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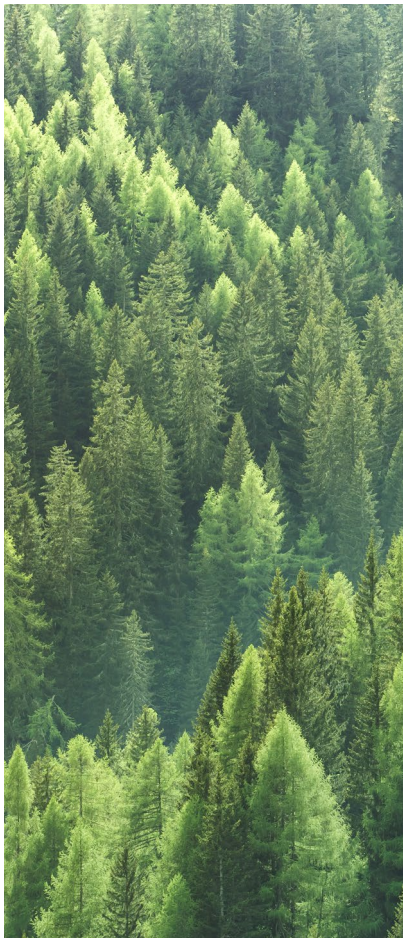
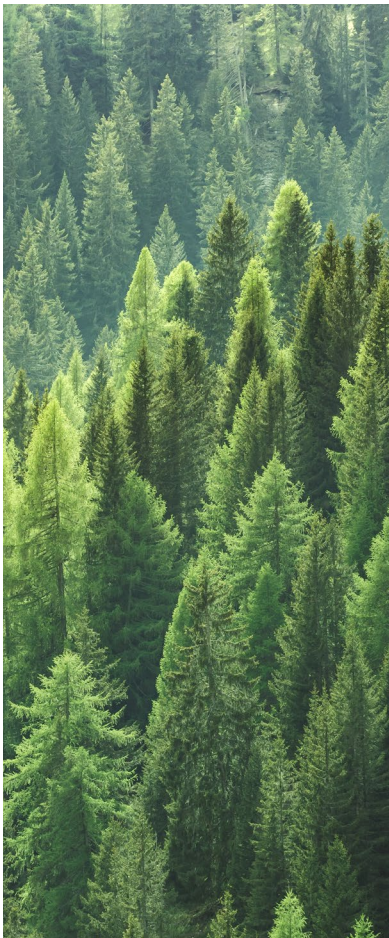
Biomass Energy: A Climate, Conservation, & Livelihoods Challenge

May 2021





Written by Richard Zell Donovan

Prepared with support from Kathryn Fernholz

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About The Authors

The author, **Richard Zell Donovan**, is an independent forest advisor, lives in Jericho, Vermont, and has 40+ years of field experience in 50+ countries in boreal, temperate and tropical forests. Email is pelicanzell@gmail.com. He has lived in Mexico, Paraguay and Costa Rica, has a Bachelor of Arts degree and dual major in history and romance languages and a Master of Science in natural resources management. Perspectives are meant to foster discussion and are the sole responsibility of the author. Richard can be reached at pelicanzell@gmail.com.

Kathryn Fernholz is the CEO/President of Dovetail Partners and a past member of the Sustainable Biomass Program (SBP) Technical Committee.

In January 2019, I joined the Standards Committee for the Sustainable Biomass Program (SBP).[1] [2] Since my engagement with SBP, some have asked me: why? Does this mean I am an unabashed advocate for biomass energy, in particular for large-scale industrial wood energy (heat or electric), or wood pellets? Is there such a thing as "good biomass"? Have I gone to the "dark side"?

The following are personal reflections, some responses to these questions, and finally, my ideas for doing biomass "the right way".

From natural gas to coal to oil, I have seen first-hand the negative impacts of fossil fuels extraction in many countries (e.g., Argentina, Bolivia, Canada, Chile, Indonesia, Jamaica, Mexico, and USA). These impacts - social, economic, environmental, and war - are all too often ignored (or accepted as a necessary evil) because they happen in places distant from population centers or their impacts are not readily visible. Based on my career in sustainability and my personal experiences, I think we need to ask hard questions about the "big picture" logic of favoring any fossil fuels over biomass energy - for sustainability, livelihood, and renewability reasons. Procurement of non-renewable resources, including fossil fuels, have major impacts on ecosystems, communities, water, soils, and wildlife. Perhaps fossil fuels play a role as short-term solutions – the so-called "transition" options - but philosophically I want renewable and sustainable, with positive impacts on communities, workers, and the environment. My perspective has gone through many iterations, based on field experience in 50+ countries and contributions by scientists, activists (even "scientist/activists"), and practitioners.

I am personally committed to renewable energy. My family has solar panels on our roof, and cutting and burning well-dried firewood has been our primary heat source for 40 years. Solar started meeting most of our home's electricity needs about five years ago, after also completing a home energy audit and investing to improve home insulation, a new boiler, and window upgrades. An "excess" portion of our solar production also provides electricity for our daughter's nearby home through a credit-sharing program.

Professionally, my experience with industrial wood energy and forest management goes back to 1981. As a graduate school researcher, I completed a survey of sawmill residues used for industrial wood energy in the tri-county region of Cheshire County, New Hampshire; Franklin County, Massachusetts; and Windham County, Vermont. Subsequently in 1985-86, colleague and forester Yurij Bihun and I examined the silvicultural impact of four wood-fired power plants in the northeastern USA (Vermont, Maine, Maryland, and New York states) through a project supported by the Coalition of Northeastern Governors (CONEG). Our final

1 SBP is headquartered in Europe and runs a certification program focused on moving towards more sustainable biomass production and biomass producers (BPs) around the globe. The SBP certification system is designed for woody biomass, mostly in the form of wood pellets and woodchips used in industrial, large-scale energy production. SBP has developed a certification system to provide assurance that woody biomass is sourced from legal and sustainable sources. https://sbp-cert.org/

2 SBP's main focus is on woody biomass, in particular from wood pellets produced in places like Canada, USA, Scandinavia, the Baltics (Estonia, Latvia and Lithuania), Russia, and recently the Ivory Coast, Vietnam and Malaysia, among others. These pellets are used in global and regional markets, particularly in Europe, North America, and increasingly Asia. SBP also covers wood chips going to industrial energy markets (for heat or electricity) at various scales around the world, and in the future, may even consider other forms of biomass that could be used for biomass energy (e.g., residues from agricultural processing of crops like peanuts, sunflowers, bagasse from sugar cane, etc.).

report noted that biomass harvesting can have positive forest impacts; but that in reality, the majority of the wood chip supply, at that time, was coming from land use clearings or wood waste from construction sites around New England and the Northeast US, not from silvicultural efforts to improve the forest. Although the potential for positive impact may have been happening on some forest sites, we noted then that the industry itself was not doing a very good job of independently ensuring this was the case or examining its impact.

From 1990-1993, I contributed to the emergence of the Forest Stewardship Council (FSC) global forest certification system. This was followed by my involvement in other sustainability-oriented certification programs in many sectors (including soy, sugar, palm oil, marine fisheries, steel, oil and gas, carbon, biofuels, aquaculture and biomaterials).[3] Building primarily (but not solely) on the experience from certification systems, we have practical tools for examining forest practices and improving socioeconomic performance. Enough so to take on the challenge of ensuring at least well-managed, if not fully sustainable, forest management at both industrial and non-industrial scales. Though forest certification remains imperfect, it has contributed concepts and practices that improve forestry and forest product supply chains from social, environmental, traceability, and technical perspectives. We are constantly gaining more tools for reducing greenhouse gas (GHG) emissions and increasing GHG conservation in forests while maintaining other forest values.

In the US, there are over 100 woody biomass energy facilities, in addition to facilities using other forms of biomass.[4] One of the oldest wood-fired electricity generating power plants is right here in my backyard of Burlington, Vermont. There are also fairly high levels of wood use at the household level for heat. My own state (Vermont) has incentives in place to foster the use of more efficient, less polluting commercial and residential wood and wood pellet stoves. The big global change over the past decade has been the growing percentage of wood volume that is consumed for the large-scale industrial electrical energy market in places like Belgium, Denmark, Netherlands, United Kingdom, and increasingly India, Japan, South Korea and Taiwan.

There has been criticism of woody biomass energy-related harvests in Estonia and other parts of the Baltics, the southeastern US, and more recently British Columbia, Canada. Such criticism is valuable in pointing out problems in commercial forest management. Sometimes these critiques have asserted that biomass energy is causing deforestation or ecosystem degradation. My conversations with scientists, local NGOs, and others on the ground, indicate the situations are more complex and not as simple as painted, particularly on the issue of deforestation, or do not always reflect the realities imparted by others. In part, this disconnect may be because some criticisms are longstanding, and some biomass operations have been trying to make changes to respond – in forests and at their mills. Philosophically, I am concerned that critics broadly do not consistently give recognition to the value of forestry and well managed forests for rural communities – contributing to an unhealthy rural-urban divide and disconnect on forest issues. Articles for and against biomass energy often provide perspectives that I sometimes agree with, and sometimes not. What is clear is that if the sector is to retain "social license" (i.e., public support) as a viable renewable energy option, the sector will need to constantly and deeply examine its own work, respond to criticisms, and improve when necessary.

3 FSC was preceded by, and learned from, both "biodynamic agriculture certification" pioneered by Demeter International headquartered in Germany and the American Tree Farm System (ATFS) forest certification program in the USA. The roots of biodynamic or organic certification go back to 1928. Tree Farm formally started in 1941 and is managed by the American Forest Foundation. Sustainability- or "responsible"-oriented certification programs have gained momentum since 1990, across many sectors, raw materials, and supply chains.

4 As of September 2020, according to Biomass Magazine, there are 103 "biomass power" facilities in the USA and 66 "waste to energy" facilities that may use wood or other biomass as part of their raw material supply. As of October 2020, 165 "renewable natural gas" facilities are in place or being constructed in Canada and the USA.

Here are my ideas on how forest-related biomass energy can be done **the right way**.

Climate Smart Forestry Practices

Positively affect "in the forest" GHGs with climate resilient forestry practices

Reducing GHG emissions requires consideration of changes to practices related to:

- commercial timber harvesting
- protection of at-risk and rare forest types (i.e., primary forest and old-growth)
- rotation lengths and cutting cycles
- treatment of slash and harvest residues
- eliminating "clearcutting"[5] as a term within forestry practice
- uneven aged management techniques
- harvest planning and operations
- restoration of degraded forest ecosystems and impacted water resources
- use of lower emission equipment and technologies

Work is continually being done that may identify new and better GHG-conserving or climate resilient practices, globally and within specific ecosystems, and for the unique challenges of both industrial management and in smallholder or family forests. These are the practices that should be incentivized.

5 In this context, clearcutting refers to the creation of large forest openings with little to no meaningful retention (from wildlife and silviculture perspectives), insufficient riparian zone protection zones, or the absence of spatial design that better conforms to natural conditions, wildlife habitat needs, and improved silviculture. "Clearcutting" is a term used in forestry texts and other guidance (even legislation) for a type of harvesting that creates patch openings, which may be small or large. It is my opinion (as a forestry generalist, not a classically trained forester) that patch cuts and "even-aged management" are viable tools for regenerating forests, depending on the biome (tropical, temperate or boreal) or production system (plantation or natural forest). Unfortunately, the forestry community has lost the public relations game on the term "clearcutting". The public by and large sees clearcutting as a negative. Personally, I no longer use the term, but rather refer to patch cuts and at the same time explicitly refer to their size and logic, technical precautions/options needed to use them effectively, e.g., variable retention (perhaps small patches of trees for the purpose of reseeding a new forest or for wildlife habitat), tuning the size of the opening to what's necessary for regenerating a target tree (or grouping of) species, shaping to better fit to landforms and natural conditions (e.g., location of streams, riparian zones), etc.

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Enable Restoration

Use energy markets to foster conservation, improved forest management[6] (IFM) and the conservation and restoration of rare or at-risk forest ecosystems

Currently, there is a major global push on restoration, as we are just beginning the UN Decade on Ecosystem Restoration initiative. Restoration initiatives are sometimes finding that wood supply for energy (locally or internationally) helps them pay for and do restoration of native ecosystems. This is happening in the Southeast US, New Mexico, California, Vermont, India, and elsewhere around the world. Restoration efforts must not be used to "greenwash" forestry operations of companies that are implementing poor practices elsewhere as part of their corporate footprint or sourcing. The biomass energy sector can be a vital partner for well-designed restoration efforts by providing financial support (i.e., market opportunities, investment, and partnership potential) for forest practices that either re-establish or improve the quality of natural forest. Research is taking place on how to better conduct forest management or harvesting in ways that might even accelerate the development of late successional old growth (LSOG) forest attributes. This is happening in degraded ecosystems by, for example, proactively creating more coarse woody debris, thinning to foster the growth of long-lived tree species, extending rotation lengths, or other techniques to foster wildlife habitat values associated with LSOG. The key is that wood energy can be a durable and valuable market for low grade fiber, supporting better silviculture and improved livelihoods for local communities.

Full Utilization

Incentivize use of mill residues

The contrast between the use of mill or processing residues (sawdust, bark, shavings, etc.) versus forest residues (slash, branches, etc.) in the production of biomass energy is complicated. In some locations, mill residues make up 80-90% or more of the raw material used for making pellets or as a direct energy source. In other locations, the opposite may be true – the raw material may be chipped logs directly from the forest. Reliable third-party audited data on the raw material is not consistently available and it should be. If we are able to consistently ensure or incentivize practices so that the highest possible percentage of mill residues is used, research indicates this could favorably impact GHG values and have other positive benefits for local livelihoods by removing material from the waste stream and minimizing emissions associated with transport and production of varied forest products. To be clear, I don't think only mill residues should or must be used for biomass energy - there are many situations where the use of wood directly from trees makes sense, but first priority should be put on using mill residues for their multiple uses, including energy. Enhancing the "highest and best use" of wood is also key. In my region, and many others, it is common best practice for loggers to do "log sorting", optimizing the allocation of harvested wood to the best-paying and usually longer-lived uses – construction, furniture, architectural plywood, or the expanding mass timber construction sector. Loggers typically do this because it means more revenue for them, but also the landowners they work with.[7]

6 "Management", is sometimes thought of as a synonym for logging. I disagree. From where I sit, management is any intentional action by humans – strict conservation or protection, reforestation, harvesting of timber or non-timber forest products or ecotourism/recreation. All management options or tools can be used well or misused, logging or harvesting being perhaps the most obvious and contentious one.

7 Though there are exceptions, few commercial forestry managers (landowners, foresters, or loggers) have their number one management objective as meeting wood energy needs. Typically, they allocate smaller diameter trees to lower-paying (per volume harvested) markets, such as energy, pulp and paper, pallets, etc. The commercial use of such low-grade fiber may be what pays the bills (taxes, education of family members, crisis bills, etc.) for some landowners. It is not atypical for such fiber to represent between 20-80% of total harvested volume for a particular harvest, depending on the quality of the forest. Many landowners (private or public) also need low-grade fiber markets to pay for thinning or other forest management interventions, including LSOG restoration, management, or recovery. The absence of such markets can be a constraint or limit their ability to do such work.

Localize and Optimize Energy Production

Incentivize local energy use and industrial co-generation

There are some regions, like the Northeastern US and parts of the Baltics and Scandinavia, where local and regional markets are already a large driver for biomass energy. This can contribute to a reduced carbon footprint of the pellet or chip production and also provide sustainable, value-added jobs. Perhaps a design goal should be to continue and expand the practice that biomass facilities serve as a cogenerating energy resource or new business hub, supporting value added industries and providing energy and livelihoods to the local community (i.e., co-gen with biochar production).

Zero Tolerance for Association with Conversion and Degradation

Make sure conversion to other land uses or the degradation of forests & other "at risk" ecosystems is not associated with the biomass energy sector

We generally need to work to stop conversion and degradation of natural ecosystems, particular those with unique or high conservation values (including social values) and seek to limit the footprint of human settlements in at-risk ecosystems. This will require further public and private sector actions as well as continued work across multiple commodity sectors.

Verify Climate Performance

Forest and agriculture certification systems need to focus on climate resilient land use practices

Having been in the middle of the so-called "certification wars" in forestry for over 30 years, my observation is that the competition of ideas and innovation around certification has had a positive impact on forests, communities, and supply chains. Because using residues from the forest or farms for energy will continue to be a part of forestry or agriculture in many places, certification standards should reach further to enhance forest and farm climate resiliency, both regionally and within individual farm/forest management units. Certification systems need to improve in many other respects – protection of primary forests, more efficient auditing processes, better support for engagement with communities, indigenous peoples and smallholders – but particularly on climate. All certification systems should include more climate resilient practices. The systems are already positioned to make a better contribution on the climate front – let's use them to do it.

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Embrace Innovation

Use the latest technology to reduce GHG emissions, smoke, and particulates associated with combustion, and do better planning for the most efficient transport

At the "burning" end, reducing GHGs requires more modern, efficient, clean, or otherwise enhanced equipment for wood fired power plants, gasification, and the use of bioenergy carbon capture and storage (BECCS). All are necessary for reducing particulate and GHG emissions. There should also be continued development of more efficient modes of transport for getting the raw material to the combustion or use point. Shipping can actually be more efficient than trucking or rail (even for shorter distances) – a bit of a counterintuitive reality, creating a challenging, ongoing discussion on better transport, GHG emissions reduction, and transport implications.

Work Across the Landscape and Communities

Support forests and forestry as part of both rural and urban lifestyles

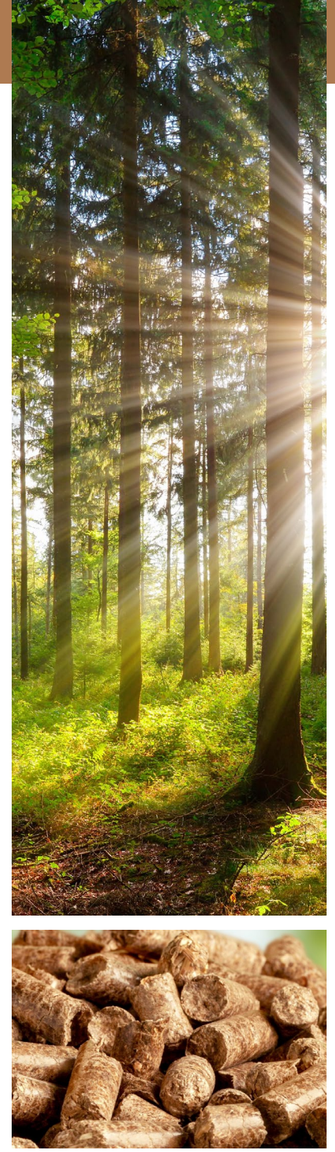
Communities across the landscape need forests and sustainable job opportunities, which can both be supported by good forest management. Having experienced the benefits of global trade in many countries, in both urban and rural communities, I would suggest that global trade should not be seen only in a negative light – it can be a viable sustainable and socioeconomic option for many communities and a path out of poverty.

Conclusion

Depending on your perspective, you may see some or all of these ideas as absolutely necessary, too expensive, wishful thinking, laden with poor thinking, or patently unrealistic. But I believe these climate-challenged times require us to “tilt at windmills” (thanks Cervantes) – we must have the courage to think and do things differently for our short, medium, and long-term future. This will require hard decisions.

Understanding the pros and cons of using biomass for energy, particularly wood, is highly specific to where the wood comes from – geography, type of input (mill versus forest residues), the state of local forests, market conditions, and the multiple climate dynamics associated with production and use. Together, all these factors point to what I see as the challenging set of questions around biomass energy. The real-life situations defy generalization, whether from a forest, energy, climate, or livelihood perspective. I believe that the best long-term solutions must be renewable and have positive impacts on affected ecosystems and livelihoods; in the directly affected local communities where the biomass comes from, at the mills that use those raw materials, and in the places where other raw materials come from to make the technologies. I see all energy technologies as having pros and cons, both in their operation and sourcing, but also the dynamics associated with sourcing the raw materials used to make each, including what happens with those raw materials after use.

I joined SBP not as an advocate for the biomass energy or industrial logging, but as an advocate for positive change for the forest, land and water stewardship, and climate dynamics associated with the production of biomass energy. Seen in full, the challenge is to evaluate every energy option for all its climate, conservation, livelihood, and raw material (even waste disposal) implications, and we must seek opportunities for renewable and sustainable, with positive impacts on communities, workers, and the environment.



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