Biofuels** are defined as feedstock intended for the production of bio-energy, produced directly or indirectly from biomass.
- Biofuels can be in solid form (fuelwood, charcoal, wood pellets, briquettes etc.) or liquid (bioethanol, biodiesel).





BIOMASS BASED BIOENERGY AND UNITED NATIONS SDGs



Biomass accounts for a significant share of the total consumption in developing countries.

- The United Nations (UN) underscores the rationale for sustainable development and has set seventeen Sustainable Development Goals (SDGs) that have been targeted to be obtained by 2030.
- One of the SDGs for 2030 is to achieve a clean and affordable power standard.
- SDG 7. Ensure access to affordable, reliable, sustainable and modern energy for all.
- By 2030, this 7th SDG aims to ensure that everyone in the world has access to energy services that are economical, ecological, and modern.
- About 675 million people still live in the dark.



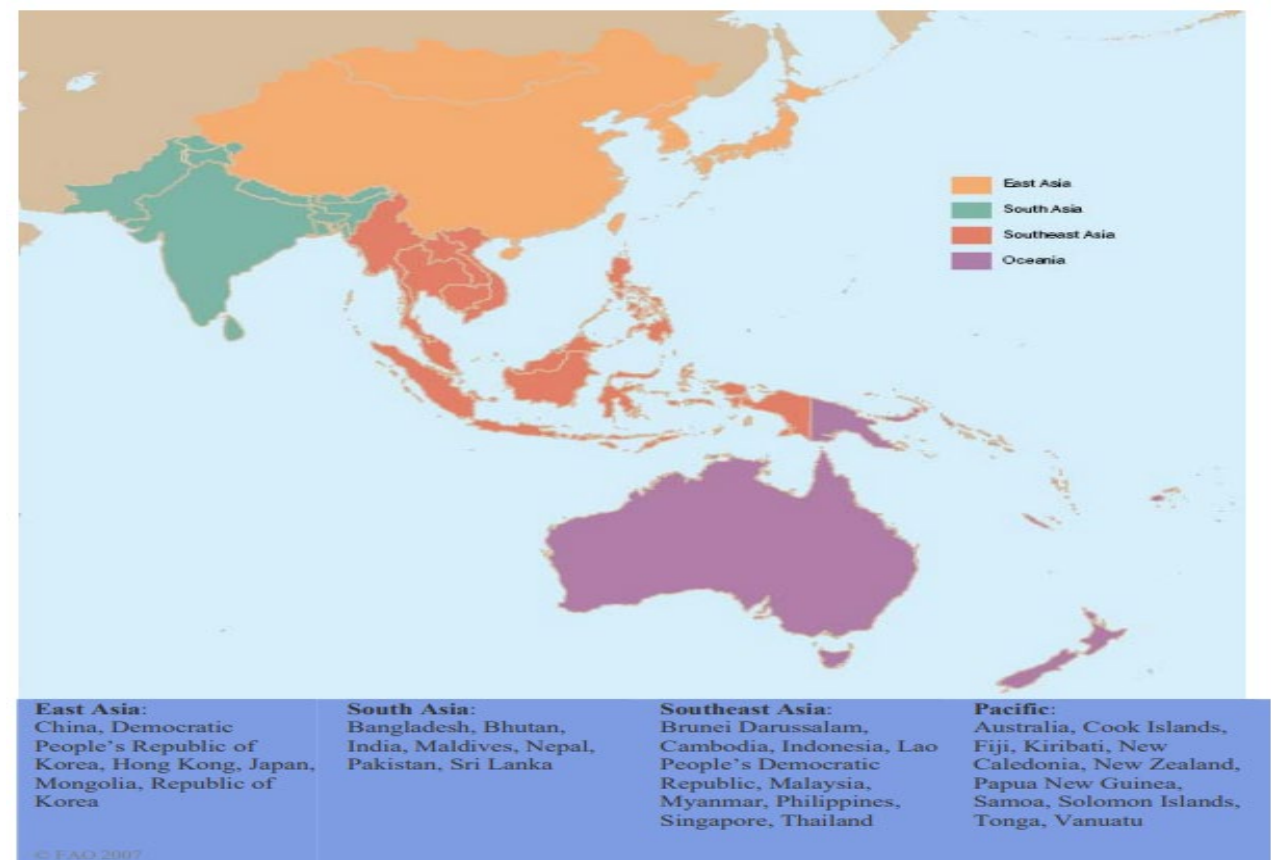
BIOMASS RESOURCES

- Biomass production is estimated at 146 billion metric tons annually throughout the world, mainly from wild-growing plants.
- Biomass sources for the energy sector are abundant in most Asian countries because of their agro-based economies and vast forest resources.
- Asia accounted for 1.6 global hectares or 34% of the total land area which is the highest percentage of agricultural land.
- Asian economies have potentials for biomass energy considering several sources of biomass: woody biomass, animal waste, agriculture residues, sewage sludge, industrial waste and municipal solid waste.



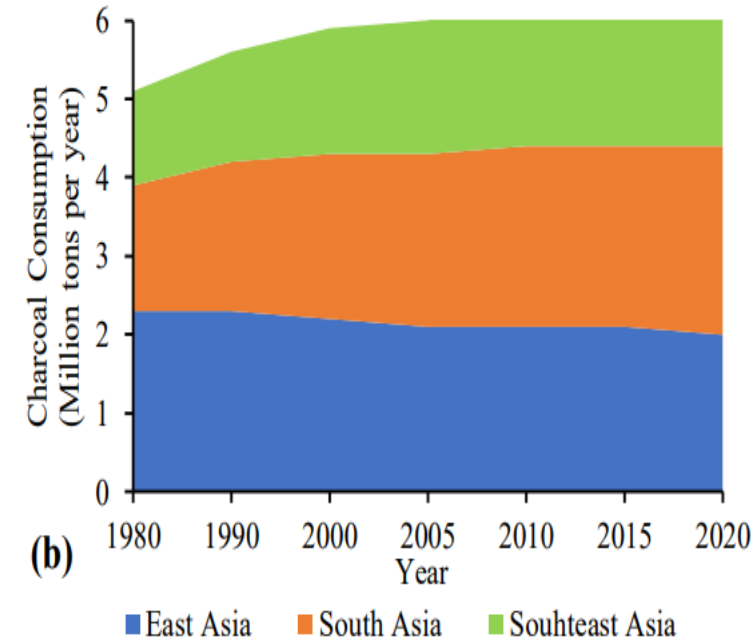
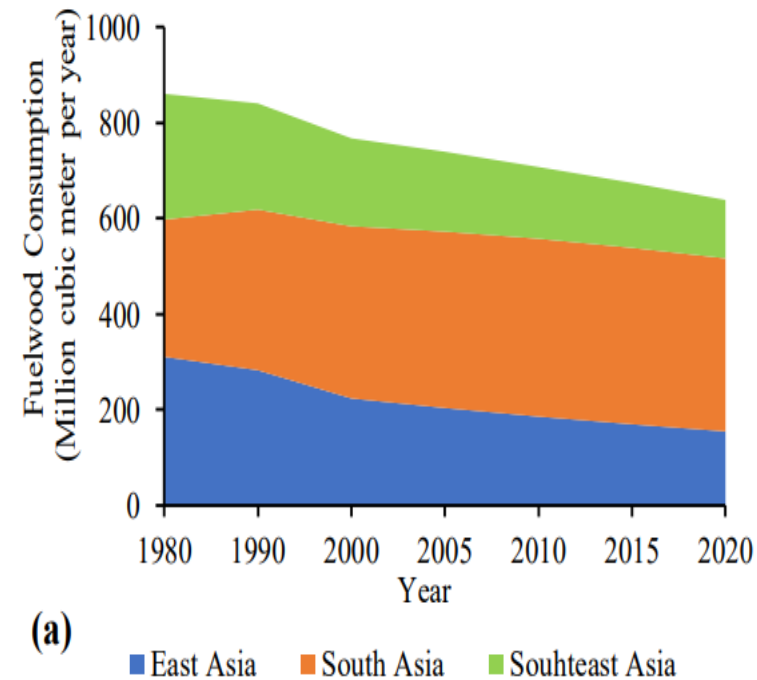
BIOMASS RESOURCES

- **Emerging global interest** in renewable energy resources has increased their role, including that of biomass.
- Biomass is used predominantly in developing countries, mostly in the form of wood and agricultural residues as the most common fuel for cooking and heating.
- Considering the importance of this source of energy in the Asia-Pacific region, where most countries still have a predominantly rural population, **wood-based energy is the main focus** in this study.



TRENDS OF (a) FUELWOOD CONSUMPTION AND (b) CHARCOAL CONSUMPTION IN ASIA REGION

- A decline can be seen in the projected annual consumption of fuelwood in Southeast Asia after 1990, trending from 222 million cubic meters in 1990 to 122 million cubic meters in 2020.
- The annual charcoal consumption in the Southeast Asian region seems to remain nearly stable from 2005.



(Tun et al., 2019)

TRENDS OF (a) FUELWOOD CONSUMPTION AND (b) CHARCOAL CONSUMPTION IN ASIA REGION

- Biomass energy is by far the largest renewable energy sources, representing 10.4% of the world's total primary energy supply or 77.4% of global renewable energy supply.
- Asia is a key supplier of biomass feedstock to markets such as Europe or the United States but within the region, new opportunities and investments in biomass are emerging, particularly in Southeast Asia.
- Southeast Asia, with its abundant bioenergy resources, holds a strategic position in the global biomass energy atlas.
- It is also a big producer of agricultural and wood products, and according to conservative estimates, the amount of biomass residues generated from sugar, rice, and palm oil mills is more than 200–230 million tons per year, which corresponds to cogeneration potential of 16–19 gigawatts (GW).

(Tun et al., 2019)

BARRIERS TO BIOMASS ENERGY TECHNOLOGIES

Technical barriers

- Some of the modern biomass energy technologies (BETs) **need further research and development** efforts before they can be more commercialised.
- Even the operational feasibility of the relatively mature BETs -- for example, gasifiers, efficient cogeneration systems, and biogas digesters -- has not yet been proven in many Asian countries through adequate demonstration.
- Also, certain BETs -- for example, briquetting machines in rice mills and cogeneration systems in sawmills – are often regarded as rather complex by the potential users.
- **In view of the above and the poor performance of certain past demonstration projects in some countries, manufacturers and entrepreneurs often perceive modern BETs as risky.**
- Lack of local expertise/manufacturers/agents and lack of maintenance service,

BARRIERS TO BIOMASS ENERGY TECHNOLOGIES

Institutional barriers

- A wide range of institutional barriers to BETs exist in Asian developing countries.
- Lack of coordination among institutions involved in renewable energy development and commercialisation, e.g., government ministries of energy/science and technology, research institutes, electric utilities, and financial institutions, hinders efforts for the promotion of renewable energy technologies.
- A government agency specifically mandated to promote RE development through coordinated efforts appears to be important for promoting renewable energy.
- However, establishment of dedicated agencies alone is not enough to overcome all institutional barriers.

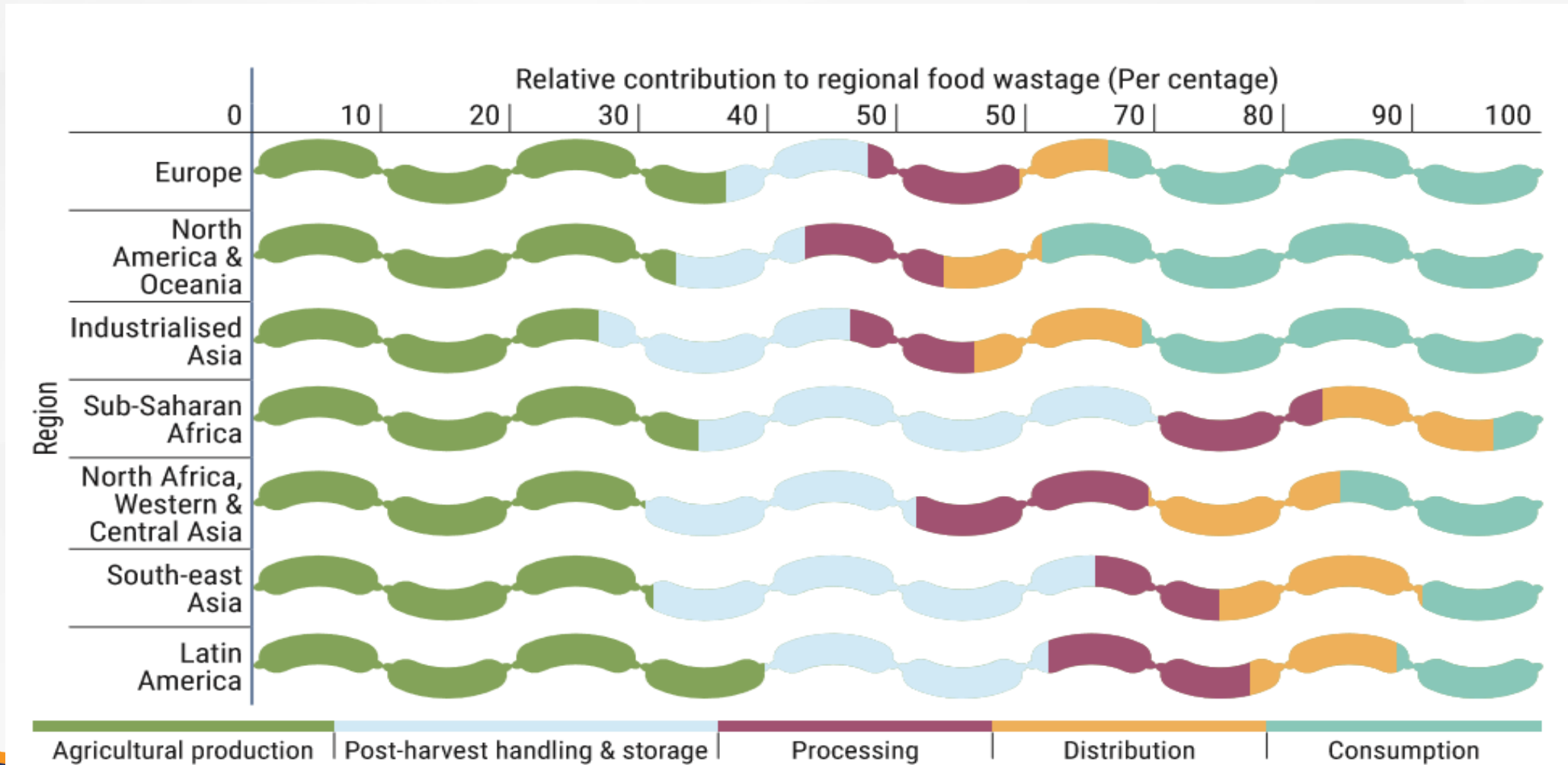
PROBLEMS AND CHALLENGES

- **Low economic growth of the countries**, lack of sufficient funding for R&D and purchase of technologies is one of the biggest challenges in the development of biomass energy sector in Asian countries such as Myanmar, and Cambodia.
- **Public and private sector involvement is still uncertain** owing to the uncertain profits and risks of utilization of biomass energy, since utilization of biomass sources concerns with low energy contents, bulky volume of biomass sources, need for large storage systems and high transportation costs, data reliability issues, underdeveloped biomass industries, and lack of local skilled personnel.
- The useful and important information about biomass sources are not widespread among the local people through education and training programs.
- **Consequently, the cooperation of the local people in the development of the bioenergy sector remains weak.** As one of the most crucial things, market development still seems slow because of lack of sufficient funding, research and development, and weakness of all stakeholder involvement.

FOOD WASTE BIOMASS: THE DISTURBING FACTS!

- ❑ Food sector accounts for **30% of the world's total energy consumption** while **emitting 22% of total GHG**.
- ❑ **Malaysia** generate **4000 tonnes per day** of **unconsumed food**. (Total 40,000 t/d)
- ❑ World's consumption of materials hits record **100billion tonnes/year** in 2020
- ❑ Since 1970 population has **doubled** but **material consumption quadrupled**
- ❑ **1.3 billion tonnes of food produced** (~\$1 trillion) are wasted each year due to poor transportation and harvesting practices, while ~1 billion people go undernourished and ~1 billion hungry.
- ❑ **Third largest GHG producer** after China and US.
- ❑ Food security is at risk due to land degradation, declining soil fertility, unsustainable water use, overfishing, and marine environment degradation.

FOOD WASTE BIOMASS: THE DISTURBING FACTS!



Region-wide Biomass Food Waste Across Different Stages of Food Supply Chain

LOSS OF BIOMASS IN DEFORESTATION

- Data from the "Forest Declaration Assessment" showed that **deforestation reached 6.6 million hectares in 2022, with primary tropical forest loss at 4.1 million hectares, while an alarming 96 percent of global deforestation takes place in tropical regions.**
- Tropical Asia is the only region that is close to the pathway for achieving zero gross deforestation.
- Tropical forest the size of Denmark was lost since the global pledge to end deforestation by 2023 was made
- Tropical forests and two of the largest tropical forest basins in Amazon and Congo are facing real and severe tipping points
- The WWF warned tropical forests are beginning to act as a carbon source, not a sink, under the pressures of a warming, drying and increasingly extreme climate if urgent action is not taken.

DRIVERS OF BIOMASS CIRCULAR ECONOMY

Extended producer responsibility (EPR)

- ▶ Aims towards reducing biomass disposal, resource conservation, increase recycling rates and promoting eco-design products (Kaffine & O'Reilly, 2015).
- ▶ **Biomass recycling is uneconomical without subsidies.**

RATIONALE OF THE STRATEGY/RECOMMENDATIONS

- To achieve the aim, **the strategy needed to synthesize and evaluate the biomass sources, energy potential, utilization, and management in the region**, based on the secondary data and field pilots.
- **To implement the sustainable utilization of biomass sources**, the strategy will need to identify the barriers and challenges of biomass utilization in these countries and proposed a sustainable approach of biomass energy, by comparing the way of traditional biomass utilization.
- Along with the advancements of technologies (such as electrification, biomass gasification, biochar) R&D, growing energy markets, and **knowledge and technology transfer from the other developed countries**, biomass energy could be crucial in offering the environmental and economic benefits in the near future of the energy sector in the region.
- **In term of regulatory framework for community biomass energy, among Asian countries there is a gap**, while some countries had the renewables energy or industrial biofuels regulations and policies. So, the need to have an common strategy on biomass energy and national policies on promoting community biomass energy is in the agenda in the context of circular economics.
- At technical level, there a need of knowledges and innovations sharing through diverse communication tools and guidelines.

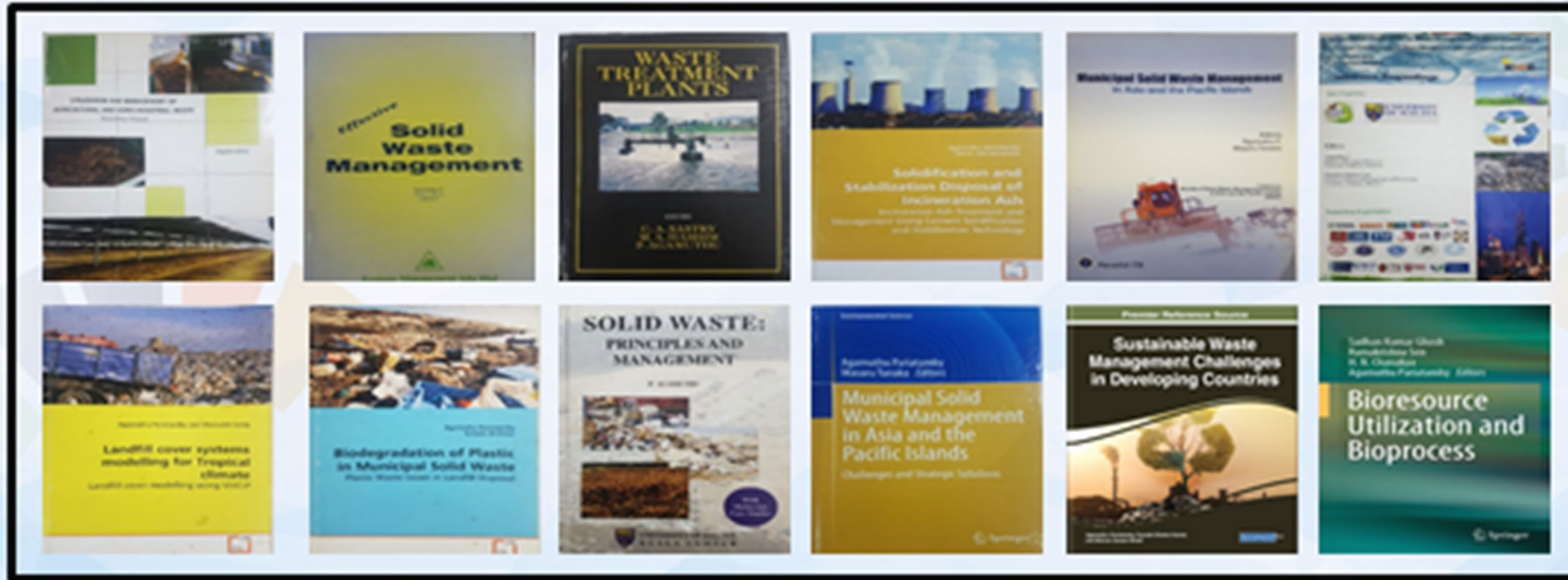
SUSTAINABLE STRATEGY/RECOMMENDATIONS FOR BIOMASS ENERGY

- To enhance the living standards of rural peoples and communities by **modernizing the use of biomass energy** at rural community through the support activities and educational trainings on biomass energy.
- **To create public policies and awareness; knowledge and data sharing, technology transfer and capacity development in biomass energy.**
- **To increase the access to modern biomass energy** and hence contributing to the environment conservation by transforming traditional biomass energy use into appropriated technology, sustainable and clean energy in rural communities.
- **To contribute to energy supply and energy security to rural communities** by generating modern biomass energy (eg., electricity) through management of agricultural residues and organic wastes.
- **To support the employment and income generation through the entrepreneurship development in biomass energy.**



Thank You !

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