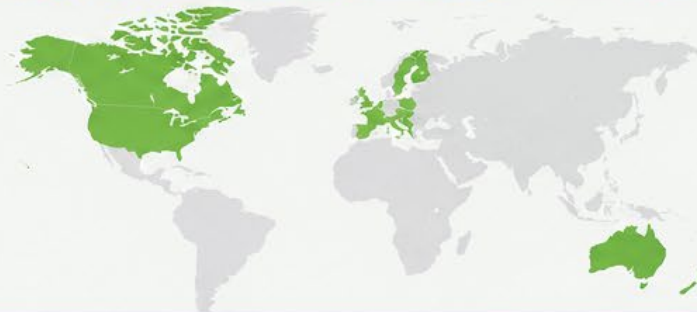


Task 43: Sustainable Biomass Supply for Resilient Net-Zero Systems

Supporting nature-positive circular bioeconomies through international collaboration



Collaborative research for sustainable, resilient biomass supply chains that deliver for people, climate and nature.



Task 43 Partners

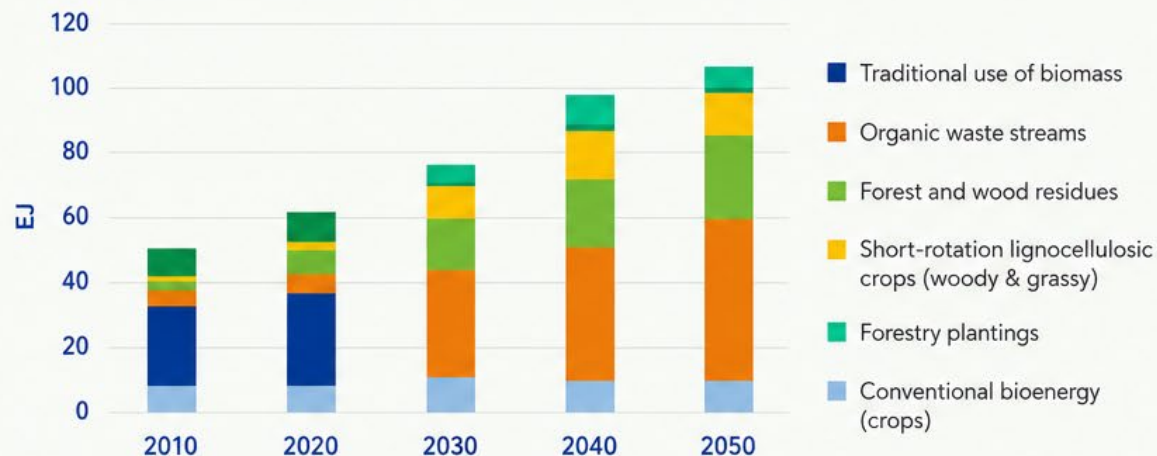
- Australia
- Canada
- Denmark
- Finland
- Germany
- New Zealand
- Sweden
- United States

Why Biomass Supply Matters More Than Ever

A critical enabler of the global Net-Zero transition

Modern bioenergy must nearly triple by 2050

Global bioenergy supply in the IEA Net Zero by 2050 Scenario



In the Net Zero Scenario, bioenergy grows from **~50 EJ** today to over **100 EJ** by 2050 — across all major end-uses.

Source: IEA (2022), Net Zero by 2050: A Roadmap for the Global Energy Sector

The strategic drivers



Energy Security

Diversifying energy systems with domestic, renewable resources reduces vulnerability and strengthens resilience.



Industrial Decarbonisation

Hard-to-abate sectors need large volumes of sustainable biomass to displace fossil fuels and reduce emissions.



Circular Bioeconomy Transition

Mobilising residues and wastes through integrated systems maximises value, minimises waste and supports nature-positive outcomes.



Sustainable biomass supply is increasingly **the deployment bottleneck.**

Task 43 Strategic Focus

Integrated research across technical, environmental and social dimensions to enable sustainable biomass supply systems



1. Quantifying Sustainable Biomass Availability

- Develop and **harmonise practical** estimates of diverse biomass resources worldwide
- Improve **data quality, consistency** and transparency
- Work with international partners (e.g., CEM Biofuture, ORNL) to advance global biomass assessment methodologies
- Build trusted evidence base to increase **investment confidence**



2. Optimising Biomass Supply Systems and Biohubs

- Design and assess **integrated biohub** systems that add value and resilience
- Improve **logistics, preprocessing,** storage and distribution efficiency
- Enable **cost-effective mobilisation** of mixed feedstocks (forestry, agriculture, MSW and others)
- Leverage **digital tools and modelling** to support decision-making and optimization



3. Understanding Social and Socio-economic Dimensions

- Assess **social and socio-economic** benefits and trade-offs across biomass supply systems
- Advance **Indigenous-led circular bioeconomies** and community benefit-sharing
- Strengthen **social licence** through inclusive engagement and transparent evidence
- Identify **good practices** for nature-positive and equitable outcomes



Accelerating the transition to **resilient, nature-positive,** circular bioeconomies through **international collaboration**

Evolution of Task 43: Adapting to a Changing World

From logistics and supply chains to resilient, nature-positive bioeconomies

2022 – 2024

Building foundations for efficient biomass supply



Supply Chains and Logistics

Understanding biomass flows, transport and cost dynamics

Biohubs Concepts

Assessing roles of biohubs, terminals and preprocessing centres

Feedstock Quality

Identifying key biomass characteristics for end-use suitability

Techno-economic Assessment

Modelling costs, feasibility and business opportunities

Case Studies and Tools

Developing CANBIO-HUB and delivering international case studies

2025 – 2027

Scaling impact for resilient, nature-positive systems



Global Biomass Assessment

Harmonising methodologies and building trusted, practical resource accounting

Resilience and Wildfire Integration

Linking biomass supply with fire prevention, recovery and energy security

Nature-Positive Circular Bioeconomies

Driving circular value, waste utilisation and regenerative land systems

Social Licence and Indigenous Leadership

Advancing inclusive engagement, benefit-sharing and community outcomes

Data, Tools and Decision Support

Leveraging GIS, digital tools and modelling for smarter decisions



Task 43 is evolving to meet **today's challenges** and **tomorrow's opportunities** for **sustainable, resilient and equitable** biomass supply systems.



Resilient



Sustainable



Equitable

Impact Theme 1: Improving Confidence in Sustainable Biomass Availability

Better data, harmonised methods and transparent assumptions build the foundation for investment and deployment

Creating trusted evidence for sustainable biomass supply



The challenge

- Inconsistent methodologies and assumptions
- Poor comparability across countries and regions
- Regulatory uncertainty and sustainability concerns
- Limited confidence in long-term biomass supply estimates



Our response

- ✓ Convene international stakeholders to align on **practical biomass assessment methodologies**
- ✓ Support **global biomass resource assessment** efforts (e.g., CEM Biofuture, ORNL)
- ✓ Develop transparent, **harmonised datasets** and assumptions
- ✓ Deliver **regionally specific resource assessments** to support decision-making

International collaboration and workshops

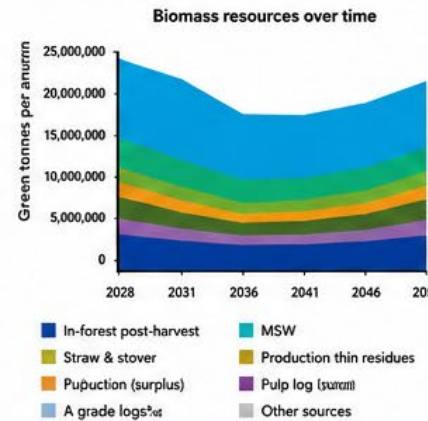


Workshop: Improving Documentation of Sustainable Biomass Resources (CEM Biofuture Platform Initiative)



Engaging stakeholders to improve data quality, coverage and consistency

Regional case study: New Zealand



Multi-decade projections by region and source inform strategic planning

Harmonised methods and transparent data

IEA Bioenergy

Residual biomass fuel projections for New Zealand; 2024

Indicative availability by region and source

IEA Bioenergy; Task 43
October 2024

IEA Bioenergy

Identifying key quality characteristics of woody biomass for bioenergy application: an international review

IEA Bioenergy; Task 43
October 2024



Building a trusted evidence base to increase investment confidence

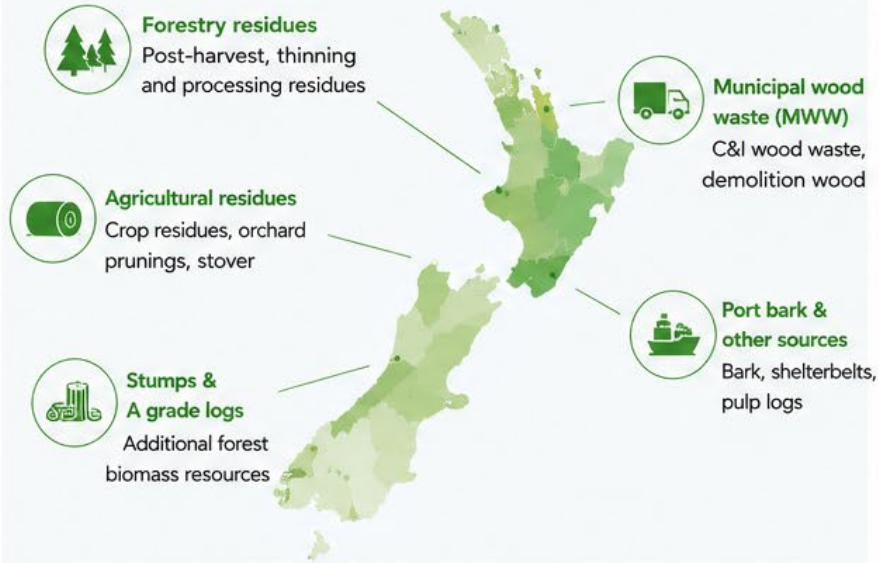


Reliable, comparable and transparent biomass supply assessments are essential to **unlock investment, scale deployment** and deliver **credible climate outcomes**.

Impact Theme 1: Case Study – New Zealand National Biomass Resource Assessment

Long-term projections of residual biomass availability by region and source

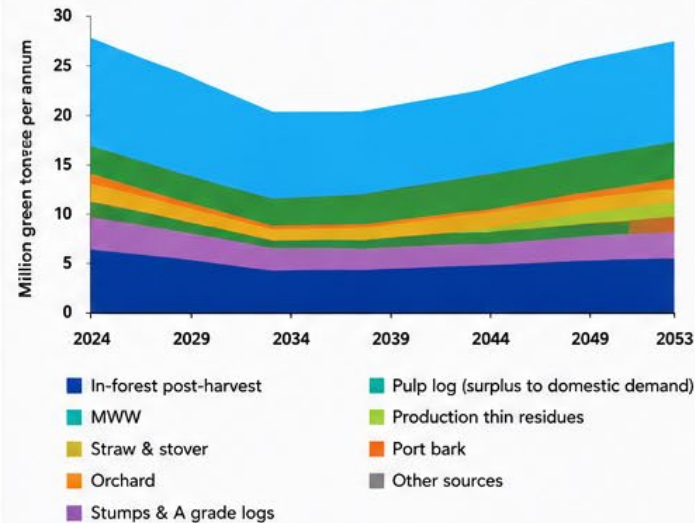
Comprehensive assessment across New Zealand



Provides transparent, long-term data to inform strategic planning and investment decisions

Indicative biomass availability by source

(1st recovery level – million green tonnes per annum)



Total recoverable biomass estimated at **~7.3 million green tonnes per annum** at the low point (~2027)
Excluding materials with existing markets ~4.1 million

Key takeaways



Multi-decade projections to 2053 support long-term energy planning



Regional insights reflect variability in resources and access



Multiple residue streams provide diverse, flexible supply options



Indicative delivered costs for 2024 to support economic assessment



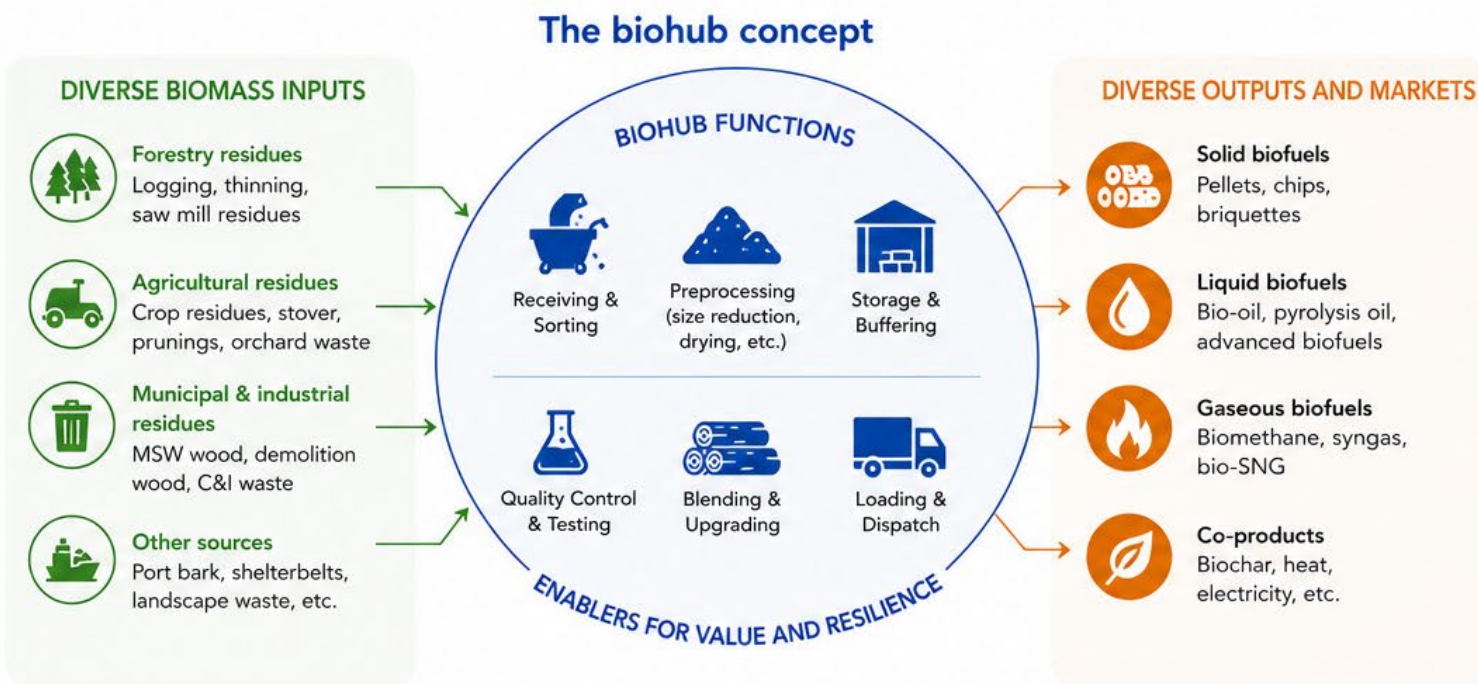
Strengthens confidence in sustainable biomass supply potential



Robust biomass accounting builds **confidence**, reduces uncertainty and unlocks the **value of residues** for a **sustainable, secure and affordable energy future**.

Impact Theme 2: Biohubs and Integrated Circular Biomass Systems

Enabling infrastructure for scalable, cost-effective and resilient biomass supply



Why biohubs matter

- Economies of scale**
Reduce unit costs through aggregation and shared infrastructure
- Resilience & flexibility**
Buffer supply variability and diversify feedstock and market options
- Quality & reliability**
Standardize and upgrade biomass to meet end-user specifications
- Logistics efficiency**
Optimize transport, storage and distribution networks
- Circular bioeconomy**
Maximize value from residues and enable low-carbon energy and products



Biohubs integrate **people, infrastructure and innovation** to transform residues into valuable energy and products that support **resilient, circular bioeconomies**.



Supported by recent Task 43 work

- Systematic review of biohubs (Valipour et al., 2024)
- CANBIO-HUB feasibility and design (U. Alberta, 2025)
- Business models for biohubs (Adetona et al., 2025)
- Environmental sustainability of biohub archetypes (Rai & Monaghan, 2024)

Impact Theme 3: Social and Socio-economic Dimensions

People, communities and equity at the heart of sustainable biomass supply systems

Our focus areas



Inclusive Engagement and Benefit-sharing

- Strengthen early and meaningful engagement with Indigenous Peoples, local communities and stakeholders
- Promote fair benefit-sharing and community well-being
- Build trust, transparency and long-term relationships
- Support social licence for biomass projects and supply chains



Indigenous-led Circular Bioeconomies

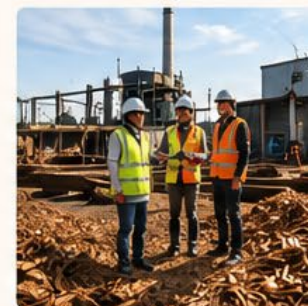
- Advance Indigenous-led innovation and circular bioeconomy solutions
- Recognise Indigenous knowledge and rights
- Support place-based solutions that deliver economic, environmental and cultural benefits
- Strengthen capacity and partnerships for local ownership and leadership



Good Practice and Evidence for Equity

- Identify and promote good practices for equitable and nature-positive biomass systems
- Assess social and socio-economic impacts across the value chain
- Provide robust, transparent evidence to inform policy, investment and decisions
- Contribute to just transition and the Sustainable Development Goals

Recent case studies



Indigenous-led bioenergy value chains (Canada)

- Explores opportunities for First Nations communities to lead bioenergy projects
- Case examples of ownership, revenue generation and community benefits
- Lessons for partnership, capacity and investment



Social sustainability in citizen energy communities (Denmark)

- Examines biomass in local energy communities
- Focus on governance, participation and local value
- Insights for social licence and equitable outcomes



Sustainable biomass supply systems succeed when they deliver **lasting benefits for people and communities**, respect rights and knowledge, and build a **social licence** for a **just and inclusive transition**.



Impact Theme 4: Data, Tools and Decision Support

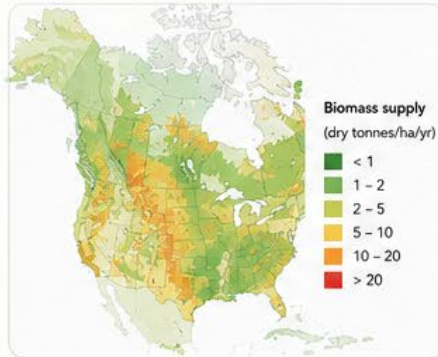
Better information and tools for smarter decisions and stronger outcomes

Building the knowledge and tools needed for effective biomass supply decisions



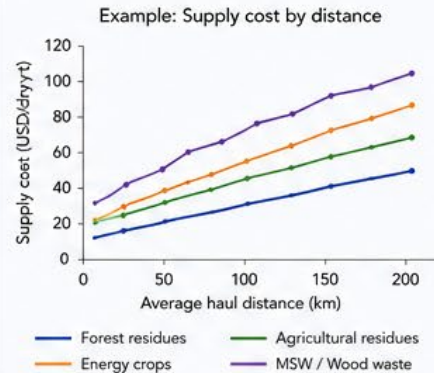
Spatial data and resource mapping

- Harmonise spatial data and parameters
- Map biomass resources and availability
- Understand spatial variability and access
- Support regional and national planning



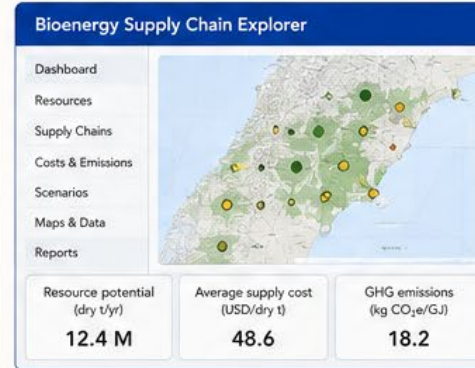
Modelling and scenario analysis

- Model supply chains and logistics
- Assess costs, emissions and trade-offs
- Explore scenarios and uncertainties
- Evaluate technology and policy options



Tools and platforms for decision support

- Develop open, transparent and user-friendly tools
- Support data access and sharing
- Enable evidence-based decisions
- Build capacity and user engagement



Data and knowledge sharing

- Build and harmonise datasets
- Improve data quality and transparency
- Share knowledge, methods and results
- Strengthen global collaboration

Examples of key datasets and resources

- Biomass resource and supply databases
- Supply chain and logistics data
- Sustainability and GHG emissions data
- Reports, guidelines and case studies
- Workshops, training and capacity building



High-quality **data**, robust **tools** and transparent **information** empower **better decisions**, reduce risk and accelerate the transition to **sustainable, resilient bioeconomies**.



Better information



Smarter decisions



Stronger outcomes



Global impact



IEA Bioenergy TCP • Task 43



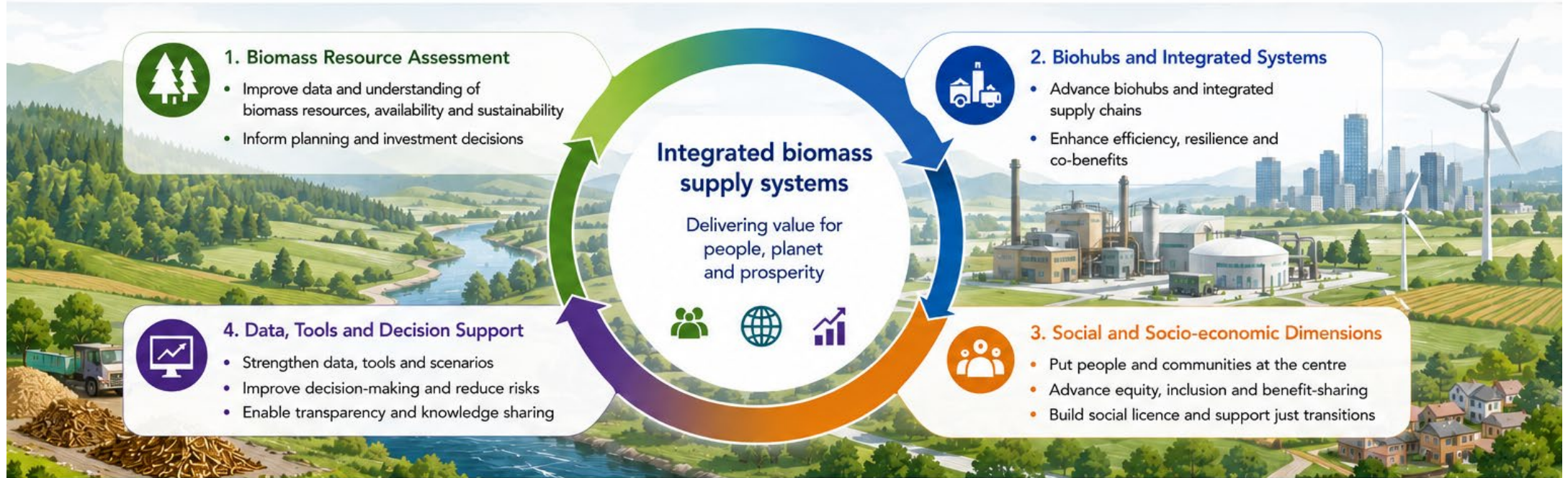
Sustainable biomass supply is foundational to net-zero deployment.



Resilient circular bioeconomies require integrated supply systems.



International collaboration accelerates credible, scalable solutions.



Our objectives and ambitions



Generate trusted evidence

Deliver high-quality data, analysis and insights to reduce uncertainty and inform better decisions.



Enable integrated solutions

Develop and demonstrate integrated biomass systems that are efficient, resilient and sustainable.



Deliver people-centred value

Ensure social inclusion, equity and community benefits are embedded in bioenergy development.



Strengthen decision support

Provide tools, scenarios and platforms that support transparent, evidence-based policy and investment.



Build global capacity

Foster collaboration, share knowledge and build capacity to accelerate progress together across regions.



Task 43 provides the platform connecting science, industry and policy to make a meaningful contribution to the transition to net zero.