EIP-AGRI Focus Group
Sustainable mobilisation of forest biomass

MINIPAPER 6: Contribution to environmental issues

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The environmental pillar in sustainable forest biomass mobilisation

(short introduction of why and what the minipaper is about, Why is it needed?)

Overall demand for forest biomass is forecast to increase in the future, a trend currently driven by developing wood-based bioeconomy and energy generation. Besides the economic and social pillars, the environmental aspects of forest biomass mobilisation need to be taken into account to make this process fully sustainable. Indeed, even if forest biomass is naturally renewable, achieving environmental sustainability is not always so straightforward.

In accordance with the scope of this EIP-Agri's Focus Group on SMFB, in this mini-paper we primarily focus on analysing how innovative biomass mobilisation in underused forests can be integrated with forest conservation programmes, ideally in win-win scenarios. Our aim is to highlight how SMFB can contribute to a series of environmental targets, such as forest fire prevention, habitat restoration and climate change adaptation and mitigation.

Addressing environmental challenges through SMFB

(description of the problems/challenges, short summary of what the main contributions of SFBM could be to environmental aspects)

Climate change mitigation

One of the strongest arguments for the use of wood is its function as carbon storage when used as solid material for long-term uses, e.g. wood construction. Apart from this carbon storage function, using wood to substitute other construction materials also helps to curve the high environmental impact of this sector. This positive role is, among others, documented in the ECO_2 project (http://www.eco2wood.com/) in the frame of the WoodWisdom ERA-net programme (**http://www.woodwisdom.net/**).

In contrast, the potential of mitigating climate change through the energetic use of forest biomass (i.e., direct burning) is now seriously challenged. Wood-based bioenergy is viewed as carbon neutral since growing wood has been sequestering CO_2 from the atmosphere, and emissions after harvesting are

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eventually sequestered again in future biological growth. Nevertheless, recently in some instances harvesting stemwood for energy use is criticised, due to the long delay between the release of CO_2 into the atmosphere when wood is burnt and the re-sequestration by a completely regrown forest at single stand level (Searchinger & Heimlich, 2015). This delay could make the use of stemwood as a source of energy counterproductive in the short term, as the urgency to avoid further CO_2 emissions operates at a shorter time scale (one/two decades) than forest regeneration. However, at country level, there is no such delay in re-sequestration when the forest resources are maintained or increased.

The energetic use of forest or industry residues and other woody biomass at the end of their life cycle is very reasonable, especially when using high efficiency technologies. However, in the case of using forest residues, nutrients depletion is a potential constraint for SMFB, as it can lead in the long term to a decrease in soil fertility and acidification. Indeed, depending on the form (round wood vs. branches/foliage) and period of wood harvest, the extraction of nutrients from the sites differs strongly. There are recommendations for forest biomass extraction depending on the country and origin, including 1) to harvest small diameter wood from deciduous trees only in winter, 2) to refrain from harvesting bundles of branches on sensitive sites with limited nutrients supply, 3) to let the branches and tops dry at the harvesting area and drop the leaves/needles before collecting them, and 4) to collect branches and tops only from final harvesting. It must be noted that in many cases the tops and branches are not collected at all for energy purposes because of the long distances between the harvesting area and the biomass heating or power plant.

Forest fire prevention

In most of the Mediterranean and in some other European regions, the intensity and recurrence of wildfires has severely increased over the last decades, mainly due to pervasive land abandonment. Low levels of use of forest resources (like timber, firewood, shrubs or pastures) naturally lead to accumulation of biomass, which has arguably some positive environmental outcomes: larger-older trees, building up organic matter in soils, food and refuge for wildlife, etc. Nevertheless, most of these benefits can very quickly disappear in areas prone to severe wildfires, where forest managers and civil protection services try to foster all types of forest biomass mobilisation to reduce forest fire hazard. In this context, SMFB could be planned taking into account wildfire prevention strategies and needs, such as the creation and maintenance of firebreaks/fuelbreaks or the peripheral protection of urban areas.

According to a study by Regos et al. (2016) biomass extraction has the potential to substantially contribute to reshape fire regime towards a more desirable scenario by decreasing the number of large fires. The study encourages land managers to consider this type of extraction as a cost-effective strategy to reduce forest fuels. Authors argue that the effectiveness of this approach will be strongly determined by the spatial allocation of the extraction and how firefighters might use the opportunities created by biomass extraction as fire-suppression strategy. They also recall that it may be necessary to combine biomass harvesting practices with other underbrush fuel-reduction treatments, such as mechanical clearing, targeted grazing or prescribed burning.

Beyond scientific studies, in Catalonia (NE Spain) there are a number of examples showing how people and organisations engaged with fire prevention have created small companies for the energetic use of the biomass their extract from forests. There are varied examples of this, from pioneer cases like that of Enerbosc (http://www.energiaforestal.com), other cooperation initiatives led by voluntary fire brigades (e.g., http://pironegawatt.com) and forest owner and municipality-led projects (http://forestal.llucanes.cat).

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Habitat restoration

Most of rural Europe is composed of cultural landscapes, shaped by farming over the centuries. The loss of certain agricultural practices, together with natural shrub/tree encroachment and artificial afforestation have led to the disappearance of numerous open habitats across Europe. Such open farmed habitats are considered to be of high environmental value, and there are increasing efforts to restore them, as well as to restore the management (typically grazing) that maintains them. SMFB could be instrumental in such operations.

As described in a case study showcased in the European Network on Rural Development (http://enrd.ec.europa.eu/sites/enrd/files/gp_webtemplate_conservationde.pdf), a German habitat restoration project has shown that using the extracted wood for energy purposes reduces costs of operations by at least 25% compared to composting or burning it. Developed in eight Natura 2000 sites, the aim of this project was to clear encroached areas which had formerly been valuable areas for conservation, including sandy dry grassland areas and overgrown hedge complexes.

Furthermore, as reported by the European Commission (2008) many of the Life projects funded to restore grassland habitats have involved extracting woody biomass. Therefore, finding new uses for the biomass mobilised in such habitat restoration actions seems to have the potential of reducing costs significantly, contributing to their viability and extension.

In Nordic countries, *esker* forests are an important part of cultural and natural landscape. Many special plants and insects live on these slopes and have adapted to sunny, warm and dry conditions. These species have declined sharply in recent decades, because of, for example, the effective prevention of forest fires and the thickening and increase of vegetation caused by general eutrophication. The habitats of these species can be safeguarded by keeping growth areas open by thinning the tree stand and through soil preparation or controlled burning. Taking care of *esker* environments is central to securing the biodiversity of Nordic forests, as a significant number of threatened forest species live in these environments.

Adaptation to climate change

Climate change is already having (and will increasingly have) negative consequences on the state of certain forest ecosystems, putting at stake many of the ecosystem services they provide, including wood and biomass. This is the case of numerous Mediterranean forests which are undergoing greater water stress due to the combined effect of higher temperatures and (depending on the area) rainfall reductions.

Furthermore, in the Mediterranean only a very small proportion of forestland is actively managed, given the lack of economic viability of forest operations. In this context, researchers and practitioners argue that forest thinning and diversification are key adaptive measures to improve the state of conservation of such forests and increase their resilience.

This is the approach of the ongoing LIFE-Adaptamed project, which includes several actions involving thinning pine and oak forest stands that would otherwise be mostly unmanaged in three protected areas in Andalucia (southern Spain). Participants in this project argue that the provision of key ecosystem services (such as primary products, soil retention, pollination, temperature regulation, water provision and prevention of desertification) will be enhanced by extracting part of the standing tree biomass. Nevertheless, the high cost of these operations clashes with budget constraints: if such adaptive management is to be applied at larger scales, better market opportunities would be needed for the biomass mobilised.

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Proposals for innovations and research

Research needs coming from practice, ideas for EIP AGRI operational groups and other proposals for innovation can be found at the final report of the focus group, available at the FG webpage **https://ec.europa.eu/eip/agriculture/en/focus-groups/sustainable-mobilisation-forest-biomass**

References

(Articles, papers, web links to research projects, etc.)

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