California Woody Feedstock

Insurance Playbook

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Woody Feedstock Insurance Playbook

Introduction and Context

In support of California's Wildfire and Forest Resilience Action Plan, as well as the state's Woody Biomass Industry Development Framework, the Governor's Office of Planning and Research (OPR) is working to unlock key barriers to developing long-term woody feedstock contracts. For purposes of this Playbook, "woody" is defined as forest-sourced material and does not include agriculture or urban wood waste.

California's Wildfire and Forest Resilience Action Plan, released in January 2021, is a comprehensive strategy of the Governor's Forest Management Task Force. The plan includes several actions, including: developing a framework for the state's wood utilization policies and priorities, supporting new long-term wood feedstock pilot projects, spurring innovation in the wood sector, developing a focused market strategy, and completing a statewide wood products workforce assessment.[1]

To support OPR's goals, this Woody Feedstock Insurance Playbook ("Playbook") was developed by insurance industry experts[2] to provide an understanding of:

- The woody biomass/feedstock value chain and its actors;
- Current insurance coverage, gaps and risks, and insurance needs of actors in the woody feedstock value chain; and
- Existing and potential market and policy solutions to address insurance gaps and risks.

The Playbook is intended for use by OPR's California Forest Residual Aggregation for Market Enhancement (CAL FRAME) pilot projects and the Joint Powers Authorities (JPAs) that are formed from these.

It will help identify insurance options to support long-term woody feedstock contracts. It will also support the advancement of California's climate change, economic development, forest management, and wildfire priorities.

Context

In recent years, the insurance industry has faced challenges related to shifting macroeconomic conditions and the increased frequency and severity of climate change related events, such as wildfires, storms, floods, and drought. As a result, the availability of insurance coverage and the limits offered have been constrained and, in many cases, required higher insurance policy premiums.

California's forests cover almost one-third of the state and provide important ecosystem services including water capture and filtration, wildlife habitat, recreation opportunities, and timber products. Climate change is contributing to the increased frequency and severity of wildfires, which cause deaths, injuries, and property damage, as well as having a negative effect on adaptive energy programs by reducing or interfering with the supply of woody feedstock. California's Fourth Climate Change Assessment[3] wildfire model suggests a 77% increase in mean area and up to a 178% increase in maximum area burned by wildfires (compared to 1961-1990) by 2050. By the end of the century, if

[1] The budget is from Assembly Bill 179, fiscal year 2022-2023, and this project is part of goal 3 "Create Sustainable Wood Forest Product" section 3.10.
[2] In contract from Fall-2023-March 2024. WTW, a global insurance leader, in partnership with The Nature Conservancy (TNC), a leading conservation organization with deep expertise in forest resilience in California working at the intersection with insurance, and Dave Jones, former California Insurance Commissioner
[3] These are conducted every five years. The Fifth Climate Change assessment is currently underway as of February 2024, but the Fourth is the latest available for quotation.

greenhouse gas emissions continue to rise, the number of extreme wildfires burning over or about 25,000 acres is projected to increase by nearly 50%.

Between 2017 – 2021, estimated average annual economic losses due to wildfire in the state of California totaled over $117.4 billion.[1] While it is not possible to quantify the economic losses specific to stakeholders in the woody feedstock value chain, they can be significant. Severe supply constraints will negatively impact the sale and production of bioenergy. Limited quantities of woody feedstock drive input prices higher, and increased risk pushes up the cost of financing bioenergy production facilities.

As noted by the fifth National Climate Assessment, climate change is leading to larger and more severe wildfires in the western United States, bringing acute and chronic impacts both near and far from the flames. These wildfires have significant public health, socioeconomic, and ecological implications for the US.[2]

For woody feedstock value chain stakeholders who directly experience wildfires and resulting losses, or whose work runs the risk of contributing to third party losses, constraints on access to and unaffordability of insurance are potential deterrents to growth and profitability.

All industry stakeholders are negatively impacted by the increasing cost and scarcity of insurance solutions. However, these impacts often have a disproportionately high impact on smaller businesses, which represent a significant proportion of the supply side of the woody feedstock value chain.

Larger companies such as processors and energy producers often require their suppliers to have insurance coverage to reduce risk to their own economic viability and sustainability. Smaller businesses can find themselves with the choice of operating unprofitably, if they purchase needed insurance policies, or losing business and increasing their risk profiles if they do not.

Smaller businesses face several constraints to managing risks (including access to financing, equipment, skills etc.), increasing efficiency and profitability, and strengthening their creditworthiness, all of which impact their ability to enter into long-term contracts. Addressing the supply and characteristics of insurance products for the woody feedstock industry can support an increase in the consistent and reliable flow of woody feedstock within the woody feedstock value chain.

This Playbook focuses on the role played by insurance regarding risk mitigation and risk transfer and the opportunities to support the woody feedstock value chain through insurance solutions. Insurance solutions are presented as a mechanism to support greater use of long-term contracts which can provide stability to value chain stakeholders and make it easier to obtain needed credit and investment.

[1] Source: "The economic, fiscal, and environmental costs of wildfires in California", George & Betty Moore Foundation https://www.moore.org/article-detail?newsUrlName=the-economic-fiscal-and-environmental-costs-of-wildfires-in-california

[2] Source: Ostoja, S.M., A.R. Crimmins, R.G. Byron, A.E. East, M. Méndez, S.M. O'Neill, D.L. Peterson, J.R. Pierce, C. Raymond, A. Tripati, and A. Vaidyanathan, 2023: Focus on western wildfires In: *Fifth National Climate Assessment*. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. https://doi.org/10.7930/NCA5.2023.F2

The CA Woody Feedstock Market Value Chain and its Actors

California's woody feedstock value chain provides employment and income across a wide range of private and public entities, including:

1. Biofuels Producers
2. Biomass electric power generation
3. Forest landowner/management
4. Forest products trucking
5. Forestry machine and equipment rental or leasing
6. Forestry services (including thinning, mastication, chipping)
7. Public Entities with Vegetation Management
8. Sawmills
9. Wildfire Mitigation and Defensible Space services

The Woody Feedstock Value Chain

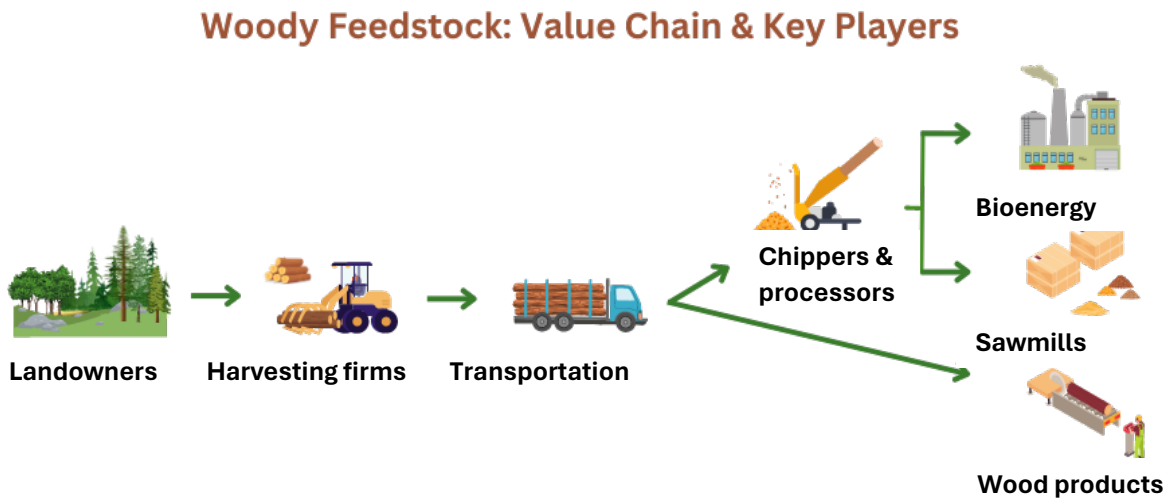
Woody feedstock value chains in California comprise multiple stakeholders. Graphic 1 below spans the full range of potential stakeholders including:

- **Landowners**, which may be private individuals, firms, NGOs, or public sector entities (Federal or State organizations responsible for land management and land use). Private landowners can enter into long-term contracts, but they are likely to have limited insight into (or resources to support) other value chain actors.
- **Harvesting firms**, which collect woody material from designated sites, effectively turning potential wood waste and wildfire risk into lumber, fuel, or other products. These firms may be small contractors, or larger project developers depending on the geographic area, local economic infrastructure, and other factors.
- **Transportation,** a key intermediation function, involves moving woody material from a collection site to a location where these materials can be transformed into lumber, biomass energy or biofuel and other wood products. A small harvester may rely on contracted trucking and transport services to deliver product to a client further along in the value chain, whereas a project developer may find it makes economic sense to integrate transportation services into its business model.
- **Chippers and processors**, which transform logs, branches and forest debris into a uniform biomass product that can serve as fuel for bioenergy production or inputs into other wood products. These services may be offered by small businesses, as part of a project developer's business model, or even as part of the bioenergy producer's business operations. Quality control over factors such as moisture, product volume and others are a critical element with respect to the efficiency of the bioenergy generation process.
- **End markets**, composed of producers that receive and utilize processed materials, converting them into wood products or energy or biofuels for resale to end-users. The most common end markets in California are **sawmills** and **bioenergy producers**[1]. Bioenergy producers might sell energy to a utility or industrial consumer or operate as a public utility that integrates bioenergy into their overall energy mix, reducing reliance on fossil fuels. Biofuels, biochar and building

[1] Biomass accounts for 8% of the renewable energy produced in the State of California and 2.8% of the total energy produced in state. Clean energy, of which biomass is a part, provides employment for more than 530,700 people across a diverse range of activities from fuel production to energy efficiency deployment. There are 23 biomass energy production plants in 17 counties in California. https://www.valleyvision.org/wp-content/uploads/Forest-Sector-Workforce-Study-Final-Report-1.pdf

materials, such as cross-laminated timber, are examples of **emerging wood products** that may use woody feedstock resulting from forest treatment projects.

Graphic 1: Key Players in the Woody Feedstock Value Chain



Source: Climate Resilience Consulting, 2024

Woody feedstock value chain growth and expansion can offer multiple benefits to the State of California:

- Reducing wildfire risk by removing woody feedstock that, if left in situ, can exacerbate wildfires.
- Increasing the opportunity for prescribed[1] or beneficial fire by reducing the need for pile burning. Helping utilities and energy producers meet renewable energy targets under the California Renewable Portfolio Standard and California Air Resources Board scoping plan.
- Increasing the availability of clean energy fuel sources to enable businesses and other economic actors to move away from fossil fuels, contributing to a reduction in greenhouse gases (GHGs) and improved climate resilience.
- Creating new jobs in a green industry and sustaining the livelihoods of individuals already engaged in the woody feedstock value chain, particularly in rural areas where unemployment and underemployment is higher.
- Reducing the disposal of organic waste in landfills and associated greenhouse gas emissions.

Given the complexity of the woody feedstock value chain, it is difficult to speak to the size and resource base of any specific stakeholder group within it. Nevertheless, the overall economic importance of woody feedstock can be appreciated by considering the importance of sustaining employment in the value chain and the potential for new green job growth.

Table 1[2] below shows long-term forestry job projections for the State of California. It illustrates the diversity of employment opportunities that exist across the value chain in the forestry sector. Jobs in transportation and bioenergy production, for example, are not included here. Not all of these forestry jobs are directly related to woody feedstock, however it demonstrates the complexity of the forestry sector and the potential for job growth.

[1] A controlled or prescribed burn is a fire purposely implemented by land managers for purposes of restoring fire-dependent habitats and reducing the risk of catastrophic wildfire.
2 Forest Sector Workforce Study Report, North State Planning and Development, 2021

Table 1. Long-Term Occupational Projections (2016-2028) in California, 2018

Occupation	Base	Projected	Change	% Change	Avg. Annl. Openings
Conservation Scientists	2,000	2,300	300	15	240
Environmental Science and Protection Technicians, Including Health	3,700	4,100	400	10.8	510
Environmental Scientists and Specialists, Including Health	15,000	16,600	1,600	10.7	1,860
Firefighters	33,800	35,100	1,300	3.8	2,470
First-Line Supervisors of Fire Fighting and Prevention Workers	3,000	3,100	100	3.3	200
Forest and Conservation Technicians	6,800	7,100	300	4.4	860
Forest Conservation Workers	2,800	2,500	-300	-10.7	440
Logging Equipment Operators	1,800	1,700	-100	-5.6	270
Soil and Plant Scientists	3,300	3,800	500	15.2	440
Surveyors	4,600	4,900	300	6.5	370
Woodworkers, All Other	2,500	2,600	100	4	330
Woodworking Machine Setters, Operators, and Tenders, Except Sawing	4,600	4,500	-100	-2.2	620

New jobs in California's forestry sector, which is the sector most closely linked to woody feedstock, are a mix of both public and private sector. Table 2, below, shows that the top ten active forestry employers in California had vacancies for over one thousand jobs as of third quarter 2021[1], demonstrating demand for workers in this sector.

Table 2. California forestry employers with the highest number of job postings. Source: Emsi Q3 2021 Data Set

Top Companies	Unique Postings
The Davey Tree Expert Company	284
US Forest Service	211
Bartlett	178
ACRT Pacific	113
US Department of Agriculture	95
CN Utility Consulting	68
National Park Service	67
Bureau of Land Management	53
Edison International	51
Asplundh Tree Expert Co.	26

Despite its economic value, growth of the woody feedstock value chain has been constrained by a variety of technological, financial, and logistical factors. In a recent survey[2] of woody feedstock value chain stakeholders conducted for this project by The Nature Conservancy (TNC), the most cited concern of industry stakeholders was the financial risks of operating.

1 Ibid.

2 TNC carried out the survey in November and December, 2023. The survey was distributed by California's Office of Planning and Research, Clere, Inc. and Headwaters Environmental. 25 representatives of the woody feedstock value chain responded. The respondents were existing value chain members, not new entrants.

The Importance of Long-term Contracts in the Woody Feedstock Value Chain

Increasing the utilization of woody feedstock by end users requires certainty around the availability of feedstock supply. Where contracts can only be issued annually, uncertainty of land access and supply can inhibit stability of the downstream value chain. For example, if woody feedstock supply companies fail to deliver supply and biomass energy producers cannot generate electricity, then the producers are at risk of losses and penalties under their energy delivery contracts. Feedstock source, processing technologies, transportation costs, and other operational expenses vary significantly within the industry. In all cases, viable long-term contracts[1] rely on multiple types of insurance throughout the contract's duration. They can unlock financing that contributes to industry growth, with insurance being a key element to support long-term contracts. Enabling more long-term contracts to be entered into, by providing insurance solutions, can demonstrate to capital providers with limited knowledge of biomass energy and other conversion[2] technologies that the industry is stable and economically viable.

The establishment of more long-term contracts would also enhance the ability of insurers to distinguish between cost-effective versus less efficient business models and would facilitate the increased use of insurance as a market-building tool. Long-term agreements can also be the basis for supporting stable job markets in rural California. This is particularly important as these areas face relatively higher levels of unemployment or underemployment.

Long-term contracts can also support industry innovation. New technologies like sustainable aviation fuel, hydrogen power, and fuel cell deployment are beginning to take hold in the United States, but for woody feedstock to be a viable source of feedstock for these technologies, more stability in the woody feedstock market needs to be demonstrated. This stability and value could be shown through a robust analysis of the ecosystem value of woody feedstock utilization, not just wildfire mitigation, so that financing and industry participants have confidence to invest in biomass as a feedstock supply for these new technologies.

Insurance is important to enabling long term contracts in the woody feedstock value chain. The current insurance options are explained in the next section.

[1] Public sector landowners are constrained by budget and regulatory processes, which can inhibit long-term contracting. Currently the Forest service cannot commit to a long-term agreement of any sort, which effects value chain stakeholders working on US Forest Service land.

[2] Biomass conversion is a pathway of biomass-based hydrogen production.

CA Woody Feedstock Value Chain Insurance Options and Gaps

Several insurance products are used by companies in the woody feedstock value chain for the purpose of risk transfer. These options are summarized below, along with the challenges identified by stakeholders in the value chain and existing gaps in insurance coverage.

Current Insurance Coverage

Five traditional insurance products are used by woody feedstock value chain participants, although value chain participants report challenges with pricing and for some products, availability: loggers broad form, liability, business interruption, directors and officers, and property insurance.

Auto and workers' compensation insurance (including employee liability) are also available to and used by woody feedstock value chain businesses, but these are broadly available and highly regulated insurance products, and the issue value chain players face with them is not different from other businesses and is limited to their cost.

In terms of current insurance coverage options, Table 3 highlights the products that are used by stakeholders in the woody feedstock value chain, [indicating which are required by statutes and which are optional] with recommended or in some cases required minimum coverage levels.

Generally, the higher the level of coverage, the greater the cost of the product, meaning that larger companies with more exposure will pay more than smaller ones with less exposure. However, the recommended coverage options are often similar or equal regardless of company size, meaning that smaller companies face a significant cost disadvantage on a unit basis. For example, the recommended coverage limit for commercial general liability insurance is the same, regardless of company size.

TABLE 3: WOODY FEEDSTOCK VALUE CHAIN INSURANCE COVERAGE TYPES[1][2]

COVERAGE	LIMIT RECOMMENDATION BY INSURED CORPORATE SIZE		
	Small	Medium	Large
Compulsory Insurance Coverage			
Automobile Liability	$500,000* Combined Single Limit	$1,000,000* Combined Single Limit	$1,000,000* Combined Single Limit
~ Includes Owned, Non-Owned, Hired Autos	Statutory	Statutory	Statutory
Workers' Compensation	Statutory	Statutory	Statutory
Employers Liability+	$100,000 BI Each Accident $500,000 BI by Disease – Policy Limit $100,000 BI by Disease – Each Employee	$500,000 BI Each Accident $500,000 BI by Disease – Policy Limit $500,000 BI by Disease – Each Employee	$1,000,000 BI Each Accident $1,000,000 BI by Disease – Policy Limit $1,000,000 BI by Disease – Each Employee
	Statutory, mandatory minimum within Workers' Compensation	Statutory, mandatory minimum within Workers' Compensation	Statutory, mandatory minimum within Workers' Compensation
Optional Insurance Coverage			

[1] Table 1 represents the ideal, best-case scenario for insurance coverage if the value chain stakeholder had the money and knowledge.
Legend: Small less than $50M revenue/year; Medium $50M-$100M revenue/year; Large– above $100M revenue/year
[2] Based on WTW industry knowledge, these are recommended coverage levels, and, as noted, some of them include a statutory mandated minimum coverage.

Commercial General Liability	$1,000,000* per occurrence $1,000,000* general aggregate	$1,000,000* per occurrence $1,000,000* general aggregate	$1,000,000* per occurrence $1,000,000* general aggregate
~ Products/Completed Operation	$1,000,000* per occurrence $2,000,000* products/completed operations aggregate	$1,000,000* per occurrence $2,000,000* products/completed operations aggregate	$1,000,000* per occurrence $2,000,000* products/completed operations aggregate
~ Coverage Trigger Preference: (if claims-made, verify retroactive date if applicable)	Occurrence	Occurrence	Occurrence
Loggers Broad Form,*** (endorsed or stand-alone)**	$1,000,000 per occurrence $2,000,000 general aggregate	$1,000,000 per occurrence $2,000,000 general aggregate	$1,000,000 per occurrence $2,000,000 general aggregate
Umbrella Liability	$1,000,000 or more Per Occurrence/Aggregate	$5,000,000 or more Per Occurrence/Aggregate	$10,000,000 or more Per Occurrence/Aggregate
Property Insurance including business interruption and equipment breakdown (boiler and machinery)	Per schedule and inclusive of special perils		
Environmental/Pollution Liability required **if** demolition, use of hazardous materials or environmentally sensitive	$1,000,000 or more Per Occurrence/Aggregate	$1,000,000 or more Per Occurrence/Aggregate	$1,000,000 or more Per Occurrence/Aggregate
Non Performance of Contract	Bond	Bond	Bond

** A combination of Umbrella/Excess and primary limits may be used to provide coverage for the amount shown.*
***Ensure that coverage for Additional Insured is included in the Loggers Broad Form*
****Note Umbrella forms will generally not follow form over the Loggers Broad Form*
+ Employers liability insurance did not come up in the survey. It is included in this assessment as an additional recommended coverage. Under California law, employers must buy workers' compensation policies with employer's liability coverage of at least $100,000 per occurrence, $100,000 per employee, and $500,000 for the policy limit. Technically, the workers' compensation coverage is Part I of the policy and the employer's liability coverage is Part II.

Source: Willis Towers Watson, 2024

Value Chain Stakeholders' Views on Insurance

TNC surveyed existing woody feedstock market participants (not potential entrants to the value chain) in late 2023 regarding their use of insurance and the availability of insurance to cover risks associated with their operations. Based on the survey, insurance products/lines used or needed for these businesses included: auto and workers comp (statutory), general commercial, third-party liability coverage, loggers broad form, property (including business interruption) environmental and non-performance of contract.

Survey respondents said that they had challenges finding and/or affording insurance for third party liability, property insurance, general commercial insurance and, for those operating in the forests, the loggers broad form coverage. A copy of the survey summary is attached as an appendix to this Playbook. Of particular interest are the cross tabs at the end of the survey summary, which indicate for each type of market participant their response on the availability and affordability by line of insurance or coverage needed. For the critical issue of non-performance of contract, the WTW assessment of the survey results led to the recommendation that supply or performance bonds be used to address the risk of non-performance of long-term biomass supply contracts.

Woody feedstock value chain stakeholders are concerned about protecting their assets and revenue through property and business interruption insurance[1]. Non-performance of contract is also a priority risk. However, concern in the value chain is highest about losses caused to others for which companies will have liability rather than their own direct losses. Therefore, challenges with obtaining and affording third party liability insurance, with an emphasis on auto liability was identified as one of the most significant issues by participants in the value chain[2].

Existing Insurance Coverage

General coverage recommendations vary by industry, the nature and scope of operations, geographic location, and contractual requirements. For example, large companies may require (smaller) companies that provide goods and services to maintain certain types of insurance coverage, such as business interruption policies. These requirements reduce risk to the larger company but increase cost and complexity for the small suppliers. Additionally, companies may be asked to hold specialized coverage based on the risk profile of the enterprise and its activities. A company harvesting forest biomass in an area with high wildfire risk would need more comprehensive loggers broad form coverage. On the other hand, a biomass company sourcing woody biomass from sawmills typically has lower wildfire hazard coverage needs and requirements.

Example- Loggers Broad Form Insurance: An important type of specialized coverage is loggers broad form insurance, which enables supply side woody biomass value chain stakeholders to ensure against risks specific to their business activities that are not covered in general commercial liability policies. This coverage, most often purchased by sawmills and loggers, includes fire, overcut, accidental trespass and property damage caused by wildfire, and third party liability coverage. In addition, for companies that are not required by law to carry worker's compensation insurance, or where this coverage may be limited, loggers broad form insurance policies can cover loggers and their employees if they fall or are otherwise injured while carrying out their duties and are unable to work. Where this coverage is included, it also pays for death benefits of the loggers and their employees.

Loggers broad form insurance generally has limits of $1M per occurrence, $2M in aggregate, including coverage for additional insureds. When loggers broad form is included with other coverage its share of the overall premium at these coverage limits can typically range between $1,000-$5,000. As a monoline insurance, the minimum premiums may be between $5,000-$10,000. Underwriters do not typically offer umbrella coverage in loggers broad form policies.

Underwriters generally consider anything associated with logging to be risky. Their guidelines include investigating the level and quality of equipment maintenance; the age and condition of equipment: whether and to what extent there are safety protocols; five-year loss history; out of service days; fiscal administration (including other insurance policies and hold harmless agreements) and financial standing, among others. Woody value chain stakeholders may be able to bring their insurance costs down or increase the likelihood of loggers broad form availability by proactively addressing these elements. There are few issuers of the loggers broad form insurance and the insurance industry's appetite to issue this insurance continues to be challenged by the risk that ignition can cause a severe wildfire due to western forests' fuel load generally, rising temperatures contributing to dryer conditions and periodic droughts, and the increasing number of businesses and people living in or proximate to California forests and associated loss exposure.

Contractual performance is of great significance for the woody feedstock value chain. For example, failure to deliver contracted supply can leave biomass energy producers without biomass fuel needed for operations, with potential consequences under the California Renewable Portfolio Standard and

[1] TNC survey in November and December 2023
[2] Ibid.

Biological Renewable Auction Mechanism (BioRAM). A key mechanism for addressing supply concerns is found in supply bonds, sometimes, also called surety bonds. Supply bonds are especially used in trucking, in the public sector, and in the construction industry and are effectively a form of guarantee that a supplier will produce materials that the offtaker (in this case a biomass energy producer or an emerging biomass conversion facility seeking investment or credit) requires. If a supplier fails to deliver the contracted production, the offtaker is made whole from the proceeds of the bond.

The risk addressed through a woody feedstock supply bond is the supplier's ability to deliver the contracted materials within the specified price and time frame. Bond issuers generally need to be well-qualified financially, but the ability of many woody feedstock value chain companies to demonstrate their financial means and stability is often limited.

Example: Supply Bonds

Supply bonds increase the likelihood of viable long-term contracts being issued. An offtaker is more likely to enter into a long-term contract with a woody biomass supplier if the offtaker is provided with a supply bond purchased or issued by the supplier which will compensate the offtaker if the supplier fails to perform. The bond reduces the financial risk to the offtaker associated with the potential non-performance of the supplier and reduces the need to enter into shorter-term contracts due to the risk of non-performance. The existence of viable long-term contracts can facilitate funding and investment further up the woody biomass value chain. Given the prevalence of small companies at the supply end of the woody biomass value chain, cost of and access to supply bonds is limited because of the perceived and actual risk levels of the company seeking the bond as a form of insurance.

The offtaker's creditworthiness and purchase terms can, in some cases, act as a counterweight to the financial condition of the supplier. The offtaker needs to purchase a certain volume of biomass in order to generate and export to the grid a contractually agreed-upon amount of electricity. If on one side of the risk equation there are questions regarding the supplier's ability to deliver, the opposite end of the risk spectrum is the offtaker's willingness and ability to pay for contracted supplies. Accordingly, the terms of the contract would need to address facility shutdown and the payment recourse of the supplier in the event of such shutdown.

Insurance Challenges and Gaps Faced by the Woody Feedstock Value Chain

Companies in the woody feedstock value chain face challenges in finding and obtaining or affording some of the insurance products they require. In the value chain, there are concerns about the cost of insurance, potential loss of third-party liability coverage, and supply interruption risk.

Market conditions impact pricing, as well as the degree of need for financial backstopping. The insurance market is cyclical and subject to periods of high and low demand, both of which impact pricing and availability of insurance products. Current market conditions, which have been disrupted by increasing risks and hazards, make pricing more challenging for some industries, types of insurance (property, casualty, cyber & executive risks), and company sizes.

Smaller operators would likely find pricing of insurance an increased burden on margins and profitability. These insurance-related issues likely contribute to the cost of feedstock in the woody feedstock value chain. The challenges facing companies with respect to specific types of insurance include:

- **Auto and fleet:** Considered high hazard, hard priced, and required by law.
- **Property:** Not required by law, but in California earthquake and wildfire risk are putting upward pressure on pricing. Some types of property insurance, including business interruption and equipment failure, are not included in general policies and when written in, require payment of an additional premium.
- **Supply interruption and weather-related supply interruption**: The availability and cost of business interruption insurance is a challenge. Alternative risk mitigation solutions such as

parametric insurance could reduce uncertainty and smooth revenue flows. Parametric insurance pays out to the insured whenever the specified event or risk level takes place, as described in the next section.

- **Third party liability coverage:** This is the most significant loss coverage for the value chain and is essential in most contracts. Many survey participants expressed distress over their inability to obtain/maintain third party liability coverage. This could be a result of insurance industry characteristics, with few insurers willing to underwrite this type of coverage in general or for the woody feedstock sector. It could also be the result of survey participants' previous loss experiences negatively influencing insurance underwriting outcomes. The insurance industry indicates that other sectors across the country have performed better and are generating better returns, growing wildfire risks and losses in the state deters insurers from writing insurance for businesses operating in or near forests, equipment used throughout the value chain may be older or less well maintained than other sectors also deters insurers from writing insurance
- **Rate increases/affordability of third party, property and business interruption insurance:** Insurance pricing and rate increases factor into the availability and cost of insurance product supply, since low profit margins are a barrier to insurance sector supply. Increased pressure on woody feedstock value chain participants' profit margins from rising operating costs may also lead to other hazards such as inappropriate cost-cutting measures, reduced investments in safety and risk management or deferred maintenance, which in turn deter insurers from insuring.
- **Automobile insurance**: Cost is a significant issue as auto insurance is required both by law and standard contractual language. Automobile insurance rates can be somewhat reduced by good loss history, driver training courses and other safety/risk control mechanisms, however lowering insurance premiums is a challenge in an industry in which transportation plays a significant role in operational outcomes and claim settlements can be high.
- **Contract availability and longevity**: Availability of long-term contracts for companies was identified as an issue, as was availability of long-term insurance policies. The availability of longer-term insurance policies would support longer-term supply and production contracts which would in turn encourage capital flows into the value chain.
- **Insurance sector knowledge of woody feedstock industry:** Concerns were expressed over the ability of insurers to understand insurance needs and risks and risk mitigation specific to the woody feedstock value chain and be discerning about options.
- **Limited availability and/or high cost of risk advisory services:** Constraints on the implementation of risk control measures that can mitigate the risk of loss. Ideally, insurers would provide and or certify third party providers of defined risk management programs, implementation of which would lead to lower insurance premiums.
- **Lower coverage levels, terms, conditions and/or endorsements:** Insurance products specific to the industry, such as the loggers broad form, often have low coverage of liabilities that are not covered in general commercial liability coverage. To the extent that companies may find the need to hold or be required to hold both loggers broad form and general liability coverage to reach appropriate business coverage levels, there is an element of double expense that will negatively impact profitability.

Insurance Risks and Needs

TNC's survey of woody feedstock value chain stakeholders assessed views on the risks to the woody feedstock industry and was used to calculate a 'impact score" for each risk. Risks were grouped by risk category (financial, strategy and operational) and then assessed for importance, impact and if an insurance solution existed. The results are presented in Table 4[1].

Risks that can potentially be resolved through insurance solutions fall into two broad categories of internal and external risk. It is important to understand that while there may be desirable risk mitigation

[1] For items on this chart with insurance solution "none," other financial mechanisms need to be deployed.

measures that companies can undertake (and that regulators and insurers can incentivize), external risks can only be addressed through risk transfer mechanisms, in particular insurance.

TABLE 4: POTENTIAL FOR INSURANCE COVERAGE AND KEY RISKS

From TNC's Woody Feedstock Survey

Surveyed Risk: Woody feedstock	Impact Score: Highest Impact =3 Lowest Impact =1	Enterprise Risk Category	Why is it important?	Impact on insurance	Insurance Coverage Solution?
Feedstock Pricing	2.65	Financial	Pricing input into value chain can influence desirability of business model	Creation of a cost-effective business model puts pressure on operating costs	None
Macro Industry Trends	2.35	Strategic, Financial	Trends were not identified but overall viability of industry is questioned	Creation of a cost-effective business model puts pressure on operating costs	None
Subsidies	2.33	Financial	Support to offset operating costs	Creation of a cost-effective business model	None
Wildfire/Liability – narrow scope	**2.18**	**Financial**	**Lack of wildfire liability insurance limits supplier ability to operate**		**Availability, but very limited. Pricing to the insured is the main challenge.**
Feedstock Supply Consistency	2.15	Operational	Lack of consistent supply limits biomass generator ability to enter into long-term electricity supply contracts and to obtain financing	Pressure on creating a lean operating model and cutting costs can lead to accidents & events	None. Non-insurance solution is long-term supply contract coupled with supply bond (see below)
New Equipment costs	2.14	Financial	Impact to P&L	Older equipment can lead to first party equipment damage or third-party liability due to defective equipment	None.
Skilled Workforce	**2.12**	**Operational**	**Correct skillsets to meet business needs have been in shortage**	**Failure to hire workers with correct skill sets can lead to accidents, triggering workers comp or liability policies**	**No direct insurance solutions. Other related key coverage lines are: Workers Compensation, Employers Liability, Employment Practice Liability, Third party liability.**
Natural Catastrophe impact on assets	**2.09**	**Financial**	**Higher incidents of weather events and impact of weather events**	**Impact on property policies, renewal rates and replacement costs and business interruption**	**Property Insurance with Catastrophe perils included. Business Interruption included. Possible Parametric, Captive and Risk Pool Group.**
Equipment Maintenance	**1.95**	**Financial**	**Failure to maintain leads to equipment breakdown, business interruption and potential accidents**	**Older equipment can lead to first-party equipment damage or third-party liability due to defective equipment**	**No direct insurance solutions. Ensure that equipment breakdown (Boiler & Machinery) is included on property insurance program. Does not include mobile equipment.**
Feedstock quality	1.9	Operational	Non-performance of contract; product acceptance	Disruption in business performance can cause operating deficiencies which lead to potential accidents	None.
Decreasing profits	1.72	Financial	Viability of business model;	Pressure on creating a lean operating model and cutting costs can lead to accidents & events	None.
Contract Performance	**n/a – no assignment of values for a score. Only Yes/No.**	**Strategic & Financial**	**Most business participants are concerned about being able to meet contract terms & conditions**	**Only solutions are performance and supply bonds. These can be expensive and require high enough credit.**	**Supply bonds. Dependent on; credit rating, availability of supply and history, pricing. These requirements represent a barrier for smaller operators.**

External risks

The two external risk categories of greatest concern to industry stakeholders surveyed are wildfire liability and natural catastrophes. In the case of wildfire liability, the availability of insurance products is limited, and the cost of these products can be prohibitively high. For natural catastrophes, stakeholders can sometimes address these through property liability insurance that includes catastrophe perils. However, not all property liability insurance policies include the option to add catastrophe perils, some will cover a few but not all relevant catastrophe perils, and in almost all cases, catastrophe coverage increases the premium costs.

The increasing frequency and severity of wildfires and natural catastrophes in recent years, and loss payouts associated with these events, have discouraged insurers from issuing new policies and caused them to increase premiums for the policies that they do offer. Other external risks identified by survey respondents related to feedstock supply include weather conditions reducing reliability of continuous supply and the availability to process material.

Internal risks

Internal risks include the availability of a skilled workforce, equipment maintenance, and contract performance. While there are no direct insurance solutions for the first two of these risks, insurers can incentivize risk mitigation measures within the insured's control. Incentives in this context are understood as a reduction in insurance premiums and/or beneficial underwriting criteria, which could be made available to companies that set specific education requirements for certain positions, require mandatory technical training for specific jobs, or implement Board (or senior management) approved and monitored equipment maintenance programs.

The insurance industry notes that woody feedstock equipment may be older and less well maintained than in other comparable insured industry sectors such as regulated utilities, making woody feedstock supply chain participants harder to insure for property risk. In addition, an aging workforce may take with it critical experience on how to operate and maintain this older property, further eroding insurance industry interest in insuring this sector most effectively.

Potential solutions for mitigating external and internal risks in a manner that would support the growth and development of the woody feedstock value chain are presented below.

Potential Solutions to De-risk Long-term Feedstock Contracts

Despite the challenges facing companies in obtaining insurance coverage generally or to enable them to enter long-term feedstock contracts, there are several potential solutions to address these in the value chain.

Four categories of potential solution sets are explored. These include:

- Traditional Insurance Approaches
- Alternative Risk Transfer Mechanisms
- Market Enablers
- State Policy Options

Market enablers are particularly important in that they increase the size and sophistication of businesses in the woody feedstock value chain, which incentivizes insurances to offer more and better coverage. As these potential solutions enable more long-term contracts to be contemplated and contracted, an additional benefit is that insurance underwriters may become more familiar with the woody feedstock sector and thus able to increase coverage availability. Furthermore, other CAL FRAME pilot projects may also help increase the market's maturity for the value chain and underwriters.

Traditional Insurance Approaches that Could Enable Long-Term Contracts in the Woody Feedstock Value Chain

The consistency of feedstock supply is highly variable based on the source and processing required, which means that issues affecting pricing across the entire industry have a dampening effect on both supply and demand. Feedstock source impacts consistency and availability of feedstock, which in turn impacts the pricing parameters that can indicate where insurance could facilitate market growth. For example, woody feedstock sourced from sawmills is concentrated within a single or small number of locations, whereas forest biomass is harvested over larger geographic areas, making transportation costs (and thus transportation-related insurance) a much higher component of all-in pricing.

Operating costs remain the key concern for smaller companies in the woody feedstock industry. Within this, insurance costs play a pivotal role as insurance is often required contractually and sometimes by law (e.g. auto and workers compensation insurance). Challenges in providing adequate insurance limits, retentions, and pricing make it difficult for small businesses to effectively use insurance risk transfer. Yet insurance also plays an important role in facilitating the flow of business activities across the value chain.

Some existing insurance approaches that operate in other industries and are applicable to woody feedstock include supply bonds and incentives/practice changes:

Supply bonds: a mechanism for facilitating long-term contracts

Supply bonds may serve as a solution for facilitating long-term contracts for woody feedstock value chain participants. For example, a strong bioenergy industry requires economically viable energy conversion technologies, combined with an assured feedstock supply and access to the energy market. Bioenergy facilities can require hundreds of millions of dollars in initial capital expenses for planning, permitting, and construction or conversion of existing plants and equipment. The magnitude of the investment can result in a payback period of 10 years or more, which complicates financing requirements.

When investors and financiers conduct due diligence on proposed facilities to utilize woody feedstock, the availability of formal agreements of feedstock supply can make the difference between receiving loans and investments or not and can lower the cost of capital when available. Given that many stakeholders are

smaller and/or newer operations, there is often a high degree of uncertainty about their ability to deliver quality woody feedstock over longer periods of time.

While there are currently no forms of insurance that cover this risk, supply bonds, sometimes referred to as non-performance of contract bonds or surety bonds, can serve as an alternative form of risk transfer. Supply bonds can be difficult to access for small companies, with weaker and/or shorter credit histories, making it worthwhile to explore collective structures that enable multiple small companies to participate in a supply bond on behalf of a single offtaker (end user). This could be leveraged in the following ways:

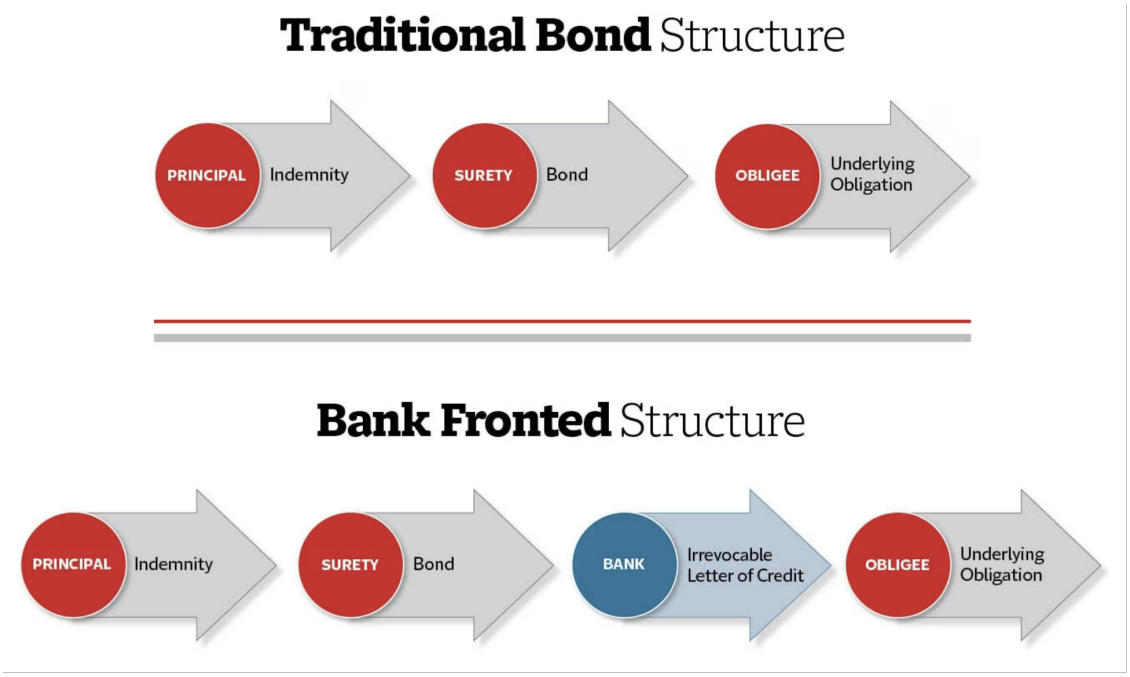
- **Collective arrangements** that enable several smaller feedstock providers to participate in a supply bond to a single larger end user would strengthen the supply side of the woody feedstock value chain.
- **Liability insurance requirements** for participating companies, that could make it easier for collective arrangements to be put in place.
- **Financial backstopping** to address the potential cost barrier. The entity requiring the supply bond will usually stipulate that the bond must be furnished by a Treasury Listed Surety or Insurance Company, sometimes also referred to as a "T-Listed" company.

Supply bonds are priced according to the maximum total exposure covered by the bond. The premium rate, the percent of amount covered by the bond, might vary between one percent and twenty percent, depending on the credit history and financial strength of the issuer. The supply bond must be issued by a creditworthy entity, so a small supplier or group of small suppliers would likely need to find a "fronting" bank so that parties could be assured of funds if the counterparty fails. Introducing the issue of creditworthiness, the supply bond is thus likely to be structured as a "surety bond", or a bank fronted surety bond. Figure 2, below, demonstrates the difference between a traditional supply/surety bond and a bank-fronted supply/surety bond.

A **supply bond structured as a surety bond**, involves an agreement among three parties whereby a third-party entity (the surety, either an insurance company or other bond issuer) stands behind a company (the "principal" in this case, the woody feedstock supplier) and provides a guarantee to the other party (the "oblige" or offtaker in this example) that the supplier will fulfill an obligation. If the supplier fails to fulfill this obligation, the surety will fulfill the obligation or compensate the offtaker for the financial loss.

A **bank fronted surety bond** includes a fourth party: the bank. With a bank fronted surety bond, a surety uses its financial position and relationship with a bank to procure a letter of credit on behalf of its client (the supplier). In a bank fronted structure, if the bank receives a demand under the letter of credit the bank will look to the surety for payment. Where suppliers, or the entity facilitating a collective supplier arrangement (such as a JPA) have established banking relationships, these relationships can make a bank-fronted surety bond feasible when a traditional option is not accessible.

FIGURE 2: TRADITIONAL AND BANK FRONTED SUPPLY/SURETY BONDS



Source: Travelers

The issuer of a supply (surety) bond generally will be a "T-listed company, usually a commercial insurance carrier, that issues the bond on behalf of the principal, in this case, the supplier. The bank-fronted bond includes an additional specific type of guarantee (bank letter of credit) so even with an established banking relationship, the principal (supplier) would typically have to provide a fair amount of collateral to the fronting bank. potentially a 50/50 split with the issuer. While bank-fronting may make the supply bond issuance accessible, this access comes with a cost attached. An incentive for T-listed companies to work with smaller and/or collective woody feedstock issuers could take the form of a public cost subsidy that reimburses a portion of transaction cost on smaller bonds, with payment occurring only after the supply bond is in fact issued.

Overall, supply bonds are not a simple or broadly accessible solution "as is". Cost and complexity may limit supplier interest. Small transaction sizes and unrated suppliers are disincentives to insurers and other surety providers. Innovative collective arrangements can lead to transactions of more marketable sizes, with creditworthiness bolstered by multiple and diverse principles. Nevertheless, a type of financial backstopping is likely to be necessary to make these transactions work for all parties involved.

Incentives and practice changes to support the industry

Barriers to efficient operations and the high cost of certain business inputs result in high operating costs and low to no profitability. In the absence of good profitability, new competitors are unlikely to enter the industry, constraining both supply and demand.

There are a range of incentives[18] and actions that could be considered to catalyze behavior change on the part of insurers. These include incentives or mandates for insurers to provide different types and/or levels of cover and new policy regulations to make certain types of industry specific coverage (such as loggers broad form) compulsory which effectively creates a larger addressable market for those products. For example,

[18] The potential parameters of these incentives and mandates are too numerous to cover in this Playbook.

energy consumers will be unlikely to switch to biomass energy unless they are certain that there will be adequate supply at reasonably certain pricing over the long term. Therefore, providing incentives to increase efficiency and reduce risk can have a positive impact.

Similarly, policy changes that create favorable conditions for smaller businesses in the woody feedstock value chain could facilitate industry growth. Possible solutions include:

- **Increasing standard requirements:** Increasing safety requirements and standards as well as equipment operations and maintenance requirements for woody feedstock stakeholders could lead to more insurance being written, because following these standards reduces risk.
- **Enterprise risk management:** Improving the financial, strategy and operational strategies that allow value chain stakeholders to mitigate risks, including engaging or disengaging with particular activities could help insurance industry executives to improve their outlook on the sector overall.
- **Public claims fund:** A public claims fund could provide an insurance substitute for risks that are outside the appetite of the insurance market. Another benefit of such an approach is that the development of experience data through the claims fund can help encourage insurers to begin covering these risks. Gaps in the market may be the result of perceptions that the total addressable market is too small to be profitable, or that needs are too specialized to underwrite, or a lack of experience data. The State of California established a Prescribed Fire Claims Fund to address the absence of insurance for practitioners of prescribed fire, which in turn was limiting the deployment of prescribed fire by practitioners. The next step could include exploration of how a claims fund could be created to cover select risks for the woody feedstock value chain participants. Another alternative would be to create a public insurance facility to write insurance for woody feedstock value chain participants. Examples of this in California for other risks include the California Earthquake Authority, which was established by the state to write residential earthquake insurance when insurers stopped writing it and the Fair Access to Insurance Requirements (FAIR) Plan, which is a state mandated involuntary association of insurers which is required to write fire insurance for property that cannot obtain fire insurance from private insurers.

Alternative Risk Transfer Options

When traditional insurance solutions do not adequately support or are not available to support the company's objectives and risk strategy, Alternative Risk Transfer Solutions can provide innovative means to address needs, protect key metrics, and meet investor risk tolerance parameters. These alternative solutions include parametric solutions and the use of captives. Since captive solutions require the use of a company's capital, which is highly constrained for most stakeholders within the woody biomass industry, the focus of this section is first on parametric solutions which rely on the capital of the insurer rather than that of the insured party.

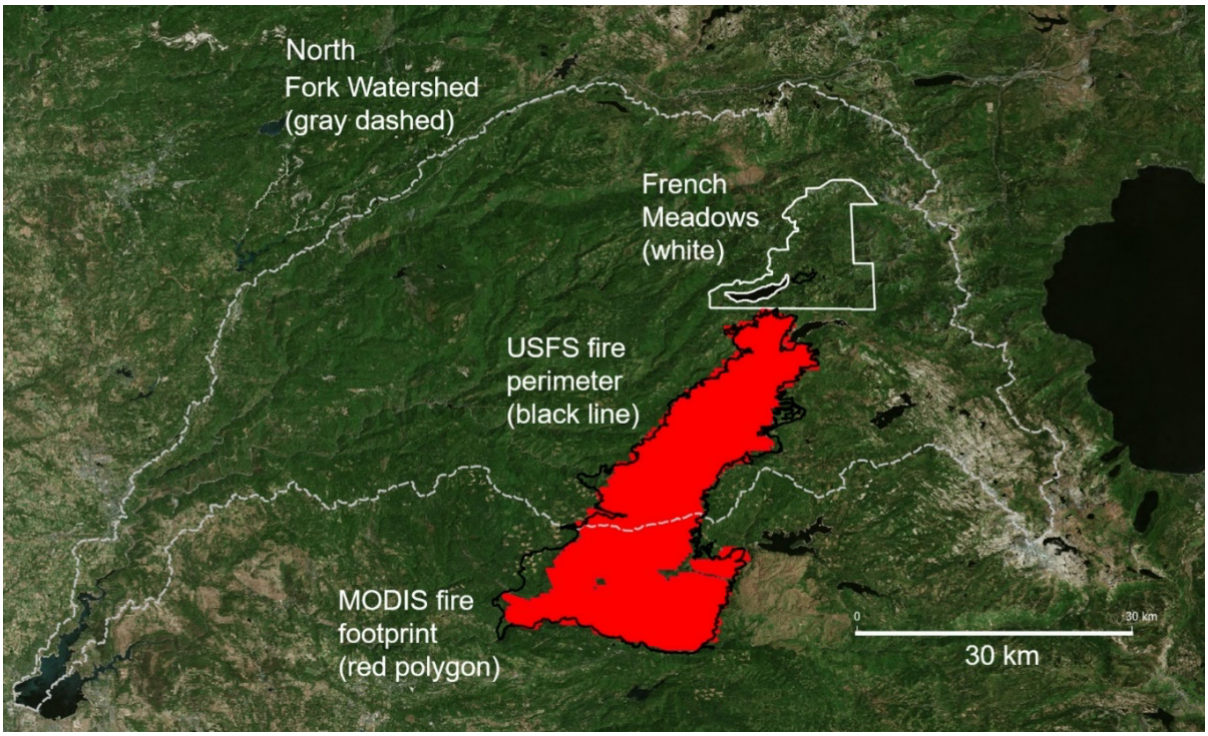
Parametric solutions

Parametric insurance is a relatively novel product, representing a much smaller market than more traditional insurance products. Parametric solutions transfer the impact of adverse events on a company's revenues or costs based on the characteristics of a change in an index or event, not the severity of the loss itself. Event characteristics could be the strength of a windstorm, the intensity of an earthquake, the occurrence of the "wrong" weather, or an event like a wildfire.

Wildfire parametric programs may take one of three different approaches. They may: (1) rely on satellite imagery of a burned area; (2) define an area or buffer around an asset or group of assets; or in an emerging approach, (3) use a fire weather index that represents the likelihood of wildfire. If the trigger associated with the chosen approach is met, a payout defined by the parametric contract is made available. These solutions can be implemented using satellite imagery to capture the extent of a fire and determine on a pixel-by pixel

basis whether the land was burnt.

FIGURE 3: SATELLITE DEPICTION OF WILDFIRE EXTENT (RED) VERSUS INSURED AREA (WHITE)



Source: Willis Towers Watson, 2023

Different from traditional insurance products, such as indemnity coverage, reliance on a trigger allows for simple insurance design and swift event verification. This results in payment within days, not months or years. Fast claims payments enable businesses to recover from loss and damage faster, thereby minimizing value chain disruptions. No proof of loss is needed from the client. Rather, the client makes a certified statement to the insurer that they had a loss greater than or equal to the payout available, prompting the insurer to issue funds. Funds dispersed have no restrictions on how they're applied to remediate the impact of an event, be it for property damage, business interruption, extra expenses, employee benefits, or coverage of an otherwise uninsurable asset. This provides the insured with liquidity in a time of crisis.

A critical component of design is to ensure that the covered event's characteristics are highly correlated to the loss that may be suffered. Solutions are customized to the geography, risk exposure, risk management objectives and budget of the client. Because of how customizable these programs are, cost can vary. Typically for wildfire programs, premiums tend to cost 4-6% of the limit insured. That is, for USD10,000,000 in coverage, a program would typically cost between USD400,000 and 600,000. The costs of parametric programs tend to scale linearly; doubling the amount of coverage will double the premium. While these contracts are typically annual, markets have written terms for three to five years in length. Parametric insurance is most appropriate for businesses with the ability to purchase additional coverage, as it is not a replacement for property, general liability or other more traditional products.

Recent innovations have occurred in parametrics, including those that recognize the risk reduction value of nature-based solutions. Wildfire resilience insurance is one example of an emerging product that accounts for forest management—ecological thinning and prescribed burning to reduce spontaneous fire risk—as a mitigation tool by offering more affordable or available insurance. This form of insurance is most appropriate for landowners and operators interested in coverage for the land itself, as opposed to structures or facilities. For example, quick payouts may be appealing to those operating on forested land who must undertake post-fire recovery and restoration activities, such as removing hazardous trees, stabilizing slopes, dredging waterways and/or reforestation. In this case, parametric insurance can replace funds reserved for post-fire activities, allowing them to be reallocated to other programs while requiring only a fraction of investment in premium.

To date, parametric markets have been more receptive to the inclusion of forest management for those operating in California's Wildfire Urban Interface (WUI) than the indemnity markets, for example, although baseline premiums tend to be higher for parametric insurance.

Example: Benefits of Parametric Insurance for woody biomass

A benefit of parametric insurance is that its costs may go down with better industry practice. A recent report by the Nature Conservancy and WTW "Wildfire Resilience Insurance: Quantifying the Risk Reduction of Ecological Forestry with Insurance found that wildfire resilience parametric insurance premium estimates decreased with ecological forestry, and that premium savings on parametric wildfire resilience "umbrella" cover resulting from ecological forestry can be substantial.

For example, parametric insurance for wildfire risk could pay out when a certain threshold of "acres burned" is exceeded, as opposed to the insured – such as a timber company - having to prove that it suffered damage and loss to insured assets from a wildfire as is the case with a traditional indemnity insurance product.

Source: Wildfire Resilience Insurance, Willis Towers Watson

Parametric insurance is emerging as an option that may be valuable for the woody feedstock value chain to support long-term contracts and inspire resilient actions in the industry. It has the potential to simplify and speed up insurance contracts and payments, which may entice more new entrants to the market

Group Insurance Captives

A group captive risk transfer is an option for businesses with a similar risk profile to share in the profit and loss of managing the risks they face. When exposure becomes too expensive or virtually uninsurable in the traditional insurance market, some businesses can shift their capital to a group captive. A casualty group captive approach can be a tool to support business in exposed locations/occupancies or in cases of unavailability in private sector insurance. Group captives can be administered and even re-insured by the public or private sector. Captives could address core insurance gaps for property, general and third-party liability, or focus on risks for which there are fewer commercial insurance solutions, such as wildfire and natural catastrophe.

Owning an insurance structure (such as a captive) provides possibilities for creativity and innovation in designing programs for managing risk structures. The captive platform provides access to reinsurers, and other capital markets - and delivers a long list of advantages that potentially include tax benefits and bespoke program design benefits such as multiple coverages and multiple-year policy terms. It is important to note that captive insurers are subject to state regulation, although the requirements may be less onerous than for commercial insurers.

Group captives, where multiple organizations form and then control an owned insurance organization, have been valuable as problem-solvers for market deficiencies in other sectors. They have the goal of *making new insurance* where the conventional commercial market is unable to meet the need. However, these innovative approaches require capital, a scarce resource for many stakeholders in the woody feedstock value chain.

Collective mechanisms that, for example, enable bioenergy producers, or supplier groups to create a captive insurance vehicle could have a beneficial impact but would likely require one or more types of financial backstopping. However, a collective mechanism to ensure woody feedstock value chain companies facing common risks does not reduce the underlying risk and, depending on how structured, can expose participants to liability for losses of other participants.

Captives have been used as a solution to financial backstopping for long-term contracts. The premium rate, the percent of amount covered by the captives, might vary between one percent and twenty percent, depending on the credit history and financial strength of the issuer. Bonds fronted by a captive would likely be issued by a bank so that Captive parties could be assured of funds if the counterparty fails. Thus, the captive issuer would typically post collateral to the issuing bank. See the graphic under supply bonds above for a visual description of these relationships.

Typically, the absolute minimum amount of capital needed to form a captive is USD250,000. However, regulators in captive domiciles will establish minimums related to the premium volume, reserves expected to be held by the captive, and the largest net retained risk. As a quick rule, the contributed capital should be the greater of (a) 33% of premiums written, (b) 25% of reserves held, and (c) two times the largest net retained loss. Because limits might need to be extremely large – in some cases, USD100,000,000 or more – a captive may present only a limited solution in real-world terms.

To assemble an effective captive program that meets the stated business objectives, first the needs or demands of counterparty entities with which the woody feedstock value chain companies are doing business must be understood. Counterparts will often expect evidence of insurance from a company that is: (a) licensed to offer insurance for sale in California, and/or (b) assigned a minimum rating from an organization such as A.M. Best & Company (e.g., "A-" or better, size VII or larger).

California does not have a captive statute, so any captive created by a woody feedstock group would need to be domiciled in a jurisdiction other than California, e.g., Utah, Hawaii, Nevada, Vermont, or Arizona[19]. If counterparties in California require local operators to show evidence of insurance from an insurer licensed to operate in California, there would need to be a "fronting" arrangement in place, in which a licensed and rated commercial insurer issued the policies and reinsured all or most of the risk with the captive, which would be licensed in its own jurisdiction under that jurisdiction's captive statute, and would operate as a reinsurer.

Many captives have, over the years, elected to obtain a stand-alone rating from A.M. Best & Co., and some have also acquired additional licenses. There are costs associated with doing this, but those costs can be outweighed by the business and cost-saving benefits. It is important to analyze and understand both; however, at the outset one should assume that a new captive will be unrated and licensed only in its domiciliary jurisdiction.

A JPA may be structured to insure participating public agencies and/or to indemnify them for losses, including engaging in providing captive insurance. But it would require substantial public capital and the cooperation of the commercial market for a JPA to be able to establish a captive insurance vehicle to insure its public agency members.

[19] Insurance is typically regulated in the U.S. as 51 individual regulatory jurisdictions, rather than on a national basis.

Surety Captives

A hybrid solution crossing supply (surety) bonds and insurance captives, surety captives offer a strategic approach for woody feedstock value chain stakeholders, including suppliers, seeking to finance their contractual obligations. The strategy involves utilizing a wholly owned captive or group captive entity to either assume obligations via reinsurance transactions or directly underwrite surety obligations to obligees (such as offtakers), owners, or requiring parties. Motivations for this approach include increasing limited availability, lowering the commercial surety costs faced by individual firms, facilitating financing of smaller, lower value projects, and leveraging the captive as an extension of the combined balance-sheet strength of a group of companies as opposed to reliance on the strength of a single firm.

The key difference between a collaborative supply bond issue and a surety captive is that the collaborative supply bond is a one-off transaction. The parties involved come together for one transaction and no further obligations or interaction are involved. A surety captive would facilitate multiple transactions, thus potentially reducing all-in costs over time. However, in the case of group surety captives, consistent administration and governance may be challenging over the long run.

Operationally, the captive issues surety contracts directly to obligees, albeit subject to state regulations which may require approval and special deposits. Additionally, captives often reinsure commercial surety under quota-share arrangements to mitigate risk. While this is broadly accepted by regulators, it requires significant collateral and adherence to complex terms and conditions. Most sureties perceive such programs as accommodations rather than true risk transfer reinsurance. Achieving a balance between the needs and risk perceptions of sureties versus those of the principals (suppliers) is a delicate exercise, but one that would become simpler over time as more successful practice examples are built. A successful surety captive must have sound mechanisms for claims management and demonstrating claims handing capabilities will reduce perceived risk levels.

One major issue faced by surety captives is the absence of ratings from financial agencies like AM Best, S&P, or Moody's, which can limit their usability in terms of lowering capital costs or securing governmental contracts. Obtaining a Federal Treasury listing is also crucial, and like credit ratings, requires meeting stringent capitalization and operational standards. Unrated bonds issued by captives may lack appeal to potential investors, causing underwritings to fall short of their financing goals.

For an unrated captive to meet industry and financing requirements, it will likely be necessary to establish a relationship with a fronting company, typically a bank or other sound financial entity. In seeking to minimize the risk that it incurs, a fronting company will expect the principal (supplier or group of suppliers) to put up sufficient security through capital, collateral, or reinsurance. Fronting companies typically charge fees for their services, which can range from 10-15% of the financing amount. Captive reinsurance, if necessary, involves modeling risk and addressing capital requirements, with regulators often imposing limits on single risk exposure to protect surplus.

Overall, surety captives offer strategic advantages but also pose challenges related to ratings, regulatory compliance, and risk management. Addressing these issues requires careful consideration of capitalization, collateralization, and operational capabilities. Collaboration with fronting companies and reinsurers becomes essential to navigate regulatory requirements and ensure the viability of the captive's operations. Where a group surety captive is under consideration, a collaborative (one-off) supply bond issue can offer a way to pilot the processes and mechanisms that would be needed to support an ongoing entity.

Market Enablers that Could Increase Insurance Coverage

Woody feedstock value chain stakeholders would increase their use of insurance if they had more funds, had more knowledge of insurance markets, and had more insurance-related advice and insurance incentive

options to support their insurance decisions. Increased use of insurance would, in turn, facilitate better access to finance and potentially lower-cost financing for woody feedstock industry participants.

Options that assist woody feedstock value chain participants to obtain appropriate insurance involve a comprehensive approach aimed at enhancing their understanding of insurance fundamentals and mitigating potential risks. The following market-enabling options could collectively be considered:

Basic insurance training

Such training equips value chain operators with essential knowledge about coverage options and their implications. Participants gain insights into the diverse coverage options available, unraveling the intricacies of each. Additionally, they learn the art of crafting an effective insurance submission, detailing loss control activities, or providing a lucid account of their loss history. Understanding why and how insurance products are priced can also provide businesses with insights into how they can better approach internal risks.

Education on credit rating

Based on the responses provided by survey participants[20], a non-financial solution that could help mitigate risks and facilitate the overall use of risk transfer solutions would be to offer education and training to companies in the woody feedstock industry sector, explaining risks, risk mitigants, and risk transfer, the role of insurance companies and industry-specific legal and regulatory requirements. An emphasis on developing an understanding of the significance of credit ratings for bonds and insurance underwriting is especially important. Participants could learn how to enhance their eligibility for insurance coverage and reduce the cost of capital raised through bonds.

Risk modeling & actuarial advice

For larger entities within the value chain, Risk Modelling & Actuarial advice (e.g. from consultants) becomes imperative to managing operational risks as well as to obtaining effective insurance pricing and coverage. This involves a meticulous property analysis for catastrophic risk evaluation, often utilizing sophisticated models such as RMS and AIR. Selecting a broker capable of running analytics to determine appropriate risk retentions and limits becomes a strategic move. Loss history analysis is also conducted to discern trends, fostering an environment for continuous improvement in risk profiles.

Offering risk/loss control options

Risk/Loss Control Options can be a game-changer. Initiatives such as Auto/Driver training programs prove beneficial in enhancing safety and potentially lower insurance rates. Implementing equipment training, maintenance best practice and employee safety programs and ensuring site safety measures are in place further contributes to minimizing risks and fortifying the insurability of the value chain players.

The key aspect of a risk/loss control option involves identifying a risk that a company has some control over (such as fire safety standards training or equipment operation and maintenance optimization) and linking best practice actions with lower insurance rates, or performance rebates. In the example of fire safety standards training, mandatory training for all (or the relevant percentage) of a company's work force might be the requirement for attaining lower insurance rates. Achieving a certain amount of time with no loss events (e.g. one year with no fire safety related events) could trigger a partial rebate of premiums paid.

Providing risk/loss control options would collectively empower woody feedstock value chain participants to navigate the insurance landscape with acumen, fostering a proactive stance towards risk management and increasing the likelihood of comprehensive coverage.

[20] TNC survey in November and December 2023

CA State Policy Options to Address Gaps in Insurance Affordability and Availability

The availability and affordability of insurance is a major concern in the woody feedstock value chain. Third party liability insurance is a significant issue in the survey. The absence of this insurance and/or its lack of affordability is an issue that could be addressed by state policy and there is a precedent for state intervention where private insurance was no longer available for businesses operating to manage forests. When insurers began to exclude coverage for liability to third parties from prescribed fire in the loggers broad form (which until that point was commonly purchased by prescribed fire practitioners to cover third party losses from prescribed fire) and otherwise declined to write insurance to cover prescribed fire practitioners, public and private landowners began to stop contracting for or undertaking prescribed fire, which is an important wildfire risk management tool. The Legislature and Governor responded by enacting legislation to create a publicly funded Prescribed Fire Claims Fund.

A State-wide Third-Party Claims Fund

The Legislature and Governor could enact a similar but separate claims fund to cover third party liability claims against some or all categories of woody feedstock supply chain participants. The new Fund could require that value chain participants demonstrate that they were unable to obtain private insurance for third party liability before being approved for coverage for claims. Coverage could be limited as is the case with the Prescribed Fire Claims Fund.

Example: California's Prescribed Fires Claims Fund

A Prescribed Fire Claims Fund was created by the Legislature and Governor as a substitute for insurance. The purpose of the Prescribed Fire Claims Fund is to cover claims against fire practitioners by third parties for losses associated with prescribed fires.

The Legislature appropriated $10 million for the Fund, which is administered by the California Department of Fire and Forestry (CalFire). To be eligible to have claims covered, a prescribed fire practitioner must follow state standards for undertaking prescribed fire and have a certified "burn boss" in charge of the "burn." Prescribed Fire Practitioners apply to pre-qualify for access to the claims fund for individual burns.

Coverage is limited to $1 Million per burn. Prescribed Fire Practitioners can demonstrate to landowners that they have been pre-qualified and that landowners will then be able to make a claim against the Fund for losses associated with the burn, such that landowners have begun to contract for prescribed fire again. The other goal of the Prescribed Fire Claims Fund is to develop experience data that will encourage private insurers to begin writing insurance, as they did in the past, for prescribed fire practitioners.

Additional data would need to be collected from woody feedstock supply chain participants to understand more comprehensively the scope of the problem, how it affects each segment of the value chain, the number and dollar value of third-party claims, and the extent to which insurance has been sought and denied from both admitted carriers as well as the surplus lines market.

A related option would be for the state to enact a publicly funded reinsurance facility targeting writers of small business insurance in the woody feedstock value chain.

Local Government or Joint Powers Authorities Will Require New State Legislation to Be Able to Insure Woody Feedstock Supply Chain Participants

Local governments have the authority to insure their assets, operations, and employees under California law. Local governments also have the authority to form Joint Powers Authorities ("JPAs"). JPAs can exercise jointly the same authority as its local government members, which includes the joint purchase of insurance for the

local government members. JPAs are also expressly authorized to create or offer insurance for members through a self-insurance facility, although there are limits to the amount of coverage.

There appears to be no explicit authority in California law generally for local governments or JPAs to purchase insurance for private sector entities, including woody feedstock supply chain participants. The insurance purchasing or self-insurance authority for JPAs appears to be limited to insuring its own assets, operations and employees and those of its government members, as opposed to insuring private sector assets or activities. It appears that even where a JPA contracts for a service (such as supplying woody feedstock), it can only insure itself, not the third party (such as a logger) with whom it contracts.

An example of a JPA formed in the wildfire mitigation context is the Marin Wildfire Protection Agency (MWPA), which is a JPA of local government entities in Marin County whose mission is to reduce wildfire risk by reducing fuels and otherwise taking actions to mitigate fire risk. The MWPA is required, under the terms of agreement between the local governments which formed the MWPA, to purchase insurance for its own activities as well as to indemnify and purchase insurance to cover any losses to its public member entities associated with activities of the MWJPA.

Whether the formation of or joining a JPA will reduce the cost and/or increase the availability of insurance for a public sector entity depends on several variables specific to that public entity and the others who are members of the JPA, the specific assets and operations it wishes to insure and the hazards it faces. There also does not appear to be authority for local governments or JPAs to establish a claims fund to cover claims against private sector entities, like private woody feedstock supply chain participants.

State legislation would need to be enacted to provide JPAs supporting woody feedstock supply chain participants with the authority to purchase or provide insurance for woody feedstock supply chain participants, or to establish a claims fund to cover claims by third parties against woody feedstock supply chain participants.

State Led Insurance Executive Advisory

To improve the insurance outlook for the woody feedstock sector overall, the Governor, Insurance Commissioner or Speaker of the Assembly or Senate President could convene an Insurance Industry Executive Advisory Committee. The senior level advisory would be made up of leaders from woody feedstock insurance experts and executives from leading commercial insurers like Chubb, Liberty and AIG. It would work to uncover the challenges of woody feedstock insurance, such as factors contributing to its comparatively less robust economic viability in a market where insurance writers are able to make good money by writing policy in more traditional or well-known sectors; the sector's major risk – wildfire – and its association with significant loss (and the related States ruling following the Pacific Gas and Electric bankruptcy that utilities were materially responsible/liable for wildfire risks)[21]; the issue that current surplus lines underwriters are excluding wildfire risk while including other exposures as well as the growing intensity, frequency and duration of wildfire loss. The Advisory would be supported by insurance industry data and rate models and its primary aim would be to consider solutions to these barriers resulting in more insurance written in the sector. The State would publicly acknowledge the executives' leadership in supporting this vital industry for both California's economy and climate resilience.

Public Sector Supply Bonds

Supply bonds are not readily available for purchase or issuance and are not likely to be affordable to actors in the value chain. The State Legislature and Governor could enact one or more of the following public program options:

[21] Insurance executives clarified that even though the woody feedstock value chain does not include utilities, the sector is less attractive to insurance because of its association with the power sector.

- Issue performance or supply bonds, subject to the supplier meeting certain standards set by the state for its operations and financial conditions.
- Establish a claims fund that would be available to pay claims for non-performance.
- Subsidize private issuers of such bonds, either directly or through tax credits to lower the cost of supply bonds for small companies. Public subsidies to lower the cost of supply bonds to small company issuers or purchasers could be linked to risk mitigation measures such as safety and maintenance requirements and performance experience as well as risk transfer measures, such as requirements that the small business carry business interruption insurance. There are already programs in California that support issues of public concern[22], such as affordable housing, that could be relevant for shaping a program for the woody feedstock industry or specific end user sectors like bioenergy.

For each of these policy options, however, more data would need to be collected concerning the historical and potential frequency and magnitude of losses associated with non-performance of long-term woody feedstock supply contracts.

[22] General obligation bonds, which are long maturity and independent of tax revenues. In theory the govt can use these as they see fit. https://www.dgs.ca.gov/Resources/SAM/TOC/6000/6871
CalFHA Conduit bond issuer program which supports developers of affordable housing:
https://www.calhfa.ca.gov/multifamily/programs/forms/termsheet-conduit.pdf

Concluding Recommendations

The range of insurance challenges, including those limiting the viability of long-term contracts, can be organized into three groups: lack of business understanding of insurance options and risk/loss control options for the woody biomass value chain; limited private sector insurance coverage options; and national and international market factors that cannot be mitigated at the state or local level.

Risk transfer, publicly funded financial backstops or subsidies, and policy changes are all needed to alleviate insurance-related challenges such as availability, pricing, credit rating, and loss history. As these solutions are implemented, it could in turn lead to greater availability of traditional insurance or alternative risk transfer mechanisms for value chain players facing these burdens.

Market enablers, particularly **basic insurance training**, **education on credit rating** and **development of risk/loss control options**, can provide significant market development benefits with limited state budget implications if conceived in a collaborative manner. For insurance companies, there are clear benefits to providing basic insurance training, and to develop risk/loss control options (analogous to the driver's education programs that can reduce the cost of auto insurance coverage). If multiple insurers work together to create, develop, and deliver training curricula and risk/loss program standards, the cost to any single insurer is minimized. They will all, however, benefit from a broader pool of informed clients and potential clients.

Similarly, education on credit ratings is important, especially for newer and smaller businesses in the value chain. These firms need to orient their business practices to facilitate access to credit, but without adequate information, they are often unable to do so. For credit rating agencies and conduit bond issuers, offering education on credit ratings can be considered as a business development tool. For the market, better-informed businesses mean greater stability and a potentially larger number of firms able to access credit for growth and investment.

State level policy options offer a significant opportunity to address gaps in the private insurance market without detracting from the operations and strategic options of private insurers**. State level third party claims funds** might be used to address critical insurance needs in the woody feedstock value chain and current gaps in the private insurance market in a targeted and limited manner. Establishing this fund in parallel with efforts to catalyze market enabling actions is in and of itself a risk mitigation measure: offering a solution that should be less necessary over time as the market matures. The state could also enact legislation to authorize local governments or joint powers authorities to purchase or provide insurance for woody feedstock supply participants.

To touch briefly on the last group of challenges, **national and international market conditions,** the reality is that the global renewable energy market in general, and bioenergy specifically, are subject to several pressures related to industry evolution, emerging physical risk climate issues and changing macroeconomic parameters (interest rates, investment regimes etc.) Although these factors are beyond the scope of this playbook, it is notable that both insurance companies and credit rating agencies monitor these challenges and issue periodic briefings and reports that both public and private sector stakeholders can access.

Table 5, below, provides comparative information on identified solutions and recommendations, including estimates of time and cost to implement, as well as potential impact.

TABLE 5: RATING OF POTENTIAL INSURANCE SOLUTIONS

Recommendations	Time to Implement	Projected Cost[23]	Potential Impact[24]
Basic Insurance Training	Short-term	Low Cost	High
Credit Rating Education	Short-term	Low Cost	High
Risk Modeling & Actuarial	Medium-term	Moderate Cost	Moderate
Risk/Loss Control Options	Medium-term	Moderate Cost	High
State Third Party Claims Fund	Medium-term	Moderate Cost	Moderate
Local/JPA Claims Funds	Short-term	Moderate Cost	Moderate
Performance/Supply Bonds	Long-term	High Cost	High

Source: Climate Resilience Consulting, 2024

Next Steps

Considering the above, the next steps will need to involve a variety of actions. These are organized in Table 6 below into measures which enable the market to develop and become more sophisticated and those which will need to be led by the public sector.

TABLE 6: KEY SHORT-TERM ACTIONS TO INCREASE THE VIABILITY OF LONG-TERM CONTRACTS IN THE WOODY FEEDSTOCK VALUE CHAIN

Overarching	
CA-FRAME pilots retain an insurance broker/risk advisory firm with expertise in insurance and alternative risk transfer like captives and performance bonds, to assist woody feedstock value chain participants in structuring and pricing insurance for long-term contracts.	
Market Enablers	**Public Sector/State Solutions**
Convening with insurers and credit raters and woody feedstock chain stakeholders to address the topic of basic insurance training (including guidelines on actions to take to inspire confidence in the insurance industry) and credit rating education modules.	Briefing paper on third party claim funds for state level consideration. • This could flow down to the regional or local level, but a state-wide option could be explored first.
Convening with insurers and woody feedstock value chain stakeholders to educate insurers about the operations, risk mitigation and safety and performance regulation of woody feedstock value chain participants.	Convening of performance bond stakeholders, led by the state and including financial service leaders, to determine what needs to happen in the market to create and issue performance bonds for the woody feedstock value chain. • These would not be general obligation (GO) bonds, but would be like the CalHFA Conduit Issuer Program, which facilitates access to tax-exempt and taxable bonds by developers for eligible affordable multifamily rental housing.
Creation of a working group with insurers (or an insurance industry association) and relevant public officials to discuss woody feedstock specific risk/loss control options. Consider enabling conditions, such as the potential need for subsidy, or the issuance of state-wide eligibility standards.	A publicly funded reinsurance facility as a mechanism for increasing the availability of affordable coverage.

[23] Projected Cost is defined as the projected cost to value chain stakeholders seeking insurance
[24] Potential Impact on increasing or otherwise improving insurance uptake that supports the woody feedstock value chain

	• The facility could serve writers of small business insurance in the woody feedstock value chain.

Glossary

Automobile Insurance: Automobile liability insurance protects the insured against financial loss because of legal liability for automobile-related injuries to others or damage to their property by an auto. Levels of liability amounts required are dictated by each state and are required coverage. Some components of automobile insurance are first party related (i.e. payout for damages occurred if the driver skids off the road and hits a tree while driving) and others are third party related (i.e. payouts to another driver for physical harm or vehicular damage if the insured driver hits their car causing an accident). (Adapted from https://www.investopedia.com/)

Commercial General Liability: The commercial general liability (CGL) policy is a standard form of third-party insurance policy issued to business organizations to protect them against liability claims for bodily injury (BI), personal injury (PI) and property damage (PD) related to the premises, operations, products, advertising/marketing or completed operations of the insured. (Adapted from https://www.irmi.com/glossary)

Captives: An insurance company owned by a non-insurance parent company, that exists primarily to meet the risk management needs of its parent-owners rather than its own profitability. Captives can also be established by a group of companies banding together to cover specific risks within their industry to create new insurance capacity for situations where available commercial capacity is insufficient. (Adapted from https://www.irmi.com/glossary)

Public Claims Fund: A fund established by a public entity to pay claims for previously defined losses on behalf of an eligible group of beneficiaries. Examples include the California Prescribed Fire Claims Fund which pays third party claims for losses associated with the operation of prescribed fire practitioners.

Environmental Insurance: Environmental Insurance is a liability coverage that provides the insured with coverage from loss or damage resulting from unexpected and unintentional release of pollutants into the environment. This coverage, which may include claims against the insured for bodily harm, property damage, cleanup costs and third-party business interruption, is typically excluded from general liability and property liability insurance policies. (Adapted from https://content.naic.org/)

Financial backstop: Refers to mechanisms that indemnify risk to the covered party and can include policy changes, contract guarantees, regulatory waivers, subsidized insurance premiums, communal payout reserves and others. Financial backstops that reduce the risk to contracting and/or financing entities can facilitate increased activity levels and potentially reduce the cost of goods and services to the end-user.

First Party Insurance: Provides indemnification of loss to the insured, paying out when the covered risk or event occurs, and damage is quantified. Examples of first party insurance coverage include: property (buildings, plants and equipment), revenues (generally as part of business interruption coverage), automobile physical damage and some forms of cyber coverage. (Adapted from https://www.irmi.com/glossary)

Loggers Broad Form: Loggers broad form is a specialized form of commercial liability insurance coverage that, unlike general commercial liability insurance, provides protection against industry specific risks, including accidental damage caused to the property of others while on their property (timberlands), loading

and unloading of logs, fire suppression costs incurred by others due to fires caused by the business owner and potentially wildfire risk. Some loggers broad form policies cover only the industry-specific risks, in which cases the company may also need general commercial liability coverage. An example policy

Parametric solutions: Parametric solutions transfer the impact of adverse events on a company's revenues or costs based on the characteristics of a change in an index or event, not the severity of the loss itself. When a covered event meets threshold levels, payment is triggered automatically, resulting in loss settlements that are typically much faster than under standard claims filing procedures.

Property Insurance: Property insurance covers loss of property or revenue (if business interruption coverage is selected) due to specified perils or all perils except for those that are listed. Examples include: theft, vandalism, storms, fire and others. Property insurance may be first party only, e.g. covering loss only to the insured, or can be third party, covering damage and loss to the insured caused by others. Within property insurance, there are categories, including (Adapted from https://www.investopedia.com/):

- Business Interruption: This covers the loss of income that results from the inability to operate after a disaster.
- Boiler & Machinery (equipment breakdown): Physical damage and loss of income that results from a loss due to breakdown of covered equipment (often HVAC or similar equipment).

Supply Bonds (Surety Bonds): Supply bonds are the risk mitigation tool most used to address issues related to non-performance of contract. Effectively, supply bonds address the risk that a supplier will fail to deliver the materials (woody feedstock) stipulated by contract, serving as a type of performance guarantee to the offtaker (typically the biomass energy producer). Due to the cost, complexity, and requirements of issuing these bonds, they are generally used for larger contracts or projects involving a significant number of different material inputs, or a high volume of a few key inputs. (Adapted from https://www.irmi.com/glossary)

Surplus Lines: Surplus lines insurance is specialized coverage written by unlicensed, non-admitted insurance companies to cover specific extraordinary items and uncommon or high risks that are generally not covered by traditional admitted and licensed insurance companies under standard policies.

Third-Party Insurance: Third party insurance refers to policies purchased by the insured (the first party) through an insurance company (the second party) to protect against damage or claims caused by third parties because of first-party business conditions and/or operations. Third-party insurance is commonly liability insurance. Public liability insurance protects companies from claims filed due to slips, trips, and falls by others as a result of unforeseen conditions, property damage or environmental liabilities related to plant equipment and operations. Property damage liability insurance can cover all kinds of products including chemicals, agricultural products, and recreational equipment, protecting companies from lawsuits related to products and components of products that may cause damage or injury.). (Adapted from https://www.irmi.com/glossary)

Umbrella Insurance: Umbrella insurance provides an extra layer of liability insurance above and beyond the dollar limits of specific types of liability insurance. If, for example, the cost of a property damage lawsuit exceeds the limit of the company's property liability insurance, additional indemnification would kick in through the commercial umbrella insurance policy. (Adapted from https://www.investopedia.com/)

Workers Compensation: Workers compensation insurance is required by the state and provides coverage for workers that become ill or injured from their employment or work. Workers' comp is effectively third-party insurance with the employer representing the first party and the worker representing the third party.

Cover image credit: Simon Williams / The Nature Conservancy

Appendix

The Nature Conservancy Survey

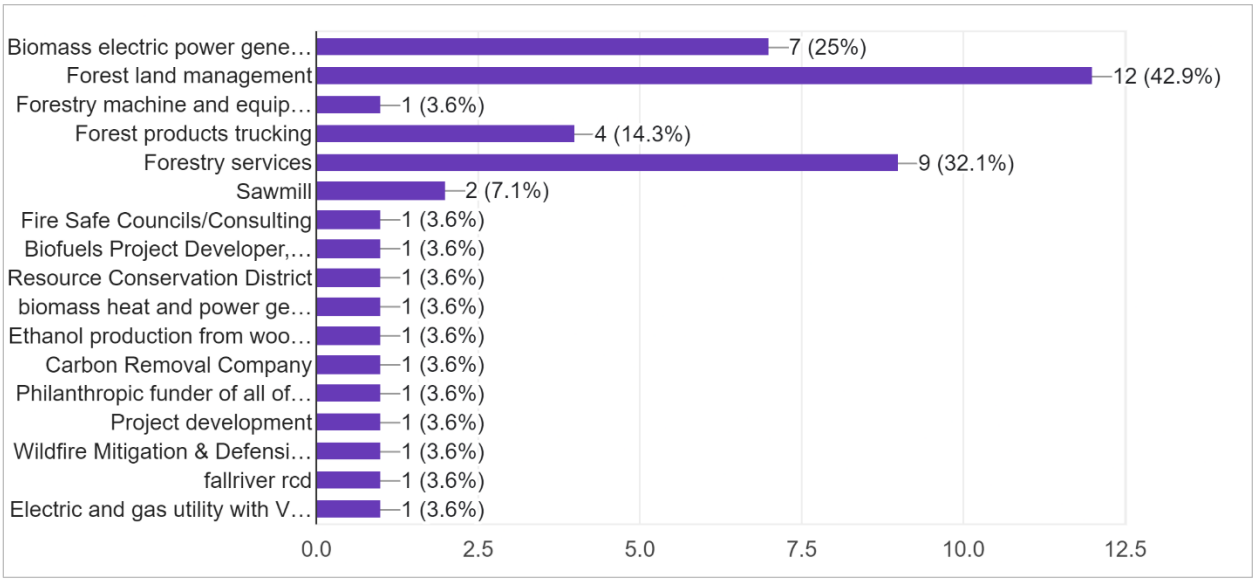
Woody Feedstock Survey Report

The Nature Conservancy, January 2024

As part of the California Forest Residual Aggregation for Market Enhancement (CAL FRAME) Pilot Project Program funded by the Governor's Office of Planning and Research, The Nature Conservancy surveyed stakeholders within the woody feedstock value chain in November and December 2023. The objective was to better understand risks, insurance needs and gaps associated with operations of a wide range of businesses in the woody feedstock industry and potentially, inform the development of solutions to mitigate risk within the woody feedstock value chain. A focus group was held with select members of the value chain to solicit feedback on survey design before administering it more broadly. The anonymous survey was emailed to about 375 recipients. There were 28 usable responses to the survey, for a response rate of approximately 8%. This report summarizes the results of the survey responses. Questions with write-in answers have been removed to preserve anonymity.

Industry Demographics

Question: Which of the following categories best describes the industry you work in or represent?



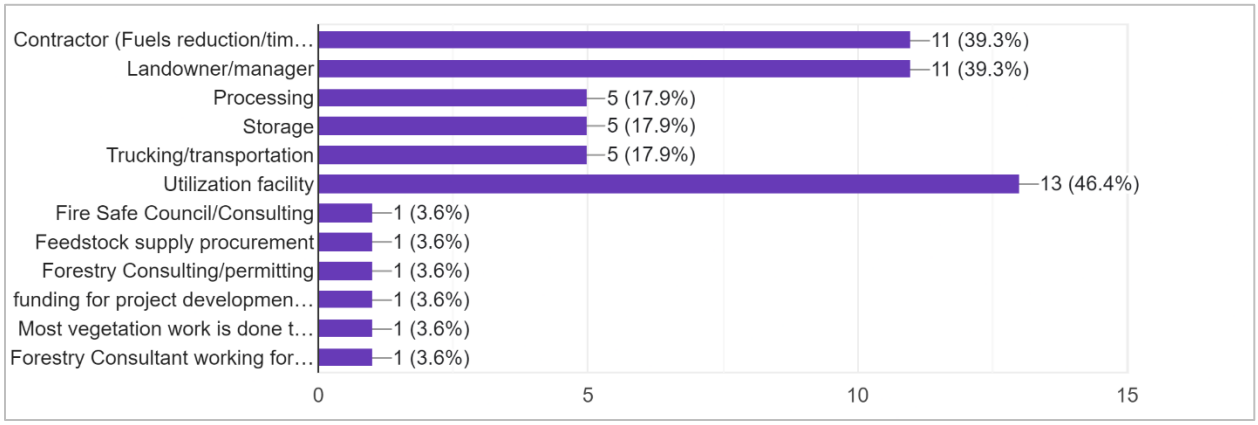
Many industry descriptions in the above were added by respondents:

1. Biofuels Project Developer, utilizing forest biomass
2. Biomass heat and power generation
3. Carbon Removal Company
4. Electric and gas utility with Vegetation Management programs
5. Ethanol production from woody biomass
6. Fall River RCD
7. Fire Safe Councils/Consulting
8. Philanthropic funder of all of the above.

9. Project development
10. Resource Conservation District
11. Wildfire Mitigation & Defensible Space

Of the 6 original industry categories, half had at least 7 responses ("Biomass electric power generation", "Forest land management", and "Forestry services") while "Forest products trucking" had 4 responses, "Sawmill" had 2, and "Forestry machine and equipment rental or leasing" had 1.

Question: Which part of the woody feedstock supply chain do you work in? Select all that apply.



While several categories submitted by respondents above add descriptions to existing categories, the following may be considered as new categories:

- Feedstock supply procurement
- Fire Safe Council/Consulting
- Funding for project development and capital construction

Note that each of the original categories included at least 5 responses.

County of Operation

Question: Which California counties do you work in? Please select all counties that apply, including counties that you have not previously worked in but plan to in the future.

The table below shows all counties with at least one response, sorted from most responses to least:

County	Responses
Lassen	16
Shasta	13
Modoc	12
Plumas	12
Placer	11
Butte	10
Sierra	10
Siskiyou	10
Tuolumne	9

El Dorado	8
Tehama	8
Trinity	8
Calaveras	7
Humboldt	7
Stanislaus	7
Amador	6
Mendocino	6
Nevada	6
Glenn	4
Madera	4
Mariposa	4
Yuba	4
Colusa	3
Inyo	3
Sonoma	3
Yolo	3
Fresno	2
Kern	2
Lake	2
Marin	2
Merced	2
Sacramento	2
San Joaquin	2
Santa Cruz	2
Sutter	2
Alameda	1
Alpine	1
Contra Costa	1
Del Norte	1
Mono	1
Monterey	1
Napa	1
San Benito	1
San Francisco	1
San Luis Obispo	1
San Mateo	1
Santa Clara	1
Solano	1
Tulare	1
Total	**226**

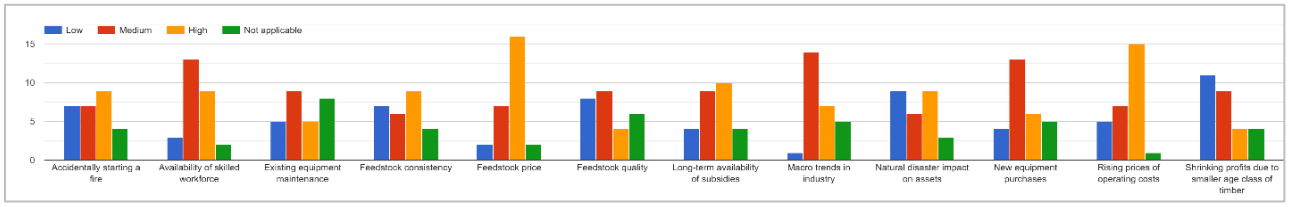
Most responses included more than one county. Below is a breakdown of the number of counties listed per response.

Number of counties listed in response	**Number of responses**
1	3
2	4
3	2

4	3
5-10	10
Over 10	6
Total	**28**

Risk Factors

Question: How much risk do you face from the following factors? Please answer for each.



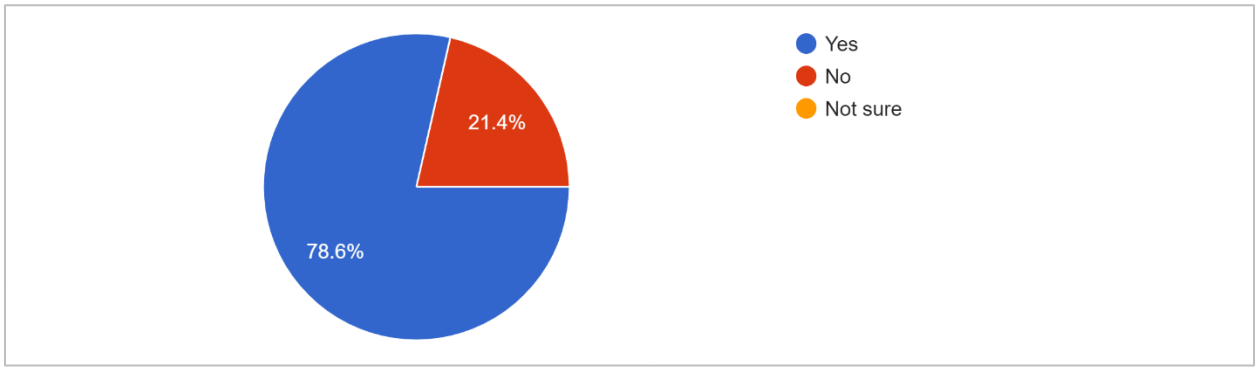
Below is a table showing the number of responses by risk factor (including N/A, low, medium and high) and the % of responses that rated the factor as medium or high risk. “Feedstock price” and “Rising prices of operating costs” are the only factors cited as high risk in over 50% of responses. While feedstock prices are a top concern, “Feedstock consistency” (35%) and “Feedstock quality” (15%) are much less so.

While “Accidentally starting a fire” and “Natural disaster impact on assets” have the same number of responses classified as high (33% each), the responses are not identical at the individual level. It is not clear to what degree respondents are concerned with natural disasters other than fires.

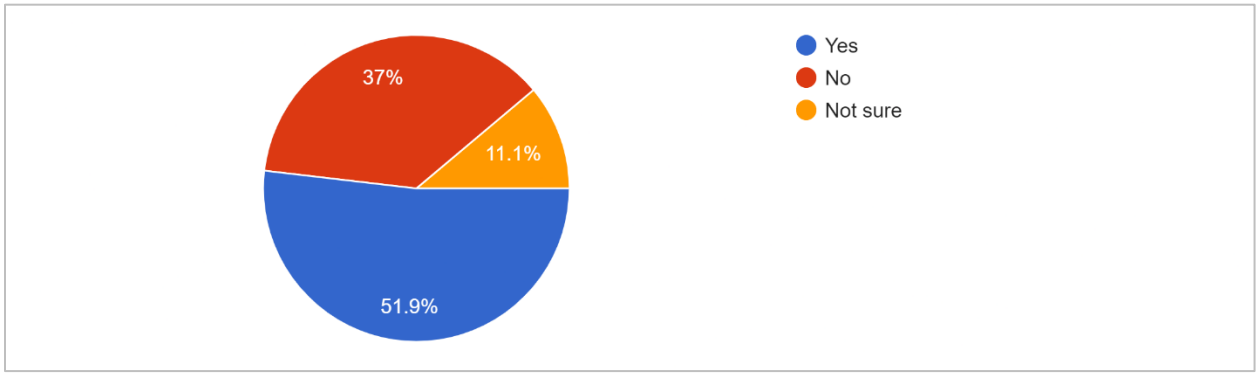
“Availability of skilled workforce”, “Macro trends in industry”, and “New equipment purchases” were not considered to be high risk factors by the majority of respondents (33%, 26%, and 21%, respectively), but they were the top factors considered to present medium-level risks with over 40% of responses classifying them as such.

Risk Factor	Total Responses	% "Medium"	% "High"
Accidentally starting a fire	27	26%	33%
Availability of skilled workforce	27	48%	33%
Existing equipment maintenance	27	33%	19%
Feedstock consistency	26	23%	35%
Feedstock price	27	26%	59%
Feedstock quality	27	33%	15%
Long-term availability of subsidies	27	33%	37%
Macro trends in industry	27	52%	26%
Natural disaster impact on assets	27	22%	33%
New equipment purchases	28	46%	21%
Rising prices of operating costs	28	25%	54%
Shrinking profits due to smaller age class of timber	28	32%	14%

Question: Are you concerned about the risk of contract failure of feedstock supply contracts? Such risks could arise when your counterparty fails to supply biomass waste material for the term of the contract.



Question: If you are concerned about feedstock supply contract failure, does it limit the length of the term of contract that your business would agree to?



While nearly 79% of responses considered feedstock contract failure to be of concern, somewhat less (52%) said it affected the length of term of contract they would agree to.

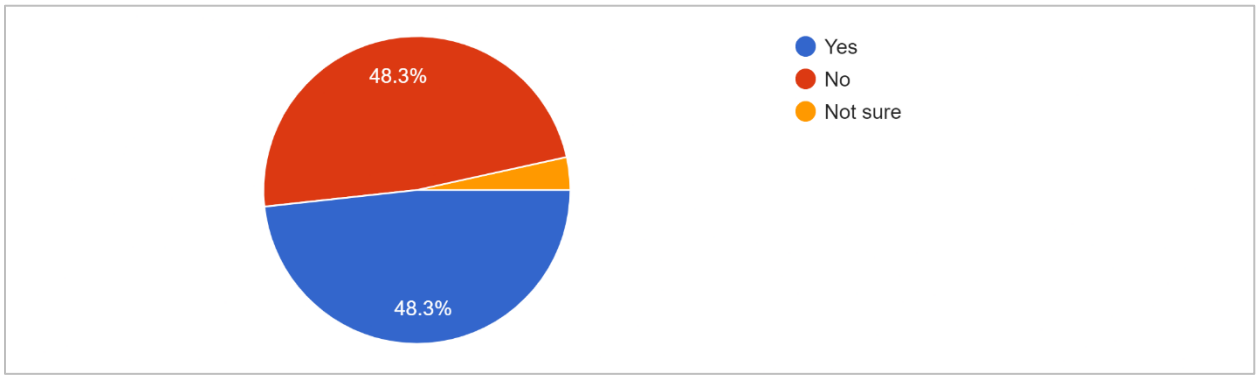
Question: Are there any risks to your business that are not included in the previous questions? List all that apply and, where possible, describe the severity of risk for each as low, medium, or high.

This question allowed respondents to describe any other risks they face. A summary of the number of mentions by category is provided in the table below.

Category	Number of mentions
Contracting risk	2
Economic factors	6
Feedstock supply	2
Insurance	4
Other	2
Regulations/permitting	5
Sawmill	3

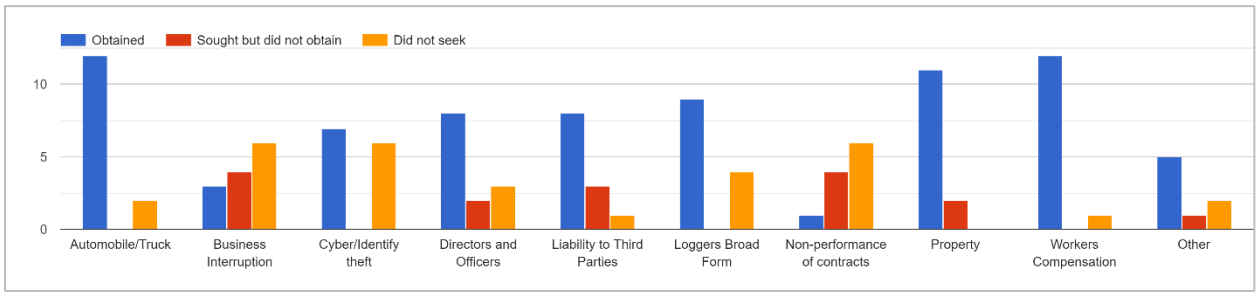
Seeking Insurance

Question: Have you sought insurance to reduce your risk?



Responses were evenly split on the question of whether participants had sought insurance.

Question: What kinds of insurance have you sought and obtained?



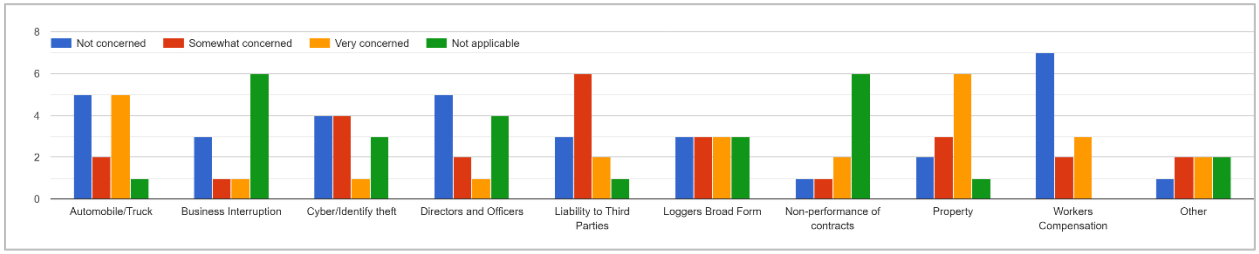
	Obtained	Sought but did not obtain	Did not seek	Success rate
Automobile/Truck	12	0	2	100%
Business Interruption	3	4	6	43%
Cyber/Identify theft	7	0	6	100%
Directors and Officers	8	2	3	80%
Liability to Third Parties	8	3	1	73%
Loggers Broad Form	9	0	4	100%
Non-performance of contracts	1	4	6	20%
Property	11	2	0	85%
Workers Compensation	12	0	1	100%
Other	5	1	2	83%

The most commonly sought and obtained types of insurance were “Automobile/Truck”, “Workers Compensation”, and “Property”, with 10 or more responses each of “Obtained.” The least sought type of insurance was “Non-performance of contracts” with only 5 responses indicating they had sought it and only one which succeeded in obtaining insurance. “Business interruption” was also not commonly sought (7 responses), with only 3 successfully obtaining insurance. For “Other” insurance, the following types were identified as either insurance they have either sought or explored seeking:

- Wildfire
- Fuel supply and performance insurance
- Hazardous Material, Medical, Umbrella
- Errors and Omissions
- Pollution

Losing Insurance and Rate Increases

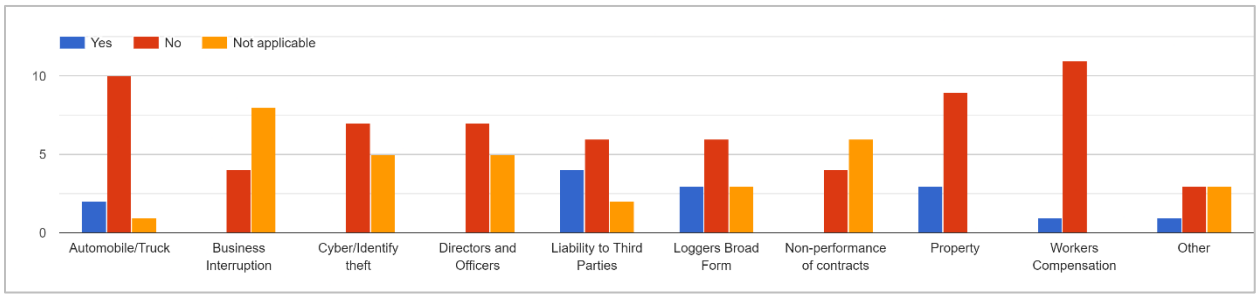
Question: How concerned are you about losing your existing coverage?



Concern over potential loss of existing coverage varies a fair amount by insurance type. Only property insurance had 50% of responses indicating a very high level of concern. On the other end of the spectrum, 1 response each indicated high concern about potential loss of Business Interruption, Cyber/Identify theft, and Directors and Officers insurance.

Insurance type	**Not concerned**	**Somewhat concerned**	**Very concerned**	**N/A**	**Total responses**	**Overall Risk Rating**
Automobile/Truck	5	2	5	1	13	1.00
Business Interruption	3	1	1	6	11	0.60
Cyber/Identify theft	4	4	1	3	12	0.67
Directors and Officers	5	2	1	4	12	0.50
Liability to Third Parties	3	6	2	1	12	0.91
Loggers Broad Form	3	3	3	3	12	1.00
Non-performance of contracts	1	1	2	6	10	1.25
Property	2	3	6	1	12	1.36
Workers Compensation	7	2	3	0	12	0.67
Other	1	2	2	2	7	1.20

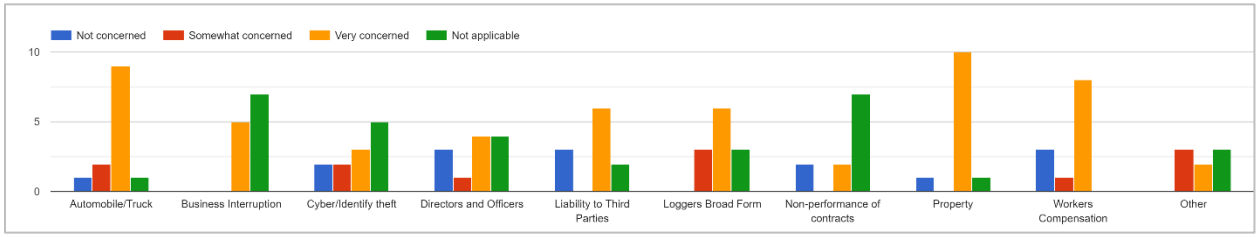
Question: Have you previously lost coverage?



The most commonly lost forms of coverage were “Liability to Third Parties” (40%) and “Loggers Broad Form” (33%).

Insurance Type	Yes	No	N/A	Total responses
Automobile/Truck	2	10	1	12
Business Interruption	0	4	8	4
Cyber/Identify theft	0	7	5	7
Directors and Officers	0	7	5	7
Liability to Third Parties	4	6	2	10
Loggers Broad Form	3	6	3	9
Non-performance of contracts	0	4	6	4
Property	3	9	0	12
Workers Compensation	1	11	0	12
Other	1	3	3	4

Question: How concerned are you about rate increases to your existing coverage? Rate increases may include rising deductibles or reduced limits provided.



Five forms of insurance had at least 50% of responses reporting they were very concerned about rate increases: Automobile/Truck, Liability to Third Parties, Loggers Broad Form, Property, and Workers Compensation.

Insurance type	Not concerned	Somewhat concerned	Very concerned	N/A	Total responses	Overall Risk Rating
Automobile/Truck	1	2	9	1	13	1.67
Business Interruption	0	0	5	7	12	2.00
Cyber/Identify theft	2	2	3	5	12	1.14
Directors and Officers	3	1	4	4	12	1.13
Liability to Third Parties	3	0	6	2	11	1.33

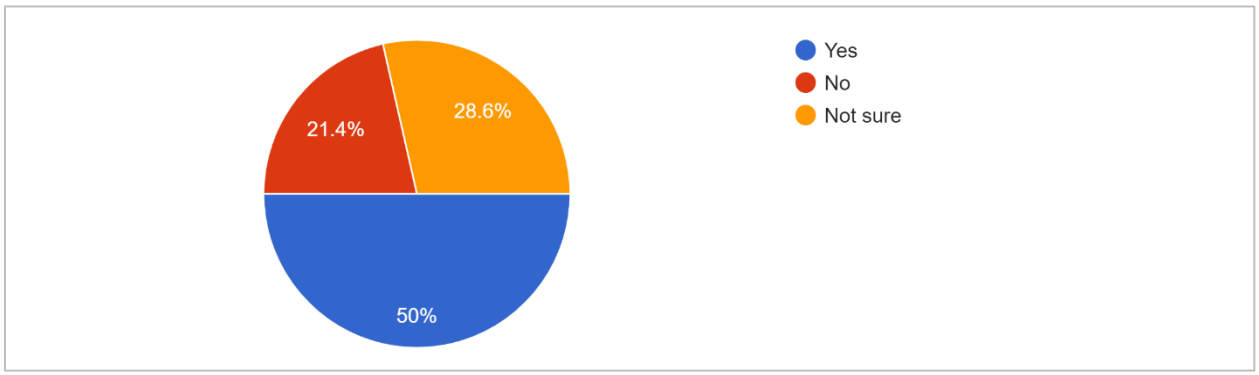
Loggers Broad Form	0	3	6	3	12	1.67
Non-performance of contracts	2	0	2	7	11	1.00
Property	1	0	10	1	12	1.82
Workers Compensation	3	1	8	0	12	1.42
Other	0	3	2	3	8	1.40

Other Questions

Question: How much do you estimate you spend in total on insurance annually?

All responses are provided below.
$10,000
$30,000
$400,000
$400,000
$416,661
$500,000
$700,000
$1,000,000

Question: Do you feel like you have adequate insurance to meet your business needs?



Question: Does a lack of insurance or the unaffordability of insurance limit your operations in any way?