ITTO

INTERNATIONAL TROPICAL TIMBER ORGANIZATION

# Energy Access through Sustainable Forest Management:
# ITTO Projects and Lessons from Tropical Forest Landscapes

RD-20 - lean Energy Technologies Conference
19-23 October 2026, Pretoria, SA

**Tetra Yanuariadi,**
**ITTO Projects Manager**



*Talking points:*

*ITTO in brief*

*Sustaining tropical forest*

*Forests, energy and livelihoods in the tropics*



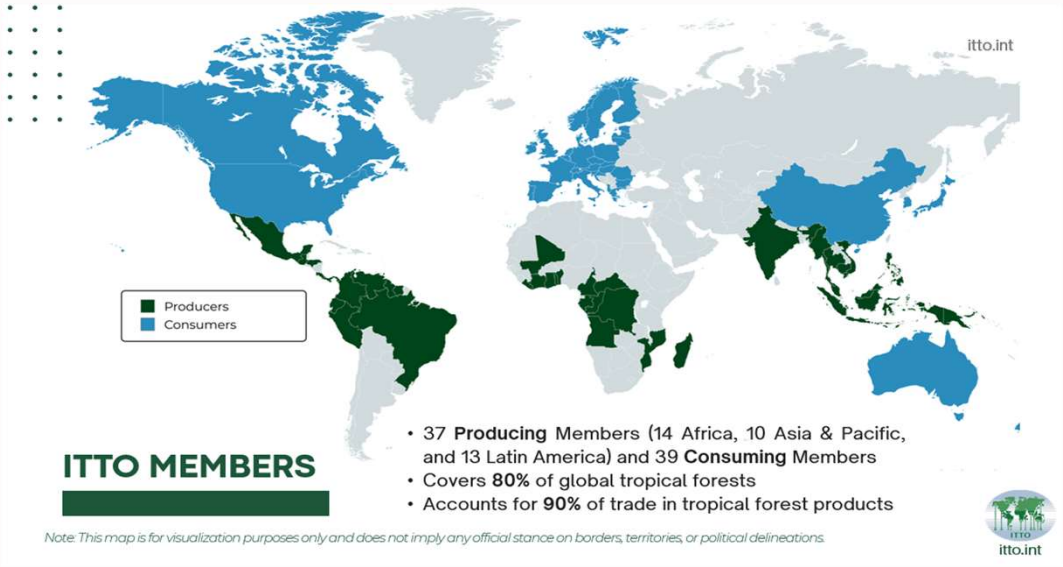


# *ITTO*



ITTO is the only intergovernmental organization focused entirely on tropical forest resources. ITTO's mandate is to:

- Support the sustainable management and conservation of tropical forests
- Facilitate the use and diversification of trade in tropical timber sourced from sustainably managed and legally harvested sources




# *ITTO IN FIGURES*

**1986**
Established under UNCTAD (UN Trade and Development)

**2006**
International Tropical Timber Agreement (ITTA)

**CURRENT**
75 members economies

- 37 **Producing** Members (14 Africa, 10 Asia & Pacific, and 13 Latin America) and 39 **Consuming** Members
- Covers **80%** of global tropical forests
- Accounts for **90%** of trade in tropical forest products

**HEADQUARTERS**
Yokohama, Japan

# ITTO GUIDELINES

ITTO C&I
(1992, 1998, 2005, 2016)





SFM Guidelines
(1990, 2015)



Guidelines for Sustainable Management of Planted Tropical Forest (1993)

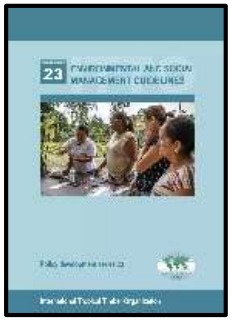


Guidelines for the Management of Secondary Tropical Forests, Tropical Forest Restoration and the Rehabilitation of Degraded Forest Lands (2002)

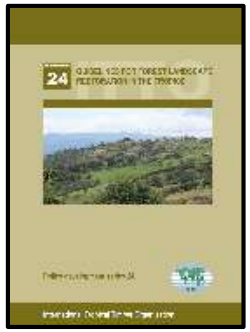


Guidelines on Fire Management (1998),

ITTO IFM Tropical Fire Toolkit (anticipated launch May 2026)



Environmental and Social Management Guidelines (2020) and Gender Guidelines (2018)



Guidelines for Forest Landscape Restoration in the Tropics (2020)



ITTO/IUCN Guidelines for Conservation and Sustainable Use of Biodiversity in Production Forests
(1993, 2008, update expected late 2026)

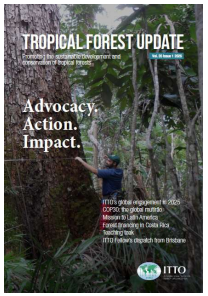
# Publications & knowledge products

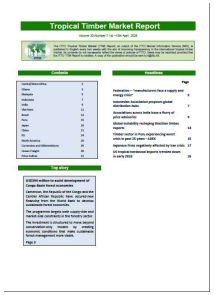
**Periodic publications:**

- **Tropical Forest Update, TFU**
- **Market Intelligence Service, MIS**
- **Biennial Review & Assessment**
- **GTI**

**Other:**

- **Policy Series**
- **Technical Series**
- **Other (technical) reports**

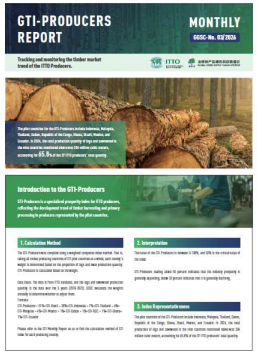


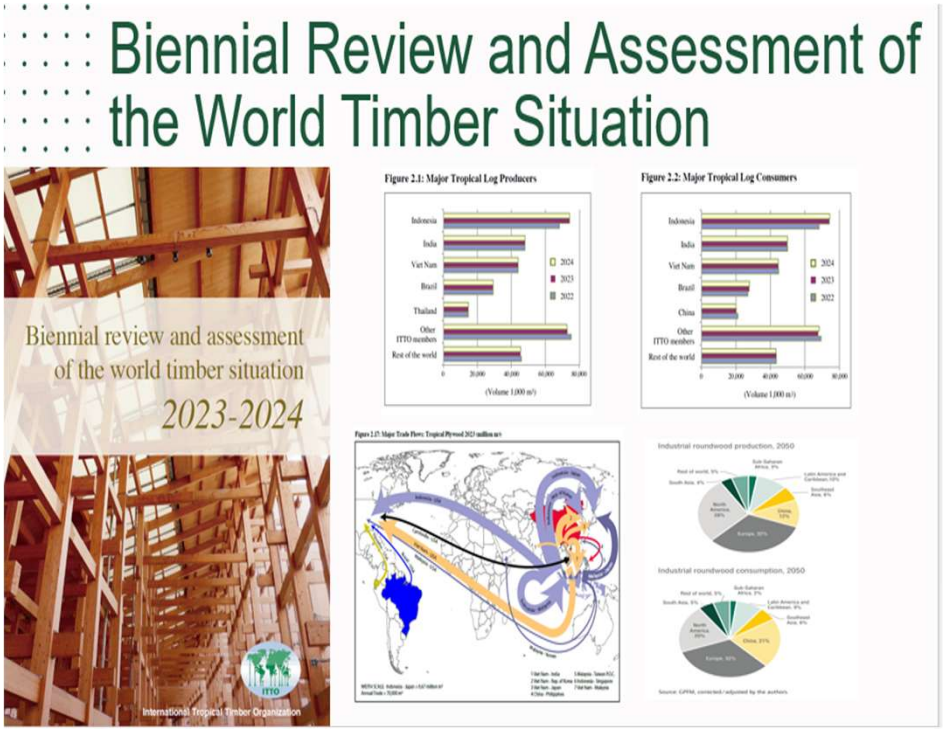










ITTO Website - Resources

*LONG-STANDING WORK ON STATISTICS AND DATA*

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# INTERNATIONAL COOPERATION

- **ITTO has gained accreditation with the Green Climate Fund**
- **Founding member of the Collaborative Partnership on Forests (CPF)**
- **Memorandum of Understanding with multiple renowned international organizations**
- **Longstanding collaboration with CITES, FAO and UN CBD**
- **ITTO's active engagement with APEC**
- **Japanese organizations such as RESTEC, JICA, IGES and others.**

CPF

APEC
Asia-Pacific Economic Cooperation

RESTEC JICA CIFOR World Agroforestry Convention on Biological Diversity CITES Food and Agriculture Organization of the United Nations GREEN CLIMATE FUND gef ITTO IUCN IUFRO United Nations Convention to Combat Desertification UNDP UN environment programme DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS United Nations Climate Change THE WORLD BANK

*Note: The logos displayed are for visualization purposes only and have not undergone the official clearance and approval process. They are not intended for distribution.*

# *Sustaining Tropical Forests*



# Threats to forests continue

- **Deforestation and forest degradation continue at alarming rates:**
  - **The world lost an estimated 10 million ha of forest (an area the size of the Republic of Korea) per year between 2015 and 2020.**
- **Major drivers of tropical deforestation: competing land uses that produce higher and more rapid financial returns (agriculture, energy, mining and transportation infrastructure).**
- **Agriculture still responsible for 80% of forest loss (conversion)**
- **Illegal logging, woodfuel collection, fragmentation, disturbances from insects, disease, severe weather events and wildfires.**



- **More than 50% of 193 UN member states have less than 20% forest cover**
- **Global population ≥ 9 BLN 2050, = ↑ food, wood products, woodfuel, income**
- **RESULT=The escalating impacts of climate change and biodiversity loss.**

# Sustainable Forest Management (SFM) Objectives

Continuously satisfying needs for goods and environmental services from forests

Ensuring the conservation of forest soils, water and carbon stocks

Conserving biodiversity

Maintaining the resilience and renewal capacity of forests, including for carbon storage

Supporting the food-security, cultural and livelihood needs of forest-dependent communities

Ensuring the equitable sharing of responsibilities in forest management and of the benefits arising from forest use



Photo: Compiled by STCP (2020)

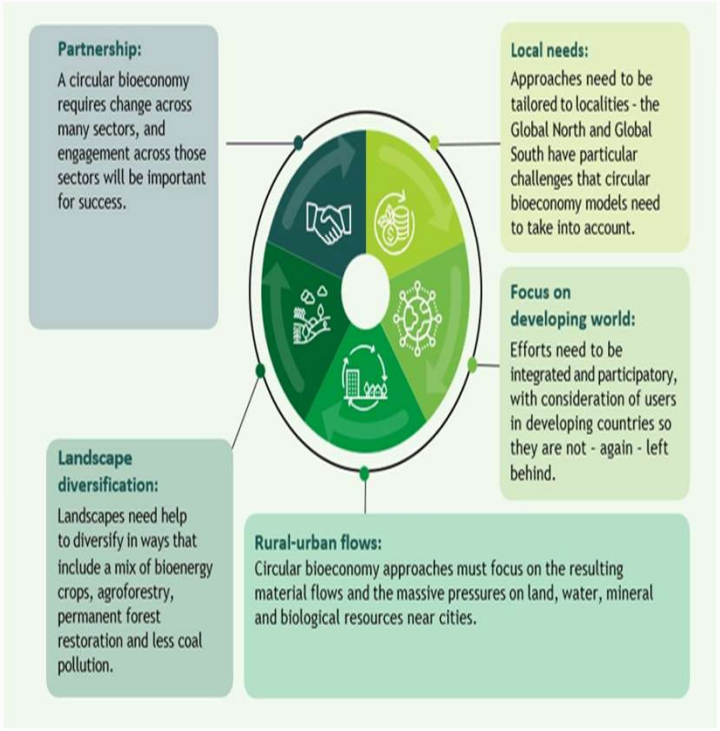
# Sustainable tropical forestry provides many benefits




- The sustainable harvesting, processing and trade of tropical timber and other forest products:
  - supplies residential and commercial consumers worldwide,
  - contributes to economies development, and
  - gives value to tropical forests, which is a key factor in reducing forest conversion to other land uses.
- When sustainably managed, tropical forests are:
  - **healthy**, **productive** and **renewable** energy and ecosystems.
  - provide vital ecosystem services (such as conserve soil and water, regulate climate, host biodiversity, filter the air, prevent land degradation and desertification, and reduce the risk of floods, landslides, droughts and other disasters).
- The COVID-19 pandemic highlighted the value of forests as a safety net for meeting basic human needs in times of disruption.

# PROMOTING SUSTAINABLE WOOD USE AS PART OF THE CLIMATE SOLUTION

## TRANSITION TO CIRCULAR BIOECONOMY




- sustainably sourced wood can replace carbon-intensive materials
- addresses challenges like illegal logging, weak governance, and consumer awareness
- need to advocate for stronger policies, investments, and collaboration to ensure sustainable timber value chains.

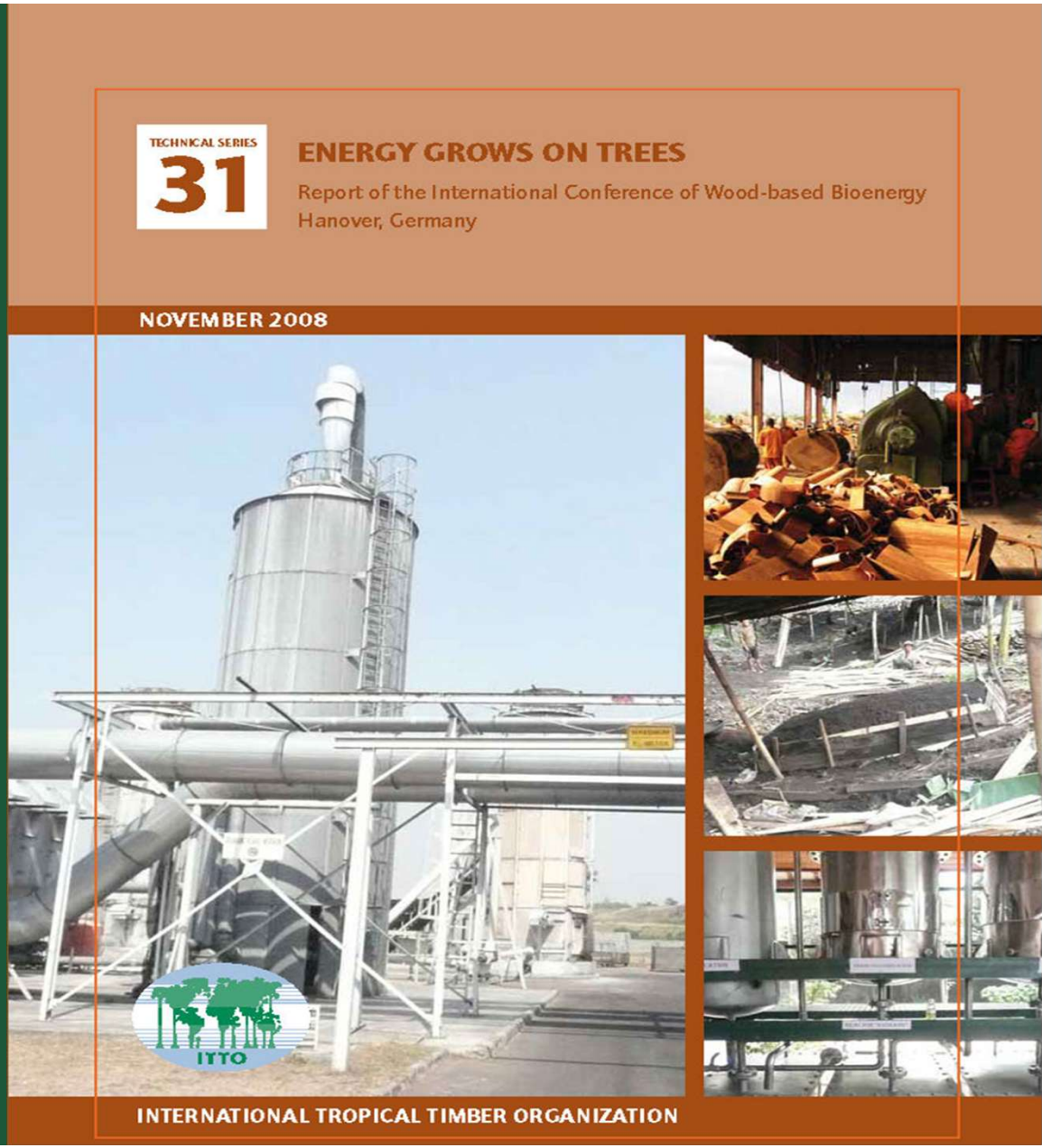
itto.int

Using wood in construction also reduces the carbon footprint of buildings/houses in comparison to other materials, meaning that wood offers great potential to revolutionize the greenhouse gas emissions of the construction industry, and in turn will help economies to fulfil their NDC.

ITTO promotes sustainable wood use in domestic markets of India, Indonesia, Malaysia, Thailand, and Viet Nam by improving:

- domestic strategy/policy
- production capacity
- CFE's skill capacity
- the assortment of wood products
- the awareness of consumers

# Forests, energy and livelihoods in the tropics



# Nexus of tropical forests, energy and livelihoods

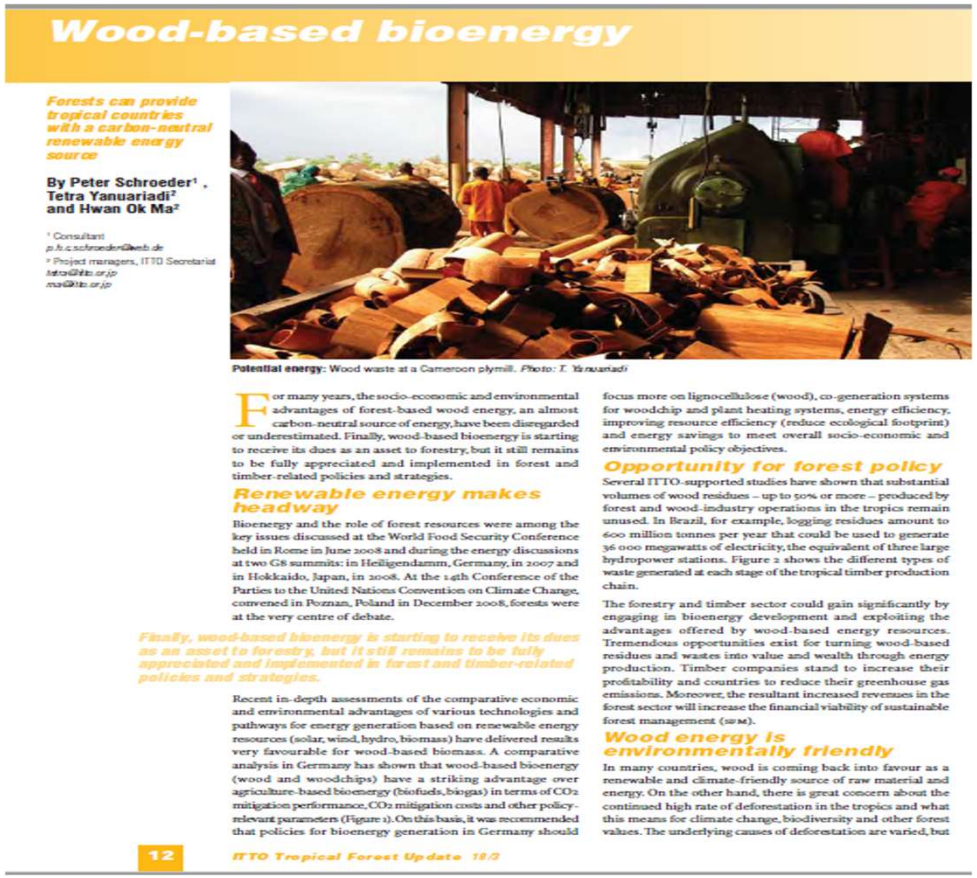
- Historically, forests have been a source for energy and livelihoods. They continue to do so, specially for rural populations in the tropics:
  - firewood
  - charcoal
  - resins
  - fibre
- Forests, have the potential to provide carbon neutral and renewable energy sources—still unappreciated:
  - generate rural jobs and incomes,
  - increase the profitability of the timber industry,
  - reduce green-house gas emissions,
  - improve energy security, and
  - improved the financial viability of SFM.



# Advantages of forest bioenergy

- The forestry and timber sector could gain significantly by engaging in bioenergy and exploiting the advantages offered by wood-based energy resources:
  - biomass for bioenergy is obtained from forests managed for multiple purposes (i.e., pulp and saw logs, ecosystem services);
  - biomass is a storable, dispatchable energy source that can support the rapid expansion of intermittent renewables;
  - bioenergy linked with carbon capture and storage (BECCS) is one available option for achieving negative emissions;
  - when bioenergy from forest biomass displaces fossil fuels, this adds to the climate benefits of managed forestry.
- The sustainable management of tropical forest, contributes to SDG 7 (Affordable and clean energy) and to almost all SDGs.

***Wood energy is environmentally friendly!***
(provided safeguards are in place)



## Wood-based bioenergy

*Forests can provide tropical countries with a carbon-neutral renewable energy source*

By Peter Schroeder[1], Tetra Yanuariadi[2] and Hwan Ok Ma[2]

[1] Consultant
[2] Project managers, ITTO Secretariat

**Potential energy:** Wood waste at a Cameroon plymill. *Photo: T. Yanuariadi*

For many years, the socio-economic and environmental advantages of forest-based wood energy, an almost carbon-neutral source of energy, have been disregarded or underestimated. Finally, wood-based bioenergy is starting to receive its dues as an asset to forestry, but it still remains to be fully appreciated and implemented in forest and timber-related policies and strategies.

### Renewable energy makes headway

Bioenergy and the role of forest resources were among the key issues discussed at the World Food Security Conference held in Rome in June 2008 and during the energy discussions at two G8 summits: in Heiligendamm, Germany, in 2007 and in Hokkaido, Japan, in 2008. At the 14th Conference of the Parties to the United Nations Convention on Climate Change, convened in Poznan, Poland in December 2008, forests were at the very centre of debate.

*Finally, wood-based bioenergy is starting to receive its dues as an asset to forestry, but it still remains to be fully appreciated and implemented in forest and timber-related policies and strategies.*

Recent in-depth assessments of the comparative economic and environmental advantages of various technologies and pathways for energy generation based on renewable energy resources (solar, wind, hydro, biomass) have delivered results very favourable for wood-based biomass. A comparative analysis in Germany has shown that wood-based bioenergy (wood and woodchips) have a striking advantage over agriculture-based bioenergy (biofuels, biogas) in terms of $CO_2$ mitigation performance, $CO_2$ mitigation costs and other policy-relevant parameters (Figure 1). On this basis, it was recommended that policies for bioenergy generation in Germany should focus more on lignocellulose (wood), co-generation systems for woodchip and plant heating systems, energy efficiency, improving resource efficiency (reduce ecological footprint) and energy savings to meet overall socio-economic and environmental policy objectives.

### Opportunity for forest policy

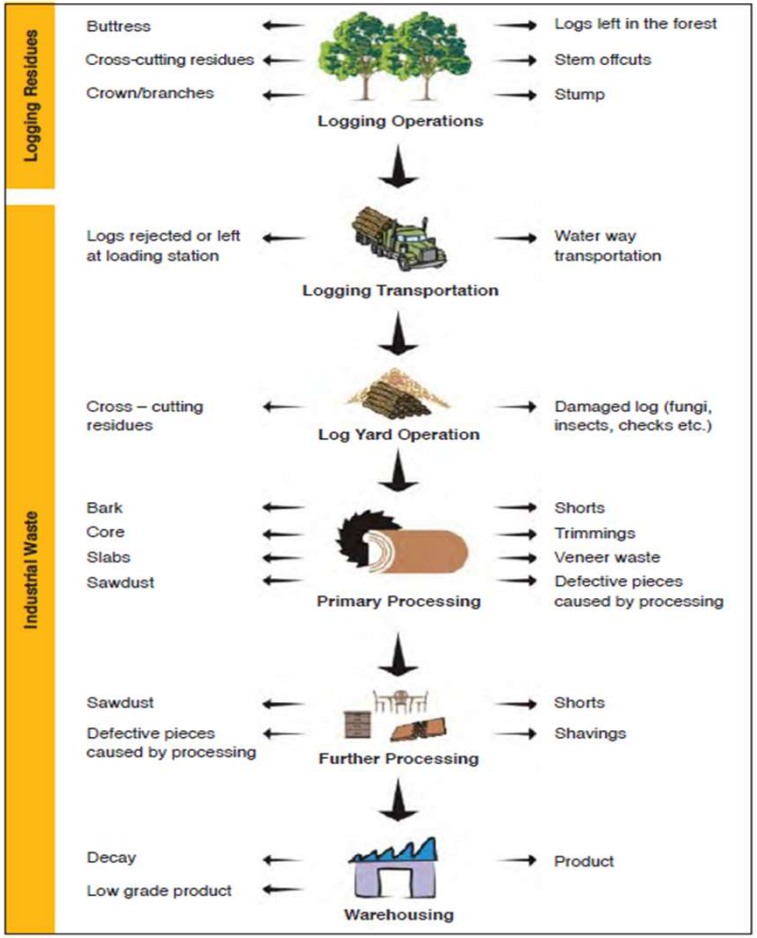
Several ITTO-supported studies have shown that substantial volumes of wood residues – up to 50% or more – produced by forest and wood-industry operations in the tropics remain unused. In Brazil, for example, logging residues amount to 600 million tonnes per year that could be used to generate 36 000 megawatts of electricity, the equivalent of three large hydropower stations. Figure 2 shows the different types of waste generated at each stage of the tropical timber production chain.

The forestry and timber sector could gain significantly by engaging in bioenergy development and exploiting the advantages offered by wood-based energy resources. Tremendous opportunities exist for turning wood-based residues and wastes into value and wealth through energy production. Timber companies stand to increase their profitability and countries to reduce their greenhouse gas emissions. Moreover, the resultant increased revenues in the forest sector will increase the financial viability of sustainable forest management (SFM).

### Wood energy is environmentally friendly

In many countries, wood is coming back into favour as a renewable and climate-friendly source of raw material and energy. On the other hand, there is great concern about the continued high rate of deforestation in the tropics and what this means for climate change, biodiversity and other forest values. The underlying causes of deforestation are varied, but

# Opportunities for wood-based bioenergy




- There are substantial volumes of wood residues in timber industry operations in the tropics (around 50%), which could be used to generate energy:
  - In Brazil, for example, logging residues amount to 600 million tonnes/year;
  - could generate 36 000 megawatts of electricity;
  - equivalent of three large hydropower stations.*
- Wood-based bioenergy (wood and woodchips) have an advantage over agriculture-based bioenergy (biofuels, biogas) in terms of $CO_2$ mitigation performance (*see graph on the next two slides*).

*Source: ITTO. 2007. *Report of the International Conference on Wood-Based Bioenergy*. Hannover, Germany, 17-19 May, 2007. ITTO Technical Series No.31. Yokohama, Japan.

# Opportunities for wood-based bioenergy (continuation)



- Wood-based bioenergy is well-suited to small- and community-scale projects:
  - increase income,
  - make productive use of marginal lands, and
  - bolster rural economies.
- Forest management that maintains or increases carbon stocks, while also producing timber, fibre and energy, contributes to:
  - climate change mitigation by storing carbon on land and replacing carbon-intensive materials and fossil fuels.

# Opportunities for wood-based bioenergy (continuation)

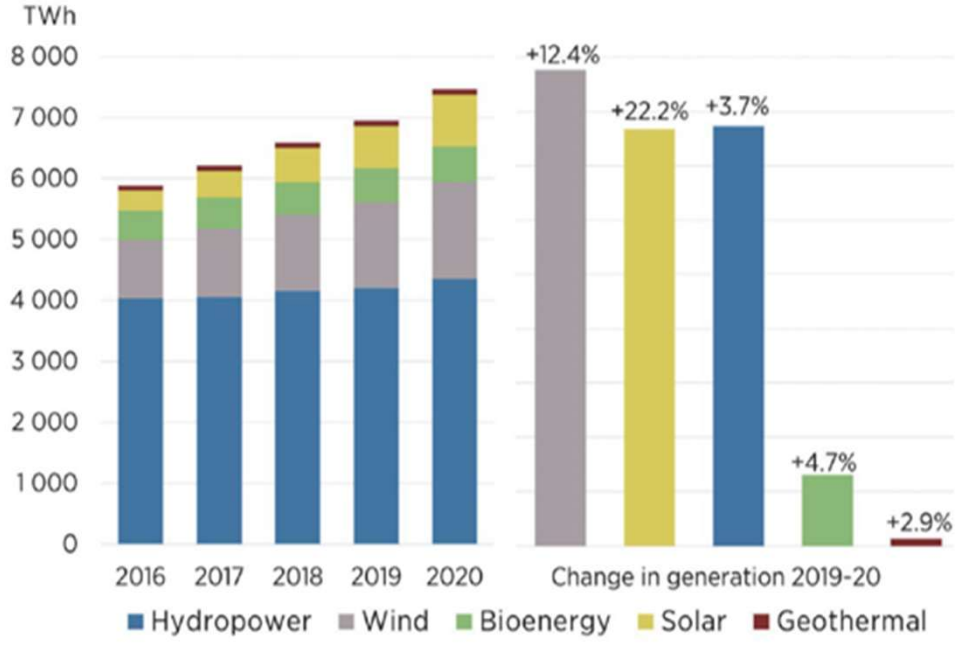


- Energy transition to keep the 1.5°C climate goal is far from being on track.
- 2021: total installed capacity of renewable electricity reached 3,064 GW, generating around an estimated 8 000 terawatt-hours (TWh) of electricity.
- Renewable generation capacity increased by 257 GW (+9.1%) in 2021:
  - solar, increase of 133 GW (+19%),
  - wind energy with 93 GW (+13%),
  - hydropower increased by 19 GW (+2%) and
  - bioenergy by 10 GW (+8%).
  - Geothermal energy increased by 1.6 GW.

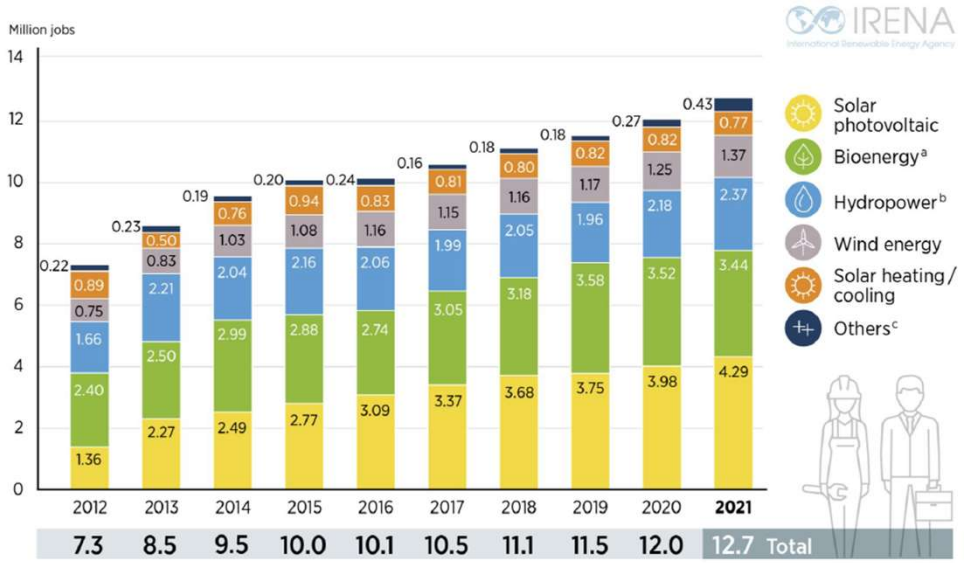
Source: IRENA's *World Energy Transitions Outlook (WETO) 2022: 1.5°C Pathway*.

# Opportunities for wood-based bioenergy (continuation)

*Growth in renewable electricity generation*[5]




*Evolution of global renewable energy employment by technology, 2012-2021*[20]




*a Includes liquid biofuels, solid biomass and biogas.*

*b Direct jobs only.*

*c "Others" includes geothermal energy, concentrated solar power, heat pumps (ground based), municipal and industrial waste, and ocean energy.*

*Source: IRENA jobs database.*

Source: IRENA (2022), *Renewable Energy Statistics 2022*.

# ITTO field work: woodflooring residues for energy production (Brazil)

- An ITTO project in Brazil improved the sustainability of the woodflooring industry:
  - Among other things, the project studied value-addition of wood-residues, including in the production of particle boards and energy generation:
    - firewood
    - pellets and briquettes
    - cogeneration



# ITTO field work: REDD+ and clean cooking (Cambodia)

- An ITTO project that assisted the Government of Cambodia to prepare for REDD+ and improve livelihoods through SFM, including clean cooking:
  - The project distributed 1,600 fuel-saving cookstoves to the communities. Beneficiaries reported:
    - savings due to reduced woodfuel consumption,
    - improved household health by reducing indoor pollution, and
    - increase productivity as less time is spent in foraging for woodfuel.

More: Read article on TFU issue 29/2 (page 16).



# ITTO field work: landscape restoration, agroforestry and charcoal (Côte d'Ivoire and Togo)



- ITTO supported the charcoal business ventures of women in Côte d'Ivoire and Togo to reconcile the short-term subsistence needs (food and woodfuel) with the medium- to long-term need to rehabilitate the forest:
  - women realized that the viability of charcoal production requires SFM—they decided to reforest and ensure the availability of the forest resource.
  - forest has been restored in the Ahua gazette forest (Côte d'Ivoire) and in Blitta and Lakes prefectures (Togo).
  - training was provided in seedling production, nursery establishment, forest plantation establishment and maintenance, and agroforestry.
  - thanks to ITTO interventions in Côte d'Ivoire, MALEBI (a women's association) improved its charcoal production using metal furnaces and efficient, eco-friendly techniques. In Togo women have increased income through agroforestry while restored forests grow for charcoal production.
- High potential for replication and for piloting decarbonized charcoal—more support is needed!

# ITTO field work: landscape restoration for pellets (Indonesia)




- An ITTO project in northern Sumatra encouraged restoration of degraded lands for biomass production for pellets:
  - the project established 33 ha of planted model forests for biomass production in degraded lands.
  - trained 35 village leaders in cooperative management for bioenergy production.
  - produced manuals on energy forest and comparative studies on wood-based energy.
- An unrealized output of the project was the investment in a biomass processing facility—lessons learnt:
  - investments require enabling conditions—this in turn, will increase the restoration area.
  - linkages to markets for woodchips and pellets are crucial for the sustainability of restoration activities (uncertainty market prices fluctuations).

# Key elements for viable forest biomass as source of energy



- Restoration of degraded landscapes must be economically viable:
  - supported by alternative livelihoods to meet short-term needs (i.e., agroforestry, beekeeping, etc.)
  - potential of forest plantations on degraded lands.
- Further dissemination of technologies and know-how for wood-waste utilization is a must.
- Wood-based bioenergy development would benefit from links to or integration with other forms of renewable energy (solar, wind, hydro, agricultural biomass).
  - facilitate decarbonization.
- Traditional supply systems for fuelwood and charcoal at the rural and suburban levels need to be respected when the development of a wood-based bioenergy sector is considered.
- Consider concerns over deforestation and conversion of natural forests to other land-uses.

# Sustainable managed forest and bioenergy

More than just impact on climate:

- soils and forest productivity,
- water catchments,
- biodiversity,
- landscapes.



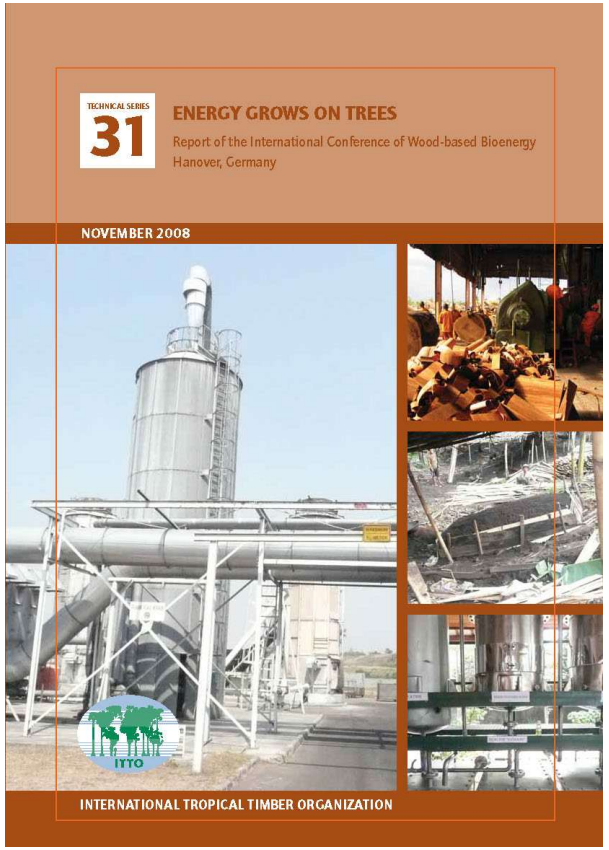
# What is needed to move forward?

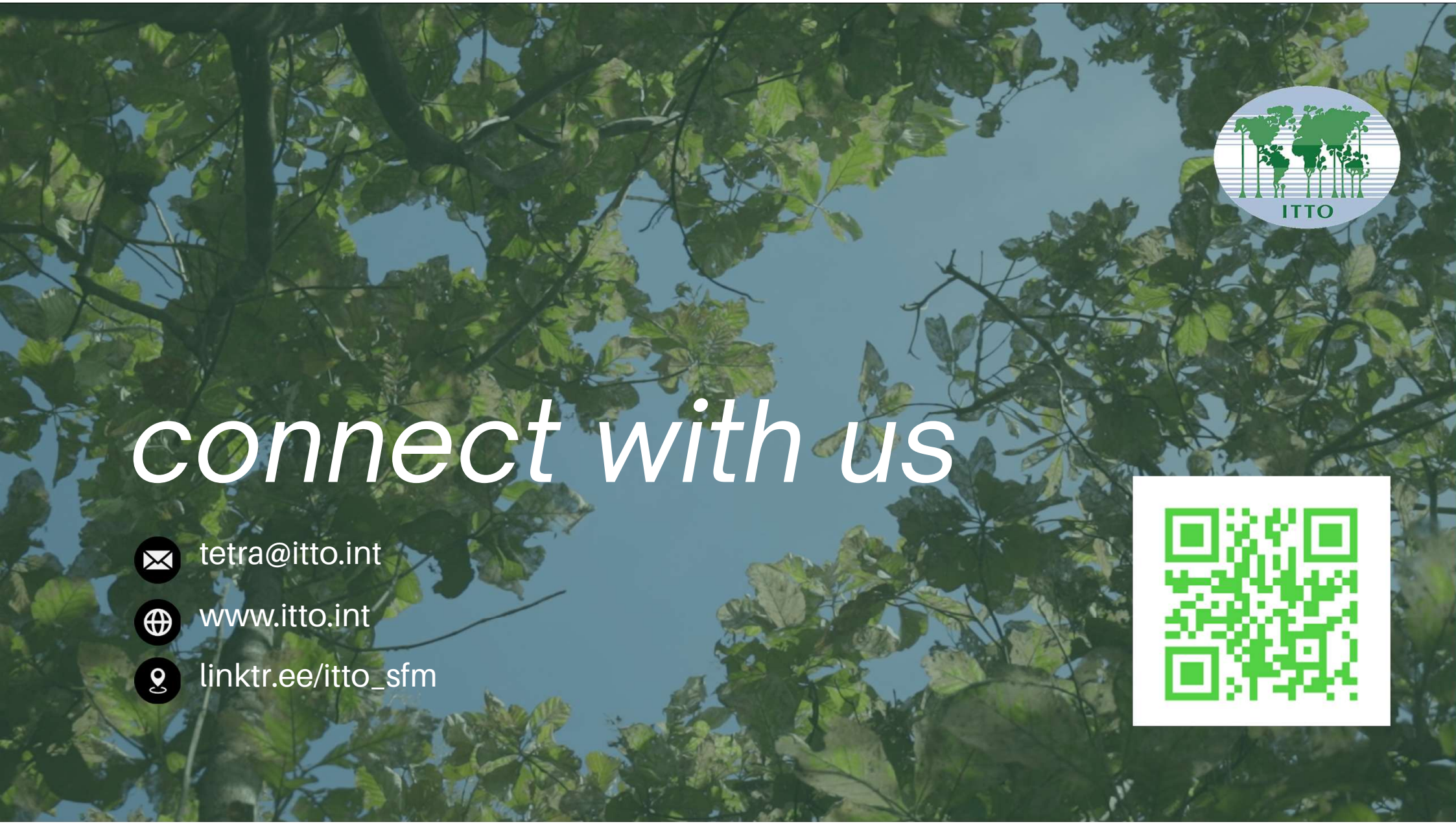


- The wood-based energy sector needs to be further developed in the basis of SFM:
  - support by the international community,
  - technology transfer, investment and capacity-building,
  - making information more accessible on:
    - wood-residue supply for bioenergy, including databases;
    - the availability and accessibility of the resource, its proximity to appropriate infrastructure and other logistical concerns;
    - the effectiveness, efficiency and economics of harvesting, marketing and energy conversion.
- The sector needs to be systematically integrated into overall energy policies.
- Establish incentives that favor the wood-waste utilization and integration of the timber industry.
- Ensure benefit-sharing mechanisms.
- Support further R&D and regional cooperation.

# For further reading

- Energy grows on trees (ITTO Technical Series No. 31):
  - Summarizes the presentations and discussions made at The International Conference on Wood-based Bioenergy held in Hannover, Germany, May 2007.
  - Includes conclusions and recommendations (still valid today) for developing wood-based bioenergy in the tropics.
  - Available at: [www.itto.int/technical_report/](www.itto.int/technical_report/)




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