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ORNL/TM-2025/3950

WORKSHOP REPORT: ADDRESSING INVESTMENT BARRIERS BY IMPROVING DOCUMENTATION OF SUSTAINABLE BIOMASS RESOURCES

Ryan A. Jacobson
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June 2025

OAK RIDGE National Laboratory

ORNL IS MANAGED BY UT-BATTELLE LLC FOR THE US DEPARTMENT OF ENERGY

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Environmental Sciences Division

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CONTENTS

ABBREVIATIONS

ORNL	Oak Ridge National Laboratory
IEA	International Energy Agency
FAO	Food and Agriculture Organization
DOE	Department of Energy
OSTI	Office of Scientific and Technical Information (US DOE)
RED-3	Renewable Energy Directive III (European Union)
LCFS	Low Carbon Fuel Standard
ICAO	International Civil Aviation Organization
IMO	International Maritime Organization
MSW	Municipal Solid Waste
GIS	Geographic Information System
ESA	European Space Agency
ExCo	Executive Committee (IEA Bioenergy)

EXECUTIVE SUMMARY

On May 8, 2025, Oak Ridge National Laboratory (ORNL), in collaboration with IEA Bioenergy Task 43 and the Biofuture Platform, convened an international workshop in Vancouver, Canada to improve the Global Biomass Resource Assessment. This effort addresses investment barriers in the global bioeconomy by improving the transparency, consistency, and usability of biomass supply data.

The workshop gathered 38 participants from 11 countries, representing government agencies, academia, and industry. Participants reviewed the status of the biomass dataset, tested the data-sharing platform, and provided direct input on priorities for improvement.

Three top priorities emerged from the workshop:

1. Clarify biomass origin classification — Develop clear, objective criteria to distinguish agricultural from forestry biomass sources, particularly for mixed-use systems such as short-rotation woody crops.
2. Improve supply categorization — Enable standardized classification of biomass by accessibility and use, such as currently used, unused but accessible in the near term, and long-term projected supply potential.
3. Fill critical geographic data gaps — Identify and address data deficiencies in countries with high biomass potential, using remote sensing and modeling where appropriate.

Additional recommendations included harmonizing terminology, enhancing reporting standards, and increasing outreach to improve visibility and participation. Participants emphasized the importance of:

- A standard reporting template with a glossary to support consistent and transparent data classification;
- Collaboration with international partners such as FAO and IEA to align data collection practices;
- Establishing a long-term institutional host to manage and maintain the dataset.

Participants widely agreed that the Global Biomass Resource Assessment is essential to support sustainable market development, regulatory compliance, and investment decisions in the bioeconomy. Feedback from the workshop will guide ongoing development under the 2025–2027 IEA Task 43 work program and the CEM Biofutures Platform goals for 2025.

1. BACKGROUND

Uncertainty about the availability of sufficient biomass has deterred investments needed to mobilize resilient feedstock sources for a growing bioeconomy. Evolving regulations around the globe create barriers to biofuels and other biobased products based on concerns about adequate availability and sourcing of biomass. In 2024, the Biofuture Platform Initiative (Biofuture) asked ORNL to address the need for an international benchmark data set quantifying available biomass supply. A system for processing and sharing information was established and a Global Biomass Resource Assessment report was issued for 62 nations. The report highlighted challenges related to inconsistencies and limitations in data quality, time frames, terminology, units, and other variables.

In 2025, Biofuture, ORNL, IEA Bioenergy Task 43, and others are collaborating to improve the data in terms of quality and extent of coverage. Another goal is to identify a potential permanent institutional home that can maintain future operations of the global biomass resource data clearing house. In February 2025, Task 43 approved a three-year plan with activities for collaborations that aim to further develop the data set.

2. WORKSHOP OVERVIEW

IEA Bioenergy Task 43, the Biofuture Platform Initiative, and ORNL (workshop partners) agreed on a plan to organize a workshop to receive input from stakeholders regarding the global dataset and how to best improve it over the coming year. Specifically, the partners wanted to make sure that ongoing work is done in a manner that best serves the needs of users, while addressing the question, "Is there enough biomass available that complies with regulatory requirements?" In advance of the workshop, the partners reached out via email, social media, and website notifications to invite all interested parties to contact the Global Biomass Resource Assessment with any comments, questions, or suggestions for improvements at: biomass.updates@ornl.gov.

It was also agreed to offer a virtual link to the workshop for interested parties that could not attend in person. The communications issued prior to the workshop, and reiterated during the workshop, were that, "All stakeholders are welcome to share feedback and suggestions regarding the agenda, topics and issues before, during, and after the workshop."

Based on the suggestions received from stakeholders from Oct 2024-Jan 2025, a detailed agenda and strawman list of next steps to improve the data set were drafted and distributed for comment. The final detailed agenda and list of potential future actions to improve the workshop were distributed to all registered participants in advance, to enable them to review background materials and consider the various options that would be discussed.

2.1 SPECIFIC AIMS OF THIS WORKSHOP ARE:

a) Provide a briefing on the status of the global dataset and data sharing platform; and discuss how participants and other interested parties can access and utilize the data.

b) Review proposed next steps (below) and prioritize them based on criteria including the needs of users, available resources, complementary projects, and workshop participant perspectives.

c) Discuss how IEA Bioenergy Task 43 member nations, workshop participants, and others, can contribute to complete the activities planned in the Task's work package on sustainable global biomass availability.

d) Identify additional potential partners (e.g., representatives from regional or national governments, private sector, or other organizations) who may be able to contribute to achieving mutual goals related to improving access to information about available biomass resources.

The formal agenda and timeline are provided in Appendix A.

3. PROJECT IMPROVEMENT OPTIONS PRIORITIZATION AND DISCUSSION

Workshop participants were invited to log in and test the utility of the data set, and to recommend areas for improvement. Participants were also provided the following list in advance of the workshop, for consideration. During workshop discussions and breakouts, these options were discussed and prioritized.

1. Clarify criteria used to determine if biomass feedstock should be classified as sourced from forestry or agriculture (e.g., how should short-rotation woody crops on arable or former croplands be classified?)

2. Define and apply criteria to classify all biomass consistently as primary, secondary, or tertiary. E.g., when classifying harvest residues, sawmill residues, pre-commercial forest thinning, wildfire risk reduction removals involving round wood, etc.

3. Clarify and apply criteria to sort reported supply estimates into bins corresponding to:
    a. how much of reported supply is already being used for bioenergy;
    b. how much of reported supply is being used for non-bioenergy purposes;
    c. how much of reported supply is accessible with current technologies and incentive programs (e.g., can be made available in the near term); and
    d. how much of reported supply is future potential that requires investments for mobilization but can be made available in the future under appropriate policy and regulatory conditions

4. Build capacity for the data to be sorted to indicate what shares of reported supplies are expected to comply with specific existing regulatory frameworks and market access requirements (RED-3, LCFS, ICAO, IMO, etc.)

5. Improve data quality for selected nations already in the data base focusing on systematic approach to clarify assumptions and criteria applied to define sustainability

6. Fill gaps in data: Prioritize and work to identify ways to fill the largest national data gaps in terms of likely biomass potential (identify data sources or reports to fill as many large gaps as possible).

7. Make data portal more user-friendly: make it easier to select, sort, and visualize the data, including abilities to select or sort data by selected criteria (location, type of biomass, source etc.)

8. Define methods for more systematic inclusion of social and economic impacts associated with reported supplies.

9. Collaborate with FAO to develop a draft "FAO Info Brief" to improve understanding of issues and potential solutions related to inconsistencies in biomass terms.

10. Develop a standard reporting template and supporting instructions with a glossary of clear, practical terms and definitions to enable consistent classification of biomass supplies that can be cross-referenced with international trade classification codes and other domains and facilitate machine-readability.

11. Identify a long-term institutional home to host data sharing portal in future and provide support as needed to transfer data and operations of the data portal.

12. [Other suggestions from participants and stakeholders]

4. OUTCOMES

The workshop was well attended, and the presentations were given to both the in-person attendees and the online members, with strong participation from both groups. Workshop attendees were presented with the goals of the Biofuture Platform, IEA Bioenergy Task 43, and the Global Biomass Resource Assessment.

This was followed by an introduction to the web portal and database to access the assembled Global Biomass Resource Assessment.

Following the introduction to the objectives and progress of the dataset, discussions focused on the needs of the diverse user base for Global Biomass Resource Assessment. Attendees of the workshop included venture capital, academic, industrial and government representatives and offered a diverse set of needs and desired inclusions in the database. These discussions led to the selection of 3 primary topics of priority investment in the Global Biomass Resource Assessment to discuss in depth, which were voted on using the Slido online polling system and the results of which are captured in Table 1. The top 3 vote receiving topics were used to break attendees into 3 groups, and the resulting discussions are captured in Table 2. Table 2 breaks the topics into 3 groups, High priority is the top 3 vote receiving topics, medium priority was the next 4 topics in terms of votes received, and low priority was the lowest 4 vote receiving topics. Some medium and low priority topics became longer-term objectives to build analysis capacity and are not immediately implementable.

Table 1. Polling results ranking interest in action topic, with an emphasis on immediate and near term implementable actions due to the project's timetable.

Priority Level	Priority Actions
High Priority	• Clarify criteria to determine when biomass is sourced from agriculture versus forestry • Verify and apply criteria to sort reported supply estimates into bins (currently used, not used and accessible in the near-term, or projected to be available in future under specific conditions) • Fill geospatial gaps in data, especially for nations with high biomass potential
Medium Priority	• Develop standard reporting template and glossary of terms for classification • Define criteria and classify biomass as primary (biomass in raw, unprocessed form e.g., maize, round wood), secondary (biomass derived from or associated with one or more industrial processing and transformation steps), or tertiary (biomass derived from sources following a primary use, e.g., MSW, reclaimed building materials) • Improve data quality with a systematic approach to sustainability criteria • Build capacity to meet regulatory and market requirements (RED-3, LCFS, ICAO, IMO)
Low Priority	• Collaborate with FAO on an Info Brief to address biomass term inconsistencies • Include social and economic impacts in biomass supply assessments • Improve usability of data portal (selection, visualization, sorting) • Identify long-term institutional host for the data portal

Six main themes emerged from the group discussions, centered around clarity in collection, classification, reporting, and making the data set more visible to the general public and decision makers.

All three breakout groups noted the need to have an internationally accepted and employed method for the classification of biomass resources without the categories becoming unusably vague. All groups also

noted the need to have standardized reporting metrics and units to allow for the assessment of what biomass is where, when or if it is available and what fuel certifications may apply. Biomass resource data collection through remote sensing was highlighted, suggesting that a combination of remote sensing and other reporting methods may enable extrapolation methods to estimate available biomass for geographic areas with limited analysis and reporting of biomass resource data (much of Africa, for example).

Participants noted that understanding market requirements for biomass, and opportunities to develop efficient supply chains in response to specific demands, could add value to the data set for users. Finally, engagement with stakeholders to encourage more contributions of comprehensive reporting of biomass resource availability, including current and projected uses compared to accessible supplies, would be helpful. All groups also noted the need to expand efforts to increase outreach and awareness among potential users of the existence and utility of the dataset, and to locate additional contributors to the dataset.

Table 2. Summary of Breakout Group Discussions on Biomass Classification and Reporting

Breakout Group	Key Topics	Summary of Discussion Points
Group 1: Biomass Classification	Clarifying Agricultural vs Forestry Biomass	- Define biomass source and origin using objective criteria (e.g., geospatial location, land cover type, crop/forest management system employed) - Recognize mixed production systems like agriforestry (trees + crops) - EU prohibits landfilling of biomass - Recommend using scientific classification: woody vs non-woody - More visualization would help with publicizing and quick analysis - Document conversions used for weights, volumes and energy - Document any data sources used for calculations for users to clearly understand the assumptions that were incorporated into the analysis - Definitions of biomass classes (e.g., what is classified as waste) - Update database to show all legally recognized countries, ask for users to contact us with data for countries with no data in the database.
Group 2: Supply Estimates and Usage	Standardization and Monitoring	- Propose standard reporting template to include at least basic data: TOTAL Biomass production (dry matter-standard) in a defined baseline year, derived from a defined production area (Has), and with measured ash content (these data allow calculation of heating value). - Use GIS and Sentinel data to monitor current biomass use (e.g., burning of rice straw and other ag residues) - Highlight value of rice straw methane reduction if baled and used for bioenergy or other productive ends; and potential value in global carbon markets from emission reductions - Work with FAO and IEA to compare and develop alignment with existing reporting to FAO and IEA (part of Priority Action #4 [Table 1]) - Compare reported volumes with new FAO dataset on bioenergy use in each nation. - Engage authors of reports on major supplies, to clarify missing data on biomass qualities, current use and disposition - Recommend classifying reported biomass volumes as either primary, secondary, or tertiary. - Recommend noting current disposition of biomass supplies (e.g., are they left in field, burned, used as animal fodder, etc.) - Consider inclusion of smallholder in future data collection activities

		- Emphasize that reliable data is essential to enable biomass markets - Conclusion: the workshop goal and this initiative, are important, because data are critical to enable markets to develop.
Group 3: Database Expansion and Stakeholder Engagement	Data Collection and Communication	- Identify and publish data gaps on website or portal - Incorporate national biomass action plans and roadmaps - Promote database visibility via publications and user networks - Recruit contributors for gap-filling - Clarify data classification types in collection forms - Emphasize biomass value chain beyond energy: bioproducts, nutrients, biochar, microbiome - Advocate for sustainable bioenergy as a low-GHG source - Engage with non-forestry, indigenous, agricultural, and fire-focused organizations - Provide form for voluntary data submission - Note satellite data utility and limitations (accessibility vs volume) - Recognize existing national reporting to FAO/IEA; institutional approaches may be more effective - Urge formalization of institutional reporting processes (long-term need) - ESA data cited as resource for biomass monitoring

These comments and outcomes will be used to shape and prioritize the future development of the Global Biomass Resource Assessment and the activities of IEA Bioenergy Task 43 in the current 3-year program (2025-27). Increasing the geographic coverage of the dataset is an ongoing effort, with additional efforts to expand the abilities of the analysis to extrapolate estimates in low-data regions using statistically valid regional and climatic extrapolation algorithms potentially linked with remote sensing datasets. Work is also ongoing with international contributors for the standardization of biomass resource terminology, classification, and reporting methods.

5. IEA BIOENERGY TASK 43 LEADERSHIP MEETING

Date: May 9, 2025

Location: University of British Columbia, Department of Forestry, Vancouver, BC, Canada

The Task 43 Leadership Group convened on May 9, 2025, to close out the 2022–2024 triennium and begin planning for the current one. Outstanding deliverables and payments were reviewed, with some carryover funds identified for reallocation. Webinars were discussed as a key outreach strategy, with upcoming topics including sustainable biomass assessment and Indigenous-led circular bioeconomy impacts. A commitment was made to enhance interactivity using tools like Slido. The group reaffirmed their approved objectives and deliverables, which focus on global sustainable biomass assessments, innovations in biomass collection and supply chains, and the socio-economic impacts of circular bioeconomies.

Several proposals for new activities were evaluated. A project on salvage wood valorization was conditionally approved with funding for a student researcher. A proposal to assess the social acceptance and socio-economic benefits of biomass supply was approved and flagged as a potential foundation for the required inter-task collaboration. Other proposals—such as those focused on LiDAR-based biomass estimation, optimizing bio-hub locations using GIS, and novel chipping technologies—were not approved in their current form but encouraged to submit scaled-back or revised versions that align better with Task objectives and budget constraints.

The group also discussed increasing participation from new countries and institutions, and reviewed progress on the approved global biomass resource assessment project (focus of the workshop). The Task formally approved the selection of a candidate to carry out work planned over the coming 2 years on the global assessment. Plans were initiated for a potential in-person meeting in 2026, potentially aligning with the ExCo meeting. The next meeting was scheduled for June 18, 2025.

6. PRODUCTS

6.1 WORKSHOP GOALS

1. Provide a briefing on the status of the global dataset and data sharing platform; and discuss how participants and other interested parties can access and utilize the data.
2. Review proposed next steps (below) and prioritize them based on criteria including the needs of users, available resources, complementary projects, and workshop participant perspectives.
3. Discuss how IEA Bioenergy Task 43 member nations, workshop participants, and others, can contribute to complete the activities planned in the Task's work package on sustainable global biomass availability.
4. Identify additional potential partners (e.g., representatives from regional or national governments, private sector, or other organizations) who may be able to contribute to achieving mutual goals related to improving access to information about available biomass resources.

6.2 CEM BIOFUTURE PLATFORM INITIATIVE

1. Mission
    a. Promote an evidence-based understanding of sustainable biomass production and use
2. Desired Outcomes
    a. Ensure appropriate roles for sustainable biomass to help achieve good practices goals
    b. Reduce risks in biomass production and use
    c. Build awareness of biomass production as a foundation of strong economic activity

6.3 IEA BIOENERGY TASK 43

1. Focus
    a. Improved global understanding of sustainable biomass availability
    b. Techno-economic strategies for sustainable biomass supply with in existing forestry, agriculture, and waste management supply chains
    c. Improving understanding of the social and socio-economic impacts of effective integration of biomass supply
2. Workshop Challenges

    a. Uncertainty about sustainable biomass availability deters investments
    b. Evolving global regulations create barriers due to concerns about sourcing and sustainability
3. Workshop Objectives
    a. Introduce the global biomass dataset and web portal
    b. Engage stakeholders in discussions to improve data quality and coverage
    c. Identify strategies to overcome investment barriers in sustainable biomass resources

6.4 PRESENTATIONS

1. **Title:** IEA Bioenergy Task 43 Workshop: Addressing Investment Barriers by Improving Documentation of Sustainable Biomass Resources
    a. **Link:** https://task43.ieabioenergy.com/publications/materials-for-workshop-addressing-investment-barriers-by-improving-documentation-of-sustainable-biomass-resources/#:~:text=ORNL%20and%20Task%2043%20Workshop%20presentation
2. **Title:** IEA Bioenergy Task 43 Workshop: Addressing Investment Barriers by Improving Documentation of Sustainable Biomass Resources
    a. **Link:** [ORNL internal presentation – available on request: jacobsonra@ornl.gov]

APPENDIX A. Workshop Agenda

APPENDIX A. WORKSHOP AGENDA

Time	Agenda Item	Presenter / Notes
13:30	Registration and refreshments	–
14:00	Welcome and Introductions	Mark Brown, University of the Sunshine Coast
14:10	Review of workshop agenda and goals	Keith Kline, Oak Ridge National Laboratory
14:20	Status update: Global Biomass Resource Assessment dataset and data-sharing platform	Ryan Jacobson, Oak Ridge National Laboratory
	- Participants explore dataset using personal devices	
14:40	Q&A and discussion: data access, qualities, terminology, and conversion issues	–
	- Identify specific updates and improvements	
	- Brainstorm approaches and key data sources for updates	
15:30	Participant input on dataset goals and user needs	Facilitated by Keith Kline
	- Are current objectives valid?	
	- Who are the primary users?	
	- What improvements are highest priority?	
16:10	Voting on next-step priorities	Via Slido poll
16:15	Health break	–
16:30	Review poll results and organize breakout groups	–
16:40	Breakout sessions: develop implementation strategies for priority actions	Each group selects a scribe
	- Are we on the right track?	
	- Recommend at least one priority action strategy	
	- Identify contributors and points of contact	
17:10	Report-out: breakout group findings and discussion	Each group presents
17:40	Discussion of next steps and continued collaboration	–
17:50	Closing remarks and announcements	Mark Brown