IEA Bioenergy
Technology Collaboration Programme

Bio-hubs as Keys to Successful Biomass Supply for the Bioeconomy

Report from Joint IEA Bioenergy Task 43 and Natural Resources Canada Workshop held in Ottawa on 6 March 2020

IEA Bioenergy: Task 43

May 2020

Bio-hubs as Keys to Successful Biomass Supply for the Bioeconomy

Report from Joint IEA Bioenergy Task 43 & Natural Resources Canada Workshop held in Ottawa on 6 March 2020

Report compiled by Samantha Nasso and Barb Sweazey (Stratos). Edited by Bruno Gagnon.

Cover page photo credit: Kalvis Kons

IEA Bioenergy: Task 43

May 2020

ISBN 978-1-910154-75-5.

Published by IEA Bioenergy

Index

Introduction

The International Energy Agency (IEA) Bioenergy Technology Collaboration Programme, under its Task 43: Sustainable Biomass Supply Integration for Bioenergy Within the Broader Bioeconomy, has launched an initiative aiming to identify successful examples of biomass logistic and distribution points for bioenergy and the bioeconomy. The Canadian Forest Service (CFS), a sector within Natural Resources Canada (NRCan), participated in the IEA Bioenergy Task 43 workshop on novel approaches for biomass supply in Hungary in fall 2019. Based on this experience, NRCan put together a Canadian version of this workshop to inform the implementation of innovative biomass supply chains and the potential for establishing bio-hubs in Canada. This workshop, hosted in Ottawa, Ontario on March 6th, 2020 brought together a collection of stakeholders and partners from across Canada to discuss how their regions, sectors and the country at large could successfully establish and implement bio-hubs to strengthen the Canadian bioeconomy.

The objectives of this workshop were to:

1. **Inform** the successful establishment of bio-hubs in support of the Canadian bioeconomy
2. **Analyse** the strengths, weakness, opportunities and threats (SWOT) of existing and potential projects
3. **Contribute** to the improvement of sustainable biomass mobilisation for energy purposes in Canada

To meet these objectives, participants heard from a number of speakers who represented a variety of perspectives along the biomass value chain and examples of sustainable biomass production. The insights shared throughout the presentations were leveraged through regional discussions of opportunities, challenges and what value bio-hubs could bring to different regions in Canada. The majority of the afternoon of the workshop was dedicated to completing an analysis of the strengths, weaknesses, opportunities and threats (SWOT analysis) of existing and potential bio-hub projects in Canada, culminating in the creation of a list of possible actions to enable their successful implementation.

This report is a summary of “what we heard” throughout the workshop, including the outputs from regional discussions, the SWOT analysis and actions identified, which NRCan and the IEA Bioenergy foresee contributing to the improvement of biomass mobilization for energy purposes. Participant inputs provided in the sections below have been edited, in some instances, for clarity. The workshop agenda and participant list, as well as a complete, unedited list of SWOT findings and action items identified by participants are available in the appendices.

What are bio-hubs?

A significant portion of the morning of the workshop was dedicated to learning more about bio-hubs, particularly of their implementation in other regions. A wide range of speakers delivered presentations, as summarized below, discussing various aspects of the biomass industry and illustrating examples of bio-hubs in particular regions. Copies of these presentations have been shared through virtual means to workshop participants.

INTRODUCTION TO BIO-HUBS AND NORDIC EXAMPLES

Kalvis Kons from the Swedish University of Agricultural Sciences provided an introduction to bio-hubs as established in Nordic countries, highlighting the advantages of using bio-hubs to supply forest product or bioenergy facilities. Some of the key advantages he mentioned included the streamlining of processing, storage and transportation, reduction in administrative costs, making a variety of biomass types available at a single location, providing an opportunity for suppliers of biomass products to continue producing in the off season (e.g., in the summer, when residents or building occupants do not require heat), as well as a place for companies to connect and trade with one another.

Using examples from Sweden, Kalvis demonstrated that bio-hubs can support development of the bioeconomy, though they may come with higher product demands, as well as the requirement of sharing roads and production space in the hub. Kalvis noted that this type of activity, and bio-hubs in general, will help Sweden become more independent from foreign resources and reach its goal of using 100% renewable energy by 2040. Though Canada has different needs and unique challenges, Kalvis's presentation of the Nordic model of bio-hubs provided a good example of biomass supply in a region with a growing bioeconomy.

BUILDING A BIOMASS SUPPLY CHAIN USING AGRICULTURAL RESIDUES

Sandy Marshall of Bioindustrial Innovation Canada (BIC), a Canadian not-for-profit organization based out of Sarnia, Ontario presented on the building of a biomass supply chain using agriculture residues. Sandy explained how BIC has been leveraging the petrochemical infrastructure in Southern Ontario to produce biofuels and other bio-based products, benefiting farmers, workers and the region. In this example, farmers partnered with Comet Bio and Cellulosic Sugar Producers Cooperative (CSPC) to set up the biomass supply chain in order to support a planned biorefinery. In this model, the farmers through the Co-operative provide 20-30% of equity in the conversion plant.

Through this approach, producers are able to earn dividends from their investment as while receiving payment for the raw product (corn stover), optimizing the value chain and building a solid foundation for business. Sandy stressed the importance of trust and relationship building to ensure the effective coordination of biomass through a bio-hub model. To enable and build this trust, farmers and producers are active participants in the entire process. Sandy also noted that these partnerships give companies a strategic advantage, with some control over both quantity and quality of the product.

GITXAN BIOECONOMY STRATEGY

Kelsey Harmse, representing the Gitxan Development Corporation (GDC) presented on the Gitxan Bioeconomy Strategy and the initiative to use renewable sources for their community's energy. The GDC, formed by the Gitxan hereditary chiefs, wants to fully utilize their forestry

license and work toward sustainable forest management, a core resource for the Gitxan. A GDC company, Gitxan Energy, is aiming to provide sustainable energy solutions, jobs and education opportunities for its community members.

The Gitxan community is moving away from fossil fuels, using pellet boilers to provide energy in high profile / high usage centres in the community. These boilers were installed and are maintained by community members, who have been trained to use this equipment. The GDC purchased its own pellet delivery vehicle and is delivering pellets to community members in large drums as a new sustainable practice instead of using plastic bags. The GDC is also working with Hazelton BioEnergy on a torrefied pellet plant project. In her closing, Kelsey shared that the Gitxan are hopeful that the community can be self-sustainable and not dependent on external sources of heat for their homes in the future.

BIOREFINING - TODAY'S REALITY AND TOMORROW'S POTENTIAL

Doug Berven, representing POET, the world's largest producer of biofuels presented on the successes and challenges of the biorefineries POET has developed in the United States. He noted that POET is currently operating 28 plants, producing renewable fuels and a range of bio-based products. Doug emphasized that their biorefining process can create the same products out of corn and agricultural residues that petrochemical producers create with petroleum. Showcasing the wide array of products POET is able to produce from biomass, he highlighted that the agriculture sector presents significant untapped potential, especially in the USA and Canada, where there is a surplus of corn, soybeans and wheat, with yields that increase over the years and where the demand is not keeping pace.

The ability to utilize these surpluses and resources could promote smart farming and more sustainable solutions to a number of products in a variety of sectors, including rubber, paint defoamer, feed and ethanol. POET has worked on Project LIBERTY, a venture of building two plants side-by-side: a cellulosic ethanol plant and a grain ethanol plant. The cellulose plant intakes biomass, generating clean and sustainable power for the grain ethanol plant to produce ethanol and other products from corn biomass, supplying cleaner energy and fuel for consumers.

ROLE OF BIO-HUBS IN DE-RISKING BIOMASS SUPPLY CHAINS

Jordan Solomon is President and CEO of Ecostrat and the head of Ecostrat's Advisory Group. Ecostrat supports aggregating and supplying quality wood fiber and organics for bio-based projects throughout North America and abroad. Jordan presented on the importance gaining access to capital markets to create a successful bioeconomy project. Jordan highlighted the advantages of bio-hubs, including the opportunity to eliminate large amounts of financial risk surrounding feedstock supply and solve for issues of quality, quantity and consistency of supply, which can enable access to lower cost capital and more rapid project financing and policy effectiveness. He explained that bio-hubs can reduce seasonal fluctuation of supply, decrease debt and equity costs and fast-track the implementation of green technology solutions. Bio-hubs can also be marketed as one large reputable supplier of feedstock, providing a contractual advantage for actors within the supply chain.

Jordan also spoke to some of the disadvantages that bio-hubs may present, including the small financial community willing to invest, the higher costs of transportation and storage of feedstock and the risk of market declines impacting the demand for products. To mitigate some of these and incentivize investors, he stressed the importance of making clear the value

that the bio-hubs would provide. He introduced the Biomass Supply Chain Risk (BSCR) Standards, which will become a national standard for capital markets to evaluate bioeconomy projects. Jordan closed out his presentation stressing the importance of being able to quantify the value of bio-hubs to investors, as well as the value of the BSCR Standards in de-risking bio-hub ventures to allow for better access to financial investments.

The information and perspectives offered by the presenters provided a robust platform for participants to engage in meaningful and productive discussions and activities throughout the remainder of the workshop, as discussed in the following sections.

What could bio-hubs look like in Canada?

In groups based on region, participants spent time exploring what a bio-hub could look like in their region. As a first step, they were asked to brainstorm and discuss any observations they have made about the bioeconomy supply chain in their region, what has been working well and any challenges that may exist. Participants prepared a pitch for a bio-hub in their region to illustrate what it could look like and what value it would bring to their region.

WESTERN CANADA

Three groups of participants discussed the Western Region of Canada, which included Manitoba, Saskatchewan, Alberta, British Columbia and the Northwest Territories. With extensive history in sustainable forestry and agricultural sectors, Western Canada has existing supply chains, though they are currently dedicated to traditional industries (e.g., pulp and grains) and not biomass for energy. Integrating diverse biomass flows into a single bio-hub would be difficult with the unique needs of the organizations that could be involved in the hub. One group suggested the separation of forestry and agricultural bio-hubs as a solution to meeting needs and using pre-existing supply chain infrastructure or production facilities. For example, existing storage, industrial or conversion facilities could be upgraded to add bio-hub services. The groups noted that finding investment to upgrade infrastructure may be difficult and may require government or anchor companies for support in the beginning stages of implementing a bio-hub.

One group noted that recently, the energy sector is using a large fraction of industrial residues, though this may not be the best choice economically, as biochemicals and biomaterials have a greater value. One group asserted that in the process of deciding if a bio-hub must be implemented, a number of positive impacts including job creation and GHG reductions must be considered in the cost/benefit equation, because financial advantage is not necessarily the most important parameter. Improved equipment and artificial intelligence technology would also be a key instrument for creating efficient and valuable bio-hubs in Western Canada.

ONTARIO AND QUEBEC

Each of the three groups from Ontario and Quebec focused on different aspects and values that bio-hubs would bring to their region. One group focused on supply and gathering biomass through unwanted residues or organic waste sent to landfills to process and manipulate it, optimizing delivery and sales agents to find the demand for bioproducts. Participants noted that using Artificial Intelligence technology could help optimize delivery and production. This group found that the logistical model of bio-hubs works better for smaller players as the larger corporations have already established effective feedstock procurement supply chains, but that smaller enterprises may find it challenging to get financing for projects, which requires a secure biomass supply. They also found that a bio-hub in Southern Ontario could optimize the use of logs and residues from deciduous forests, facilitate coordination with the agricultural sector and address certain structural issues currently faced by the industry.

A second group spoke to the idea of municipal bio-hubs, giving northern Toronto as an example of being able to divert landfill waste to fuel bioenergy. The third group focused on the concept of value - how bio-hubs would need to demonstrate what they could bring to the region (i.e., jobs, ownership and partnership opportunities) and the value of people of the region wanting to take a holistic advantage of the land, building trust and common goals

around project development principles. On the demand side, this group explained the need for standardizing and creating higher-value products. It was also mentioned by groups that Ontario already has some examples of bio-hubs within the province, with established wood supply chains in vertically integrated companies and merchandizing yards. In Quebec, a bio-hub is in development for forestry and agricultural activities, including current production of biochar, and that there have been discussions on the creation of an eco-industrial park.

EASTERN CANADA

There was one group that reported on Eastern Canada, noted that there were differences in what bio-hubs could look like in Nova Scotia and New Brunswick. In Nova Scotia, bio-hubs exist in some capacity already, but would need better integration of the forest and agricultural sectors' feedstock supply and a larger market pull to create demand for bioproducts that would made out of the feedstock provided by bio-hubs. The identification of synergies among actors in the supply chain of bioproducts could be leveraged for the development of bio-hubs, which could themselves be part of an eco-industrial park. This model could provide flexibility of distribution as well as holistic forest management practices that allow for the supply of high-quality feedstock, in turn increasing confidence in the marketplace.

In New Brunswick, participants noted that the forest sector is largely influenced by one large corporation, which is already vertically integrated and has little motivation to work with other actors to establish bio-hubs. In the agricultural sector, the potential is also limited due to a lack of coordination and organization between producers to manage the residue piles required to create bio-hubs in the province.

Participants from all regions had robust discussions that covered some of the opportunities and challenges of bio-hubs as well as the value they could create in regions across Canada. While each region has distinct characteristics, all areas of the country appeared to face some of the same opportunities and challenges. This is further explored in the next section where participants completed a more in-depth analysis of potential and existing bio-hubs in Canada.

SWOT analysis

The workshop then shifted to completing a strength, weakness, opportunities and threats (SWOT) analysis for existing or potential bio-hubs in Canada. Participants were asked to form new groups for this activity, with a mix of regions and industries providing a diverse perspective of potential SWOT inputs. Participants spent time discussing the strengths of bio-hubs in Canada in each group and curated a list to be put into a live voting platform, Slido. Participants then individually used the tool to "upvote" up to five inputs they found most important. This process was repeated for weaknesses, opportunities and threats. Inputs presented in this report have been edited to reflect clarity and plenary discussions. Raw, unedited inputs are available in Appendix C.

STRENGTHS

Participants listed the strengths of existing and potential bio-hubs in Canada, considering what Canada does well, what unique resources the country can draw on and what others may see as strengths. Figure 1 below shows the top voted strengths identified through small group discussion and the total number of individual upvotes the ideas received from individual participants in the plenary voting exercise.

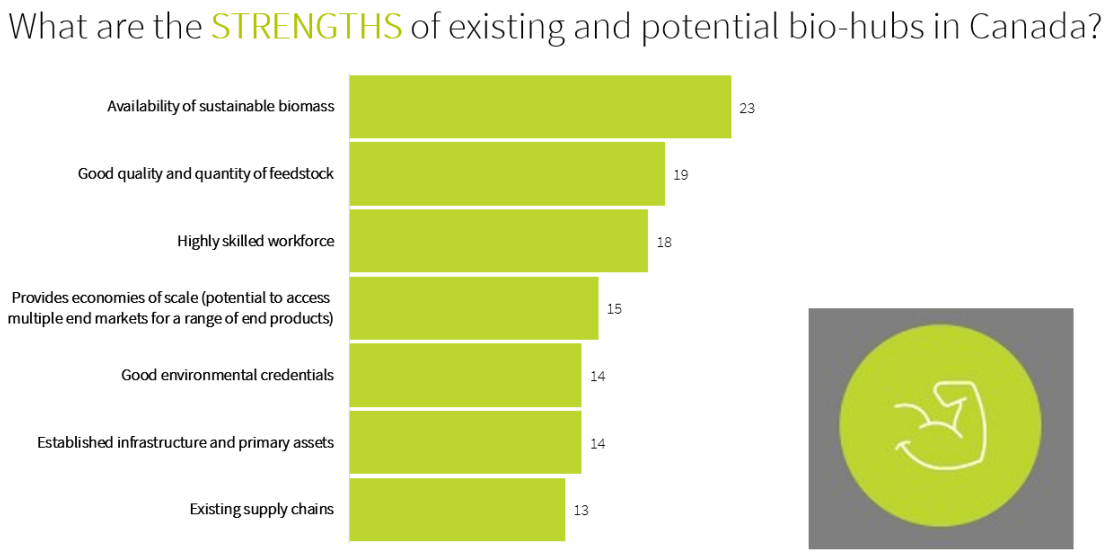

Figure 1: Top voted strengths of existing and potential bio-hubs in Canada

The quality and quantity of available biomass, the sustainable management practices of both the agricultural and forest sectors as well as the already established supply chains and infrastructure, as well as the reputation of being environmentally responsible were highlighted as Canada's greatest strengths for potential and existing bio-hubs, and would allow for realizing growth in the Canadian bioeconomy. It was also suggested that economies of scale result from storing and conditioning biomass from various sources at a central location, with the bio-hub offering multiple products for further processing or end-uses.

Participants discussed the ability of utilizing Canada's highly skilled workforce in the establishment of bio-hubs as a strength; however, other participants noted that though there are many highly qualified workers, Canada may be lacking in the expertise to coordinate the development of bio-hubs. Others expressed concern about what incentives the owners and

operators of bio-hubs could offer to these workers and experts to incentivize them to relocate to potentially remote locations, where bio-hubs may be developed. In addition to these plenary discussions, it was also noted that bringing together smaller players in this space and helping to reduce barriers to access infrastructure and capital markets can be considered a key strength of the Canadian potential for bio-hubs.

WEAKNESSES

Another round of discussion had participants identifying the weaknesses of bio-hubs in Canada, considering what could be improved, where regions or actors have fewer resources (e.g., data, funding, expertise, etc.) than others and what others may see as Canada's weakness. Figure 2 below provides a summary of the top upvoted responses captured in Slido during the plenary voting exercise.

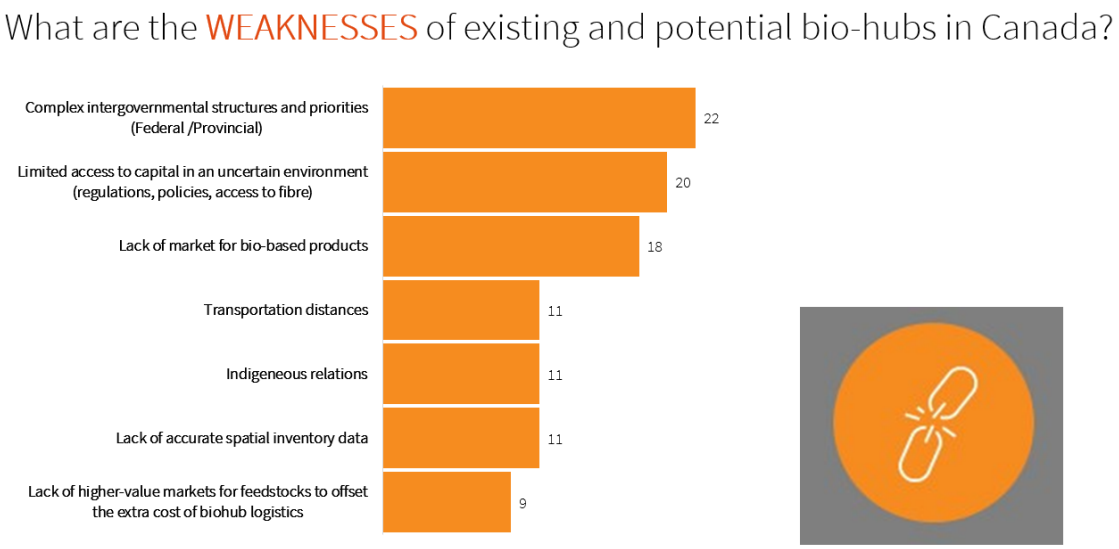

Figure 2: Top voted weaknesses of existing and potential bio-hubs in Canada

Bio-hubs represent a new supply chain model that could prove difficult to implement in a complex intergovernmental structure with diverging priorities of different levels of governments (federal, provincial/territorial, municipal, Indigenous) ill-equipped to adapt to changes. This was the highest rated weakness of bio-hubs in Canada, noting the cumbersome regulatory environment and governance structure in Canada and their implication for the bioeconomy writ-large. The plenary discussion centered on one particular weakness – that related to the internal challenge of having limited access to capital. Participants identified a range of factors that contribute to this weakness, including limited access to fibre, lack of policy to incent recovery of added forest residues and lack of market drivers for bio-based products. These factors reduce access to capital markets, and in turn this negatively impacts both the willingness of established companies to adopt a new business model and the capacity for smaller or newer players to enter the bioeconomy.

Other notable weaknesses identified in the discussion included differing and competing needs of various businesses dealing with potential bio-hubs, inter-provincial barriers to trade, dispersed biomass supply and harvest operations, and the focus of industry on traditional commodities. The costs of transportation, namely associated with the dispersed nature of the

biomass, the limited transportation options in several regions, as well as handling costs were also considered weaknesses of bio-hubs in Canada specifically.

OPPORTUNITIES

In the third round of discussions, participants identified what opportunities are open to Canadians, considering how strengths could be turned into opportunities (externally focused) and what trends that could be taken advantage of. Figure 3 displays the top upvoted opportunities identified by participants.

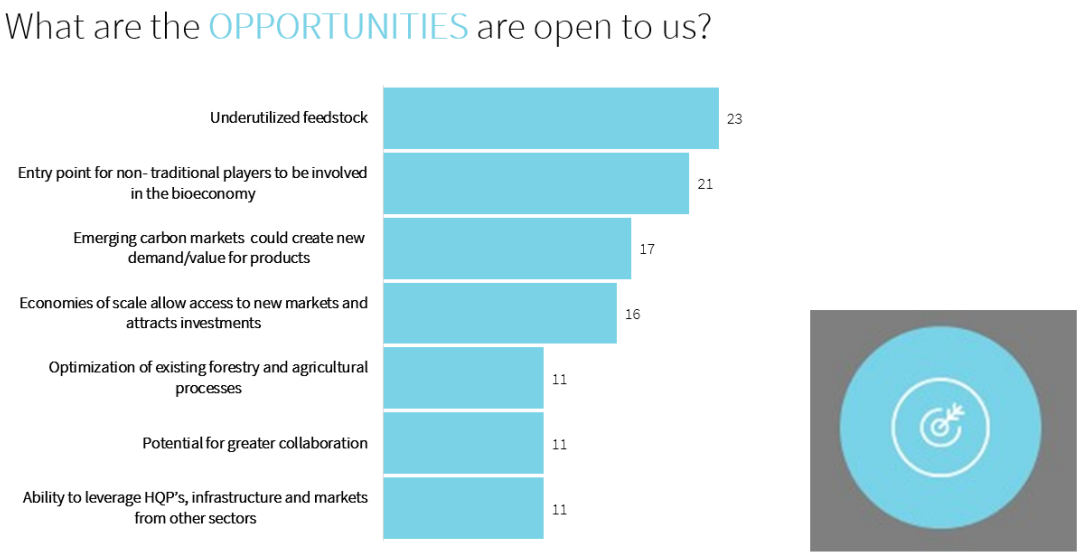

Figure 3: Top voted opportunities of existing and potential bio-hubs in Canada

Participants identified several opportunities for Canada to enhance the national bioeconomy and use biomass in various ways. The majority of participants highlighted that Canada frequently underutilizes its agricultural and forest feedstocks, which could be used across markets for many different purposes, many of which are increasing in demand, including packaging paper or alternatives to single use plastics or fossil-based chemicals. Bio-hubs could also serve as an entry point to the emerging bioeconomy for innovative players that have developed new conversion technologies, but have little knowledge of biomass supply chains and have difficulties securing feedstock.

The amount of available biomass could be increased through improved forestry and agricultural practices. Once a bio-hub is established around a critical mass of suppliers and clients in a region, it would become easier to attract additional investments through economies of scale and access new markets with a more diverse offering of biomass types. Participants also addressed the growing demand for renewable fuels from climate change policies such as carbon pricing and the Clean Fuel Standard. Multiple groups highlighted the opportunity to leverage highly qualified personnel (HQP) and infrastructure from other sectors and increase collaboration for multiple industries to create a robust supply chain for these emerging products and technologies.

THREATS

In the final round of discussion for the SWOT analysis, groups identified threats (externally focused) that could be harmful to Canada's success in implementing bio-hubs. Figure 4 are the inputs from participants into Slido that received the most upvotes for potential threats to successful bio-hubs in Canada.

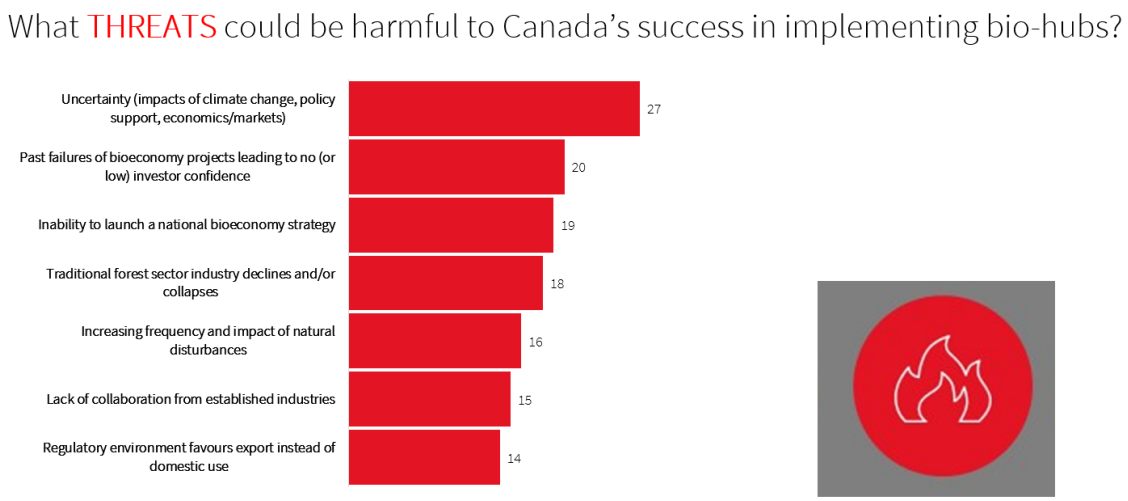

Figure 4: Top voted threats of existing and potential bio-hubs in Canada

Participants explored a range of external factors that may generate an uncertainty that could impede successful implementation of bio-hubs in Canada. External challenges such as those associated with the impacts of climate change, access to market and lack of policy support, were identified by participants throughout the dialogue. Participants also discussed how past failures of emerging biotechnologies or bioeconomy projects, and the various issues surrounding the business case of bio-hubs disincentivizes potential investors from channeling funds to companies trying to enter the market. Many participants found the lack of a national bioeconomy strategy from the federal government was also a threat, and that the need for a collective vision/mission of a bioeconomy was essential to ensuring a focus of those working to implement bio-hubs and other pieces of a bioeconomy in Canada.

Collaboration with established industries could also be challenging, either because they see bio-hubs as competitors for feedstock or because structural decline for some forest products prevents them from adding bio-hubs services to existing facilities. Climate change and the resulting impacts (e.g., forest fires, flooding) were also recognized as a serious threat to a successful implementation of bio-hubs, threatening the availability of enough biomass to create a stable and valuable offer of products.

The SWOT analysis provided an opportunity for cross-sectoral and cross-regional discussion and a forum for understanding issues and assets within the Canadian bioeconomy. The conversation explored those strengths that need to be better leveraged, while acknowledging those threats that need to be mitigated to implement bio-hubs in Canada. The small group discussions combined with the plenary voting experience using Slido allowed each participant to voice their unique opinions as well as contribute collectively to identifying those issues that are most important. A full list of the ideas shared by all groups throughout this exercise are available in Appendix C.

Realizing the potential of bio-hubs in Canada

After completing the SWOT analysis, participants were asked to brainstorm the possible actions required to build on strengths, minimize weaknesses, seize opportunities and mitigate threats based on the top five ideas identified during the SWOT analysis (Figure 5).

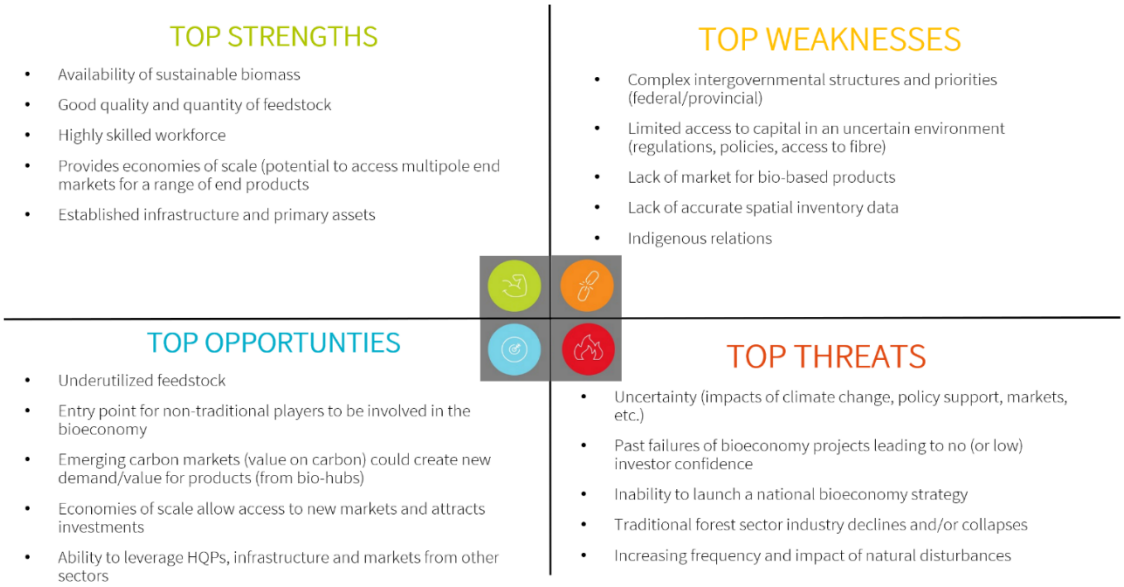

Figure 5: Top SWOT ideas from completed analysis

Participants were asked to choose a new discussion group, based on themes that emerged during the SWOT discussions and identify possible actions that could be advanced, within the respective themes listed below:

1. Policy, regulations, framework and strategy
2. Data, knowledge, information sharing
3. Infrastructure (including transportation) *
4. Skills, workforce and expertise *
5. Investment, financing, attracting capital
6. Product, market development (innovation and technology)
7. Feedstock
8. Partnership and collaboration, relationship building and integrating with existing industry

Table notetakers were asked to input actions identified by their group into Slido, one group at a time to create a list of unique possible actions that could be taken to successfully implement bio-hubs in Canada. After the list was created live on the screen, participants were invited to upvote their top five choices. The most popular actions, as voted by participants, are displayed below (Figure 6) and the full list is available in Appendix C.

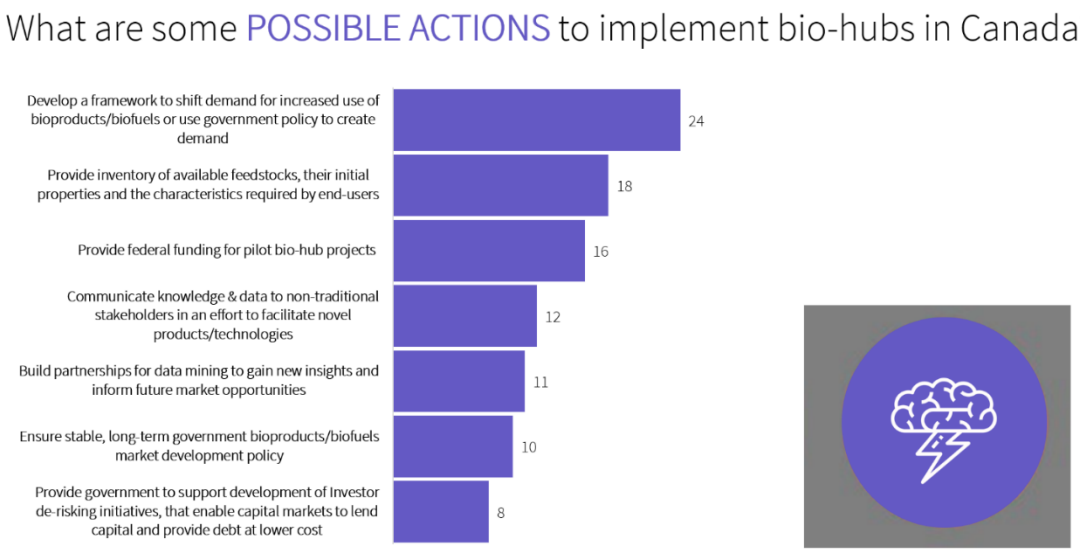

Figure 6: Top possible actions upvoted from table discussions

The plenary discussion that followed the identification of possible actions was interesting as many tables discussed similar issues through the lens of their theme. For example, multiple tables identified that one of the highest priorities for promoting bio-hubs in Canada would be to incentivize the use of bioproducts and biofuels, therefore increasing demand from consumers and other users. One table gave the example of the Clean Fuel Standard, which they explained will create demand for low carbon fuels, including biofuels, because it is legislating fossil fuel producers or suppliers to invest either in upstream GHG reduction projects or procure biofuels. Another table focused on financial programs and policies to incentivize the use of biofuels and products, including capping the feedstock price to facilitate investment. A third table focused on regulations that prioritize the procurement of renewable energy or bioproducts, for example the ban of single-use plastics, which could spur demand.

Almost all small groups also identified the need for cooperation and collaboration among partners, including all levels of government, to successfully implement bio-hubs in Canada. One table suggested that the federal government could facilitate linkages through the supply chain and serve as a “match-maker”. A second table also identified the need for collaboration and partnerships for sharing large data sets, gaining insights to inform operations; they also stressed that it is important to get the right actors together, providing coordination services to drive administration of the bio-hub system. One group suggested that the federal government continue to engage with stakeholders and encourage conversation between industry, academics and governments to leverage networks and knowledge. This group also highlighted the need for greater cooperation between different levels of government in order to bolster confidence with investors and harmonize policies and regulations.

A couple of tables also highlighted the importance of taking existing inventories of bioresources and creating a detailed inventory of available biomass supply. Others identified that funding pilot projects in different regions would be helpful in establishing a solid business case for bio-hubs. One of the tables identified that the database could be used to disseminate available biomass information (types, annual quantities, characteristics, etc.), while another highlighted the importance of understanding feedstock, including varying properties that would be required for end-users. A federally funded pilot project would be

useful to assess the feasibility of bio-hubs and could use existing infrastructure (e.g., a sawmill) and/or provide an upgraded feedstock to existing industrial facilities (e.g., an oil refinery) to assess how bio-hubs can help secure the required feedstock for biofuels or bioproducts production. The pilots could be used to demonstrate to investors that bio-hubs are an economically viable venture.

Participants also identified some practical considerations that would need to be addressed. For example, creating contracts that address the volume, quantity and cost of biomass need to be considered and agreed upon. Additionally, engagements must be held with key stakeholders, including Indigenous communities, prior to the development and implementation of a bio-hub project. Continued partnership and collaboration with stakeholders, with the potential for engaging new stakeholders such as agricultural cooperatives or biotechnology developers, would also be imperative to creating a successful supply chain and satisfied consumers of the feedstocks offered by bio-hubs. Participants also acknowledged that support from the government would enable the successful implementation of bio-hubs, through policy, regulatory, strategic and financial supports. This is especially true for forest-based feedstock, given the role provincial governments play in allocating harvesting rights on Crown land and ensuring the sustainable management of the resource.

Conclusion and next steps

This workshop provided an opportunity to gather academic, industry and non-profit leaders together to share insights and experiences relating to Canada's current biomass landscape, while also providing a platform to discuss potential bio-hub development in regions across the country. The presentations at the beginning of the workshop provided broad and diverse perspective on bio-hubs, setting the stage for meaningful discussions on how bio-hubs could be implemented effectively in Canada. Participants were eager to learn more about bio-hubs, with questions still remaining around the concept, how they could be established and what unique considerations would apply to bio-hubs across regions and sectors in Canada. Disseminating existing knowledge on the topic and documenting Canadian case studies was proposed as ways to continue to improve the understanding of stakeholders.

The regional discussions provided a helpful context to explore the realities facing different Canadian regions, understanding the opportunities and challenges bio-hubs could encounter in various regions, as well as the learning about the potential value bio-hub projects could bring to specific regions. Groups from Ontario and Quebec discussed the option of using waste intended for landfills for bioenergy, the effects innovative technology could have on the implementation of bio-hubs, and examined lessons learned from both established and developing bio-hubs in their region. Groups representing Western Canada explored how bio-hub services could be provided by upgrading existing infrastructure, and the merits of separating agricultural and forestry bio-hubs to meet the unique needs of the region. The group from Eastern Canada also explored the value of bio-hub projects in the region for the pulp and paper industry and the need to better integrate the agricultural and forestry biomass and create a larger market pool to successfully implement additional bio-hub projects.

The SWOT analysis provided an opportunity to highlight Canada's strengths in implementing bio-hub projects, as well as those impediments that could weaken Canada's ability to implement projects successfully. Participants identified the availability and high quality of biomass as one of Canada's greatest strengths. They also identified that economies of scale resulting from storing and conditioning biomass at a central location, a strength of bio-hubs in general, as another of Canada's greatest strengths. Participants highlighted the difficulties of establishing a new model into complex intergovernmental structures and diverging priorities, and limited access to capital, as Canada's top weaknesses. Participants also explored the external opportunities and potential threats to Canadian bio-hub projects, identifying the biggest opportunities as first Canada's underutilized feedstock, and second as the entry point they offer to non-traditional actors to participate in the bioeconomy. According to participants, the greatest threats to successful bio-hubs in Canada include the uncertainty of the impacts of climate change and economic markets and low investor confidence, while also highlighting the need for implementing a national bioeconomy strategy.

Building on the results of the SWOT analysis, participants provided input on a range of possible actions that could be put into place to realize the potential of bio-hubs in Canada. Through their identification of possible actions, workshop participants encouraged the government to continue their engagement with stakeholders as successful bio-hub development depends heavily on cooperation between all levels of government, industry, academia and non-profit organizations. Participants emphasized that continued consultation and cooperation with stakeholders and partners would aid in building confidence in the development of bio-hubs, but also the bioeconomy writ large. Collaboration between the different levels of government to harmonize policies, regulations and frameworks was also

raised as an important factor to accelerate the development bio-hubs. Participants finally urged the federal government to develop an investment environment that incentivizes investment in biofuel and bioproduct facilities, which in turn could help bio-hubs secure long-term commitments from clients.

In light of what was heard at the workshop and the interest expressed by participants in novel approaches for biomass supply, Natural Resources Canada will over the next 18 months:

- Provide the results of the SWOT analysis to other team members of the IEA Bioenergy Effective Deployment of Bio-hubs project, to inform case studies planned for 2020-2021.
- Share reports and other resources from IEA Bioenergy on bio-hubs with workshop participants and interested parties in Canada.
- Seek to document and disseminate Canadian bio-hubs case studies, in collaboration with partners from industry, government, communities and academia.
- Investigate opportunities to support bio-hub pilot or demonstration projects across the country.

Leveraging the strengths Canada possesses could allow for Canadian leadership in the global bioeconomy. Independent of the measures taken to support bio-hubs, the success of bio-hubs depends on their ability to demonstrate their value as reliable suppliers of quality feedstocks that are adapted to the needs of producers of new value-added bioproducts or bioenergy.

Appendices

Appendix 1 – Participant agenda

Natural Resources Canada | Ressources naturelles Canada

IEA Bioenergy

Bio-hubs as keys to successful biomass supply for the bioeconomy

Joint IEA Bioenergy Task 43 & Natural Resources Canada Workshop

Sir William Logan Building, 580 Booth, Ottawa ON

6 March 2020

IEA Bioenergy Task 43: Sustainable Biomass Supply Integration for Bioenergy Within the Broader Bioeconomy has launched an initiative to identify successful examples of biomass logistic and distribution points for bioenergy and the bioeconomy. The goal of this initiative is to explore integrated bioeconomy supply chains to develop solutions for the reliable production and supply of high-quality biomass for energy. These examples are also meant to serve as sources of inspiration that other biomass producers can use to enhance their own activities as well as for policy makers to familiarize themselves with the bio-hub concept.

This event takes us a step forward towards new biomass supply chains within the broader bioeconomy. The innovative examples selected for this workshop show how biomass can be produced together with wood products and food in sustainably managed landscapes.

The aim of the workshop is to inform the successful establishment of bio-hubs in support of the Canadian bioeconomy. Following the presentation of existing bio-hubs, the relevance of the bio-hub concept for Canadian regions will be investigated. The analysis of strengths, weaknesses, opportunities and threats (SWOT analysis) of existing or potential projects will also be performed by participants. The workshop will have a dynamic format, consisting of exchanges around showcase presentations and work in groups. The results of the workshop will feed into the development of a framework for bio-hubs, which will then be further applied and tested as part of following IEA Bioenergy activities.

Natural Resources Canada and the **IEA Bioenergy** foresee that the gathered knowledge and shared experience at the workshop will contribute to the improvement of sustainable biomass mobilisation for energy purposes, namely in Canada and in other member countries of the IEA Bioenergy Technology Collaboration Program.

8:00 – 8:30	Registration and welcome
8:30 – 8:50	• Opening remarks and program for the day • Overview of IEA Bioenergy Task 43 • Overview of the BioDesign consortium
8:50 – 11:00 (including break)	**What are bio-hubs? Introduction of bio-hub concept and presentation of selected case studies**
	• *Introduction to Bio-hubs and Nordic Examples* (Kalvis Kons, Swedish University of Agricultural Sciences) • *Building a Biomass Supply Chain Using Agricultural Residues* (Sandy Marshall, Bioindustrial Innovation Canada) • *Gitxsan Bioeconomy Strategy* (Kelsey Harmse, Gitxsan Development Corporation) • *Biorefining - Today's Reality and Tomorrow's Potential* (Doug Berven, POET) • *Role of Bio-hubs in De-risking Biomass Supply Chains* (Jordan Solomon, EcoStrat)
11:00 – 12:00	**What could Canadian bio-hubs look like? Regional / sectoral discussions**
	• Work in regional/sector groups to explore what Canadian bio-hub projects could look like in different settings • Report back in plenary and plenary discussion
12:00 – 13:00	Lunch (provided)
13:00 – 15:00	**Can bio-hubs be implemented in Canada? SWOT analysis**
	• Identification of strengths, weaknesses, opportunities and threats for Canadian bio-hubs as enablers for the emerging bioeconomy
15:00 – 15:15	Health Break
15:15 – 16:15	**Realizing the potential of bio-hubs in Canada**
	• Work in groups on the possible measures and actions required to: build on strengths, minimize weaknesses, seize opportunities and mitigate threats • Report back in plenary and plenary discussion
16:15 – 16:30	• Closing remarks

IEA Bioenergy

SUSTAINABLE BIOMASS SUPPLY INTEGRATION FOR BIOENERGY WITHIN THE BROADER BIOECONOMY

Appendix 2 – Participant list

First Name	Last Name	Organization
Ahmed	Koubaa	Université du Québec en Abitibi-Témiscamingue
Allan	Eddy	Port Hawkesbury Paper
Amar	Mohanty	University of Guelph
Amit	Kumar	University of Alberta
André	Denis	Gouvernement du Québec
Andrew	Klain	NRCan – Canadian Forest Service
Anne-Hélène	Mathey	NRCan – Canadian Forest Service
Annie	St-Onge	Groupe Remabec
Bruno	Gagnon	NRCan – Canadian Forest Service
Christa	Abou Zeid	NRCan – Office of Energy Efficiency
Claudia	Goulet	Combustion Expert
Cyriac	Mvolo	NRCan – Canadian Forest Service
Daniel	Brown	NRCan – Canadian Forest Service
Dany J.	Chilton	Conseil de la Nation Atikamekw

First Name	Last Name	Organization
David	Bressler	University of Alberta
Derek	Sidders	NRCan – Canadian Forest Service
Devin	O'Grady	NRCan – Office of Energy Efficiency
Diane	Nicholls	BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development
Évelyne	Thiffault	ULaval
Farid	Bensebaa	National Research Council
Flavia	Braghiroli	Centre Technologique des résidus Industriels
Greg	Rampley	NRCan – Canadian Forest Service
Jamie	Stephen	Torchlight
Jean-François	Levasseur	NRCan – Canadian Forest Service
Jean-Philippe	Jacques	Innofibre
Jennifer	O'Donnell	Bio NB
Jennifer	Tuthill	NRCan – Canadian Forest Service
Jennifer	Logan	CIC Engineering
Jordan	Solomon	Ecostrat

First Name	Last Name	Organization
Kalvis	Kons	Swedish University of Agricultural Sciences
Kate	Bigney	Agriculture an Agri-Food Canada
Kelsey	Harmse	Gitxan Energy Inc
Kendal	Bradburn	Renewed Energies Consulting Inc.
Laird	Van Damme	CRIBE
Luc	Desrochers	FPInnovations
Mahmood	Ebadian	University of British Columbia
Maria	Wellisch	Agriculture and Agri-Food Canada
Martin-Claude	Yemele	Société de développement de la Baie-James
Marzouk	Benali	NRCan – CanmetENERGY
Mathieu	Fortin	NRCan – Canadian Forest Service
Meggin	Messenger	BC Ministry of Forests, Lands, natural Resource Operations and Rural Development
Mike	Gravel	Government of Northwest Territories
Mike	Rutter	Biothermic
Murray	McLaughlin	BioDesign

First Name	Last Name	Organization
Nancy	Kingsbury	NRCan – Canadian Forest Service
Pascale	Lagacé	Resolute Forest Products
Robert	Larocque	The Forest Products Association of Canada
Rod	Badcock	Nova Scotia Innovation Hub
Sandy	Marshall	BioIndustrial Innovation Canada
Scott	Miller	Ontario Ministry of Natural Resources and Forestry
Sebnem	Madrali	NRCan – CanmetENERGY
Sevrenne	Sheppard	NRCan – Canadian Forest Service
Terrence	Sauvé	Ontario Ministry of Agriculture, Food and Rural Affairs
Trevor	Longpre	NRCan – Canadian Forest Service
Warren	Mabee	Queen's University
Barb	Sweazey	Stratos Inc. (Facilitator)
Samantha	Nasso	Stratos Inc. (Notetaker)

Appendix 3 – Complete Slido inputs

Strengths

Idea text	Upvotes
Availability of sustainable biomass	23
Good quality and quantity of feedstock	19
Highly skilled workforce	18
Provides economies of scope (potential to access multiple end markets, multiple end products)	15
Established infrastructure and primary assets	14
Good environmental credentials	14
Existing supply chains	13
Very diverse wood fibre supply	7
Provide a shared infrastructure and reduced costs	5
Knowledge economy/science-based policy	4
Serve as a buffer and be used for inventory control	4
Crown land vs private land	4
Linkages with regulatory requirements	2
But awareness is rapidly changing, and We believe we are on the edge of a fundamental reshaping of finance. In this context, the will of Canada is there.	1

Weaknesses

Idea text	Upvotes
Complex intergovernmental structures and priorities (Fed/Prov)	22
Uncertainty (regulatory, policy, access to fibre)	20
Lack of Market	18
Lack of accurate spatial inventory data	11
Indigenous relations	11
Transportation distances	11
Lack of defined markets does not offset the extra cost of bio-hub logistics	9
Lack of a standardized way for capital markets to quantify (or rate) value-add of bio hub	8
Lack of access to transportation infrastructure	8
Consumer behaviour is hard to change	8
Price of energy in Canada/cheap energy/price on carbon	8
Large spaces, small markets	7
Resistance to change (structures, supply chains)	6
85% of Canada is Crown Land	6
Attracting investment	5
Added cost to feedstock of bio hub	3
Lack of business case for collection / harvest of residues	2
Lack of diversity: producers, commodities, industrial sites.	2
Provincial variations in needs/available resources	1

Opportunities

Idea text	Upvotes
Underutilized feedstock	23
Provides opportunities for non- traditional players (chemical, architecture, etc.) to be involved in the bioeconomy	21
Emerging carbon markets (value on carbon) could create new demand/value for products	17
Economies of scale creates new markets -> attracts investments	16
Ability to leverage HQP's, infrastructure and markets from other sectors.	11
Potential for greater collaboration	11
Optimization of existing forestry and agricultural processes!	11
Leverage the new generation of younger, greener consumers	8
Never ever ending supply	7
Improving access to information	7
Leveraging our connection to Europe to shift consumer behaviour	6
Work with natural disturbances to create fibre disturbance opportunities	6
Developing biomass Feedstock Risk Ratings based on BSCR Standards to communicate the value of bio-hubs to capital markets	5
Open for partnership with international technology developers	5
Drive market opportunities to Canada by creating an internet-based information platform that showed information such as where excess fiber exists, location of infrastructure such as transportation.	4
Starting from ground zero and potential to have something new	3

Threats

Idea text	Upvotes
Uncertainty (impacts of climate change, policy support, economics/markets)	27
Past failures (tech risk, poor business case) = no (or low) investor confidence.	20
Failure to launch a national bioeconomy strategy	19
Traditional forest sector industry declines and/or collapses	18
Increasing frequency and impact of natural disturbances.	16
Lack of collaboration from established industries	15
Regulatory environment favours export instead of domestic use	14
Lack of early engagement and involvement with First Nations	13
Trump and international tariffs	11
Focus on short term problem-solving	9
Cheap energy costs combined with stalled carbon markets/policy.	9
Public confidence in our environmental credentials for bio-based products	6
Lack of government support to de-risk biomass supply chains for investors	5
Political instability	4
Trucks and rail cars coming back empty to bio-hubs.	2
Difficulty dealing with rail companies	2
Monopolization of Markets	1
Size of Canada (geographically large, population small)	1
Lobbying Groups	0

Possible Actions

Idea text	Upvotes
Framework to shift demand for bioproducts/biofuels or use government policy to create demand (ex. Clean Fuel Standard incentivizing biofuel production).	24
Inventory of available feedstocks, their initial properties, and the characteristics required by the end-user.	18
Federal funding for pilot projects to assess feasibility	16
Take action to communicate knowledge & data to non-traditional stakeholders in an effort to facilitate novel products/technologies.	12
Build partnerships for data mining to gain new insights and inform future market opportunities.	11
Stable, long-term government market development policy	10
Government to support development of Investor de-risking initiatives, such as Feedstock Risk Ratings, that enable capital markets to lend capital and provide debt at lower cost.	8
Focus support on existing bio-hubs (pick winners), which leverages the existing assets and anchor companies	7
Provide support (or implement) universal internet access to facilitate improved data capture & sharing (to improve resource utilization and optimize value chains).	6
Implement ongoing monitoring and reporting of indicators of sustainability (related to land use practices) to support environmental reputation/credentials.	6
Broker dialogue between players: clarify expectations and objectives, involving end users	6
Finance business case studies	5
Provide investments to de-risk pilot projects	4
Investment to de-risk feedstock supply; increase the credit worthiness of that supply	2

IEA Bioenergy

Technology Collaboration Programme