

Cascading of woody biomass: The tricky path from principle to policy to practice

The concept of “cascade use” or “cascading” of wood has risen to prominence in recent years in separate but related discussions within the European Union about renewable energy, the “bio-based” economy and the “circular” economy.

Cascading is a complex concept, but put simply, it means that natural resources should be used and recycled for as long as possible, and allocated to the most valuable purposes possible at each stage. Translating this principle into policy and practice has proven difficult, however, not least because it is hard to define what constitutes a “valuable purpose”.

In the European Union in particular, there have been intense debates about whether and how the cascading principle should be incorporated into policy. The discussion has focused mainly on woody biomass and is tightly connected with ongoing debates over the role of wood-based bioenergy in future EU energy policy.

This discussion brief presents the conceptual origins of cascading; provides an overview of how cascading fits into ongoing EU policy debates; and reviews different policy options that have been discussed for implementation of cascading. It ends by highlighting key questions that need to be addressed to advance the current EU policy discussion on cascading. The brief expands on an analysis for IEA Bioenergy published last year.¹

The origin of cascading

The concept of cascade use or cascading of resources is best understood as an outgrowth of some of the ideas about closing resource loops that form the basis of European policies on waste management.² As shown in Figure 1, cascading can be illustrated as a stepwise downward flow, similar to water that flows across a series of rocks – hence the term “cascading”.

Sirkin and Ten Houten first presented the cascading framework in 1994.³ They stipulated that in order to maximize resource efficiency and reduce environmental stress, resources should be used and recycled for as long as possible, for the most valuable purposes possible.



Sawmill by-products such as wood chips can be used for bioenergy, but also to make paper or particleboard.

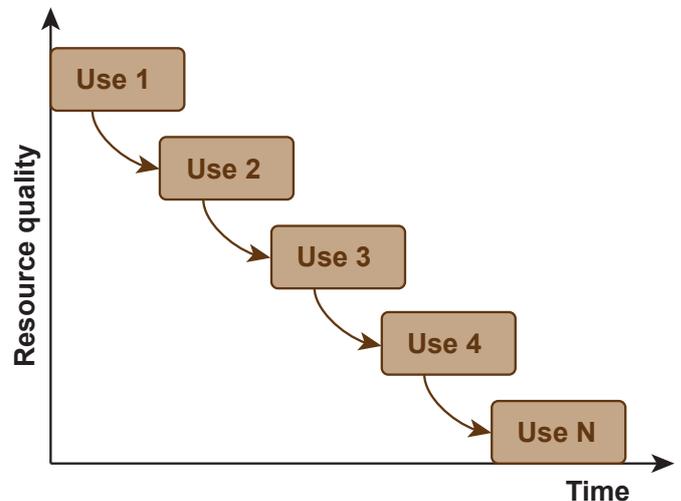


Figure 1: Illustration of the cascading principle

Source: Adapted from Sirkin and Ten Houten (1994).⁴

How “valuable” a particular use of a resource is depends on the “resource quality”, a concept that Sirkin and Ten Houten did not fully explain. They did draw inspiration from the thermodynamic concept *exergy*, which can be said to mean “energy quality”.

A simplified example: Electricity can be used both for space heating and to power industrial machinery, whereas 85°C water can be used for space heating but not to power industrial machinery. Thus, it makes sense to use 85° water for space heating and electricity to power industrial machinery. Sirkin and Ten Houten’s “resource quality” concept expands this thinking from energy to all resources, but does not provide any clear guidance on how this could be implemented.

Cascading in current EU policy discussions

Development of ideas related to cascading continued through the 1990s and early 2000s (e.g. within the field of industrial ecology⁵) but “cascade use” and “cascading” as phrases were largely absent from policy discussions, at least at the EU level, until the most recent five-year period.

Now cascading has become a commonly reoccurring concept, both in EU policy discussions on forests and energy, and in actual EU policy in these fields. This is likely a consequence of two parallel trends: a) a growing policy focus on the circular economy, and b) increasing political tensions about the expansion of wood energy in the European Union.

A circular economy is defined as “one that is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times”.⁶ The concept has been widely promoted in recent years. A common theme in both cascading and the circular economy is that energy use of wood should be avoided,



The Werl Power Plant in Germany is fuelled by wood waste and wood chips.

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distortions of competition in the market for wood-based products”.¹³

Both environmental NGOs and industrial users of wood contend that European policy affecting forest products needs to become more closely aligned with the cascading principle.¹⁴ The industry position emphasizes the need to even the “uneven playing field” between energy and material use of wood. However, industry organizations seem to be sceptical of legal enforcement of the cascading principle, while NGOs tend to favour of stronger enforcement.¹⁵

On the other side of the debate are European forest owner organizations and bioenergy industry representatives. They have expressed concerns about how the cascading principle might be applied.

There are fears that strict implementation of cascading would result in market restrictions – for instance, by limiting to whom forest owners can sell their wood.¹⁶

because this would constitute an end to the wood cascading chain or a break in the circular resource flow.⁷

The discouragement of energy use of biomass in the cascading concept has tied it closely to the ongoing discussions and debates on the future EU energy system. These discussions became increasingly intense in anticipation of the European Commission’s new Renewable Energy Package (“RED II”) that was presented in late November 2016 and will cover the time period 2020–2030.⁸

Since 2008, many EU Member States have turned to wood-based bioenergy as a means to increase the share of renewable energy in their respective energy mixes, as part of broader strategies to meet the targets set by the EU Renewable Energy Directive.⁹

However, the European wood energy expansion has come under criticism, mainly from two directions. Environmental groups in Europe have argued that policy support for wood-based bioenergy is leading to increased risks of deforestation and biodiversity loss. This criticism is especially focused on the situation in the southeastern United States, a region that rapidly has emerged as a key supplier of wood pellets to European utilities.¹⁰

Second, portions of the European forest industry have argued that financial incentives for bioenergy are diverting certain types of wood products – particularly sawmill residues but also low-quality roundwood – away from industrial utilization. The incentives are said to have made it difficult for industrial users to compete for available wood.¹¹

An example of the latter controversy is the recently closed investigation of the UK government’s financial support for the conversion of a unit at Drax Power Station from coal to wood pellets. The probe was launched at the behest of American pulp and paper companies that claimed subsidies to Drax and the ensuing rise in demand for small-diameter roundwood were distorting U.S. wood markets. In its verdict, however, the European Commission concluded that the support granted by the British government to Drax would “not lead to undue

Cascading in current and future EU policy

The concept of cascading has already been applied in several EU policy documents. Since 2012, “cascade use” or “cascading” has been highlighted as a central principle in documents from at least four different EU policy fields, including the EU Bioeconomy Strategy,¹⁷ the EU Forest Strategy,¹⁸ the EU Circular Economy package,¹⁹ and the directive on indirect land use change (iLUC).²⁰

The iLUC directive is the first piece of EU legislation that explicitly requires raw materials used for biofuels to be sourced in a way consistent with cascading principle. It is relevant to this discussion because technological developments are making the distinction between liquid biofuels and solid biomass in EU legislation is increasingly artificial and dated.²¹

Notably, the language on cascading in the iLUC directive is rather vague, and a clarification was added in the final revision saying the cascading principle should be applied “taking into consideration the regional and local economic and technological circumstances”.²²

In late 2016, the European Commission presented a revised Renewable Energy Directive (RED II) with 2030 as a target year. In a working document, “mandatory cascading use of wood” is listed among the policy measures *not* included in the new directive. The document notes that non-binding cascading guidelines on cascading will be released by the Commission in 2018.²³ However, questions remain about implementation by Member States. This merits a closer look at how the cascading principle has been implemented before.

Past cascading implementation: the ‘designated eligibility’ approach

Historically, cascading-like policies have been used to designate specific types of wood or by-products as eligible or ineligible for energy use. In effect, the point has been to highlight that bioenergy is an option only if it does not compete with industrial uses. Decisions on whether different wood assortments are eligible have been made through one of two methods:

Method 1: Specify eligible wood assortments in the legislative text

In some cases, the wood assortments eligible for energy use have been specified in the law. This approach mimics the way the EU has dealt with sustainability criteria pertaining to liquid biofuels in response to debates about food vs. fuel and about indirect land use change.

For example, in the iLUC directive, biofuels from specific raw materials may not be counted towards the targets on renewable energy in the transportation sector set in the Renewable Energy Directive. Possibly inspired by this approach, Action Aid and others suggested that the RED II state that roundwood with a diameter above 10 cm should not be used for energy, except under very specific circumstances.²⁴

Method 2: Decide on a case-by-case basis

Decisions can also be made on a case-by-case basis. For instance, in Sweden in the 1980s and 1990s, projects to build new energy installations that would increase the use of wood for energy were subject to a special review by the government. The objective was to ensure that the increased demand would not disturb supply-demand balances in the region in question.

In Flanders in the most recent five-year period, subsidies for power stations using wood were conditioned on approval by the panel board and paper industries. If the industry organizations protested that the wood demand increase interfered with their raw material sourcing, it was within their mandate to deny subsidies to the power stations.²⁵

Problems with the designated eligibility approach

Historical experiences are not encouraging when it comes to implementing cascading by designating eligibility in legislation. This is regardless of whether the eligibility criterion is

specified in the legislative text or decided case by case. The main problem is that it transfers power of resource allocation from open markets to restricted interest groups. Lobbyists from all sides will work hard to influence whether or not a specific wood assortment is eligible for energy use or rationed for industry purposes.

It also tends to disguise the subtle realities of how wood markets really work. It is often quite difficult to make an objective assessment of whether a specific wood assortment can or should be used for industrial purposes. The reason is that this is more a matter of market and cost structures, than of physical characteristics. This means that whether sawmill by-products are used for production of paper or particle-board varies geographically and over time. For example, it depends on whether the sawmill is close to a pulp mill or a panel board production site.²⁶

How to achieve a level playing field?

We noted earlier that forest owners have expressed concern that any policy that requires cascading will constitute a step away from market-based allocation of wood. A counter-argument here is that the market for wood is already skewed by subsidies for bioenergy. This is the argument made by representatives of forest industry, who call for a “level playing field” between material use and energy use of wood.

However, the issue is more complicated than the rhetoric implies. As it happens, all sides in the debate emphasize the importance of a “level playing field”, but in different ways:

- The renewable energy sector calls for policy incentives to internalize the external costs of fossil fuels and thereby establish a level playing field between fossil fuels and renewable energy sources.
- The bioenergy sector calls for a level playing field among renewable energy sources, so that policy measures supporting renewable energy are technology-neutral. This tends to favour bioenergy, as it is relatively easy to implement in existing infrastructure used for fossil fuels.
- The biochemical industry and portions of the forest industry call for a level playing field between different users of biomass.

These differences reflect the complexity of bioenergy issues. Bioenergy interacts not only with the energy sector, but also with forestry and related industries, agriculture and food industries, and waste management. It is almost inevitable that measures in one policy area have unexpected or unintended spillover effects in other fields. Achieving coherence across the different policy fields is thus bound to be difficult.

This is a complicated problem that needs to be handled with care. Cascading can be useful as a descriptive framework for how natural resources should be used, but the transition from principle to policy will fail if it does not account for the broader context of bioenergy markets. A combination of measures in different policy areas is likelier to support a society-wide transition to renewables than adherence to a specific model such as cascading, regardless of its conceptual appeal.



A stack of logs ready for transport.

ENDNOTES

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- 6 See the Ellen MacArthur Foundation website: <https://www.ellenmacarthurfoundation.org/circular-economy>.
- 7 Some industry organizations argue that since biogenic CO₂ emissions are part of the short-term carbon cycle, all use of sustainably sourced wood – including for energy purposes – inherently constitutes a circular flow. See:
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