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Sustaining the European Bioeconomy: The Material Base and Extractive Relations of a Bio-Based EU-Economy

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14.1 European Bioeconomy—Global Biomass Sourcing?

The European Union defines a bioeconomy in its eponymous strategy as an economy based on the production and conversion of biomass: “The bioeconomy [...] encompasses the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy” (European Commission 2012, p. 10). A growing bioeconomy is meant to replace a range of products currently produced from fossil resources with more sustainable alternatives based on renewable biomass. In a long-term vision, it is not only traditional goods like food and feed or paper and furniture that would be made from biogenic sources, but also industrial products ranging from chemicals and plastics to construction materials and energy.

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If this vision ever becomes a reality, the EU-economy is likely to consume more biomass than it already does. While there is no consensus in the literature about the exact scale of the demand for biomass in a future European bioeconomy, increases are expected to be significant (Scarlat et al. 2015, pp. 26–27). One study conducted on behalf of the EU, which has become a basis for official projections, found that demand for biomass can be expected to grow on a global scale by between 49% (a modest bioeconomy) to 96% (a bioeconomy boom) by 2050 (Kovacs 2015, p. 89). Only a few tentative projections exist on how to meet the increased demand for biomass. The EU Commission acknowledges this lack of information in its updated bioeconomy strategy: “Notably, information is still scarce on how much biomass is available and can be mobilized sustainably, how much is being used and for which purposes, and how the increased pressure on natural resources can be reconciled with environmental, economic and social sustainability in Europe and globally” (European Commission 2018, p. 32).

It is no coincidence that the EU is concerned about the sustainability of increased resource use on a global scale. In addition to environmental concerns, this concern is due to the fact that the EU will hardly be able to fully satisfy increasing demand for biomass without imports. The United Nations Environment Programme (UNEP) stresses this point in a study on trade flows in biomass and other resources: “At the global level, Asian and European countries are close to maximum productivity for their available land. Intensification is at a maximum and does not leave much space for further increases in productivity. These densely populated areas are depending on imports from other regions, i.e. regions of low population density” (UNEP 2015, p. 69). Along with developments in Asia, the expansion of an EU bioeconomy will thus have a significant impact not only on biomass production in Europe but also on global biomass demand and trade flows. The EU is already among the biggest biomass consumers in the capitalist world system. Growing demand for biomass imports means that other countries or regions need to export more if the bioeconomy is to flourish in Europe. These interrelations have far-reaching implications for the economic models of biomass-exporting countries, an aspect widely neglected in European bioeconomy debates. Engaging this blind spot leads to questions about the global social and

environmental sustainability of expanding the bioeconomy in Europe (Ramcilovic-Suominen and Pölzl 2018, p. 4178).

Against this background, and in order to assess the consequences of a growing bioeconomy, the following analysis is aimed at answering three questions: What forms the material base of the existing EU bioeconomy? Which trade flows are relevant to the EU bioeconomy and how does the EU bioeconomy connect to economies in other countries or regions? What kind of change in these relations can be anticipated based on expectations about future biomass demand in the EU? The first question can be answered primarily in the framework of material flow accounts (MFA). The MFA system provides quantifications of biomass and other material inputs and flows that constitute the material “metabolism” of an economy (Eurostat 2018, p. 12). In contrast to conventional trade data, which commonly measures trade flows in monetary terms, MFA data highlight the material footprint of traded commodities. The second and third questions about the material connections between the EU bioeconomy and national economies around the world and about possible change to these relations calls for a transnational perspective. This is achieved using the framework provided by world systems theory (WST) (Wallerstein 2007). WST analyses the capitalist world system from the vantage point of the transnational division of labour among national economies. Wallerstein uses what he calls the “axial division of labour” to distinguish between the centre, periphery and semi-periphery of the world system (Wallerstein 2007, pp. 28–29). These concepts appear to be useful for the analysis of transnational relations in the bioeconomy, because they highlight the connections between politico-economic developments in different parts of the world. Finally, the economic dynamics of biomass-exporting countries are discussed based on debates about (neo-)extractivism as an economic and/or development model that is mainly implemented in the peripheries of the capitalist world system (Gudynas 2011; Svampa 2012; Schaffartzik and Pichler 2017).

Accordingly, the analysis is structured as follows: the second chapter begins with a brief outline of relevant theoretical concepts and their application in the context of this text. The third chapter discusses the state of the EU bioeconomy in terms of its resource usage and transnational linkages. Projections about the future biomass demand of

a growing bioeconomy are presented in the fourth chapter along with an analysis of likely consequences. The fifth chapter draws conclusions and points to critical questions about transnational relations, which the future bioeconomy, as envisioned in the EU strategy, will face. Findings are based on original MFA data supplemented by other datasets, secondary analyses and further studies on resource use and biomass trade.

14.2 The Capitalist World System, Extractivism and Extractive Relations

Two key insights from WST are important for this analysis of the European bioeconomy: first, this perspective draws attention to the fact that production in capitalist economies tends to be transnational in scope and that markets tend to be connected beyond nation-state borders (Wallerstein 2007, pp. 24–27). Secondly, at the same time, the fragmentation into national economies helps to establish and protect differences in profitability and thus advantages in the accumulation process for certain capitalist enterprises (ibid., pp. 27–30). This leads national economies to become the site of more or less profitable production processes or of differently profitable steps in a given production process. Without going more into detail at this point, the global division of labour, in which more or less profitable steps of a given production process are allocated to certain national economies, constitutes centre and periphery positions in the world system. While the more profitable activities of certain production processes concentrate in the centre, less profitable activities usually take place on the periphery. The centre-periphery relation is not fixed (ibid., pp. 29–30). Changes in the composition of production processes in a national economy may lead to changes in its relative position vis-à-vis other economies in the world system. So-called *emerging economies* like the Asian Tigers (Hong Kong, Singapore, South Korea, Taiwan) or the BRICS states (Brazil, Russia, India, China, South Africa) are cases in point.

The WST perspective is helpful for the study of inequalities in the bioeconomy, because it conveys an understanding of asymmetries in transnational economic and political relations. The bioeconomy project

is mainly concerned with developing “simple” primary industries into advanced production processes. The transnational (re-)distribution of more profitable steps in new bio-based value chains among production sites is a contested part of this development. Strengthening competitiveness in the global economy is a key issue of the EU bioeconomy strategy (European Commission 2018, p. 10). The focus on competitiveness can be seen as a means to defend and amplify the position of European countries at the centre of the capitalist world system. At the very least, the EU member states in Western and Southern Europe are clearly part of the core, even if the configuration of the world system itself has been changing with the relative decline of US hegemony and the ascent of China and others (Babones 2005, p. 51; Komlosy 2016, pp. 465–467).

In contrast to the EU, countries like Malaysia, Brazil and Argentina promote the bioeconomy with the explicit aim of upgrading their primary industries in order to incorporate more sophisticated steps in respective production processes (Backhouse et al. 2017, pp. 17–20). These countries’ governments frame the bioeconomy as a possible means of escaping their semi-/peripheral role as subordinate suppliers of primary products for the world market. In the debate about political economy, and especially in Latin America, this role has been referred to increasingly as “extractivism” or, in conjunction with the rise of left-wing governments in the 2000s, as “neo-extractivism” (Gudynas 2011; Svampa 2012). Gudynas defines extractivism as the extraction of large amounts of raw materials in enclave economies primarily for export and with little or no domestic processing (Gudynas 2011, p. 70). Although the term is more widely used for mining and oil drilling, it is also applicable to the export-oriented agro-industrial production of biomass. Locating the debate in a world systems perspective, Svampa characterizes extractivism as a form of territorial and global division of labour between centre and periphery where Latin American countries, among others, are condemned to provide raw materials (Svampa 2012, p. 14).

Assuming a broader view that includes other world regions, Schaffartzik and Pichler focus on the transnational dimension of extractive economies to develop a quantitative analysis of extractivism based on material flows (Schaffartzik and Pichler 2017). In general, they underline the point that “[b]y supplying energy- and material-intensive resources

to the global market, extractive economies enable other countries to concentrate on the addition of value in the secondary or even the tertiary sectors" (ibid., p. 1). Beyond the identification of extractive economies, the sole analysis of material flow data seems to bear few insights, as these countries are found to be quite diverse in terms of socio-economic structures and wealth (ibid., pp. 6–7). The authors emphasize that further qualitative factors need to be considered in order to assess the circumstances of extractive activities. For example, the economic structures associated with the biomass production process (e.g. monocultures, the focus on cash-crops and agro-industrial production methods) are decisive for any analysis of extractivism. Citing the example of Canada, Pichler and Schaffartzik also point to the fact that extractive economies might exist on a subnational level based on disparities between regions inside a national economy (ibid., p. 3).

Disregarding such disparities in the internal structures of extractive economies for the moment, it is still possible to highlight some points about the role of these economies in the world system and in relation to non-extractive economies like the EU. First, extractive economies produce raw materials like biomass primarily for export to the world market. Second, the consumption of these raw materials allows importing countries to concentrate on generally less energy- and material-intensive processing. Third, the allocation of the steps associated with extracting and processing in bio-based production processes to different countries constitutes a centre-periphery relation between the involved economies or subnational regions. Therefore, the relation between the EU and a biomass-supplying extractive economy can be referred to as an *extractive relation*. This relation is a centre-periphery relation based on raw material flows from primary producing countries or subnational regions to Europe. The prospects of a growing bioeconomy need to be evaluated against this background.

14.3 Biomass Flows and the EU-Economy Today

The construct of bioeconomy unites diverse economic activities from fisheries to the production of biofuels. The common denominator that defines these activities as part of a bioeconomy (at least in the European conception) is the production and conversion of biomass. Following this definition, 9% of GDP in the EU was generated by the bioeconomy in 2016 (Ronzon et al. 2017, p. 6). Biomass consumption in the EU has seen some fluctuation with a tendency towards moderate growth over the period from 2008 to 2016 for which statistical data is available (see Fig. 14.1).¹ By the end of this period, almost 2 billion tonnes (t) of biomass were being used per year (including for exports) distributed over three main categories, in addition to a neglectable share of fishery and hunting products. The bulk of biomass inputs comprises one-fifth wood, two-fifths crops (excluding fodder crops) and two-fifths crop residues, fodder crops and grazed biomass. Biogenic raw materials are used mainly for feed and food (61.93%), bioenergy (19.13%) and as biomaterials (18.82%) (Camia et al. 2018, p. 83).²

Overall, the share of imports accounts for 16% of total raw material inputs (RMI) in biomass with higher shares for crops and wood (21% each) and a lower share for fodder crops, residues and grazed biomass (6%) (see Fig. 14.2). Compared to other raw materials like metal ores and fossil energy carriers, import-dependency is relatively low in the biomass sector (Eurostat 2018, p. 106). However, an import contribution of 16% is still a significant amount. When the balance between imports and exports is considered, the EU has a physical trade deficit.

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¹Aggregate data on biomass consumption and flows is taken from the EU's material flows and resource productivity database. See, <https://ec.europa.eu/eurostat/web/environment/material-flows-and-resource-productivity>. Accessed 10 Nov 2020. The year 2016 is chosen as a reference for the data presented in this paper because complete data for later years is not available in all cases.

²Biogas and bioelectricity are not included in these figures.

Fig. 14.1 Biomass inputs in the EU-28 over time (RMI in Million Tonnes of Raw Material Equivalent) (Source Eurostat)

Fig. 14.2 Biomass inputs in the EU-28 by type, 2016 (in Million Tonnes of Raw Material Equivalent) (Source Eurostat)

Nevertheless, this deficit has shrunk since its last peak in 2007. However, imports have continued to grow but their growth was outpaced by the growth in biomass exports. In 2016, EU biomass imports were 1.22 times higher than exports (in 2007 the ratio was 1.74 to 1). Together with Asia and Africa, Europe forms the group of global net importers of biomass, whereas North America, Latin America and Oceania are net exporters (UNEP 2015, p. 60). Even though biomass is primarily consumed locally and is not as widely traded transnationally as other commodities, the biomass trade is an important and, in absolute terms, a growing segment of global markets (UNEP 2015, p. 59). Europeans are important actors in this sector as exporters and more importantly as importers of biomass. This role will be further augmented by a growing bioeconomy.

To assess the implications of European biomass use and imports in the world system context, it is important to scrutinize relations with individual countries based on these flows. Unfortunately, trade flows between the EU and individual trading partners cannot be analysed at the level of abstraction presented so far because a functional accounting system for incorporated biomass flows on a global scale that treats the EU as a block does not (yet) exist. Individual trade flows only become visible at the level of single commodities, which is why the composition of imports deserves more detailed attention. In order to identify the commodities that constitute the main biomass flows into the EU, MFA data can be disaggregated to some extent beyond the main categories. These sub-categories can then be cross-matched with data on the commodity trade from the UN Comtrade database.³ Looking at crops (excluding fodder crops), oil-bearing crops are the biggest sub-category for imports. Among all imported oil-bearing crops in the Comtrade database, palm oil and its residues make up the largest proportion of EU-imports. For crop residues (used), fodder crops and grazed biomass, the biggest sub-category in

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³UN Comtrade database. See, <https://comtrade.un.org/data>. Accessed 15 May 2019. Direct comparisons between European MFA data and UN data using HS codes are not possible because of differences in methodology, categories and units of measurement. However, absolute quantities of traded commodities are less important here. Rather, the intention is to identify the relative importance of traded commodities and especially the trade relations with individual countries constituted by these flows.

terms of imports are fodder crops and grazed biomass. Comtrade shows that soya beans including soya oil cake is by far the most important fodder crop imported to the EU. Wood places timber (industrial roundwood) as the most imported sub-category. Data from Comtrade show a slightly different picture due to a different system of categorization. In this case, the three largest imports are fuel woods, wood in the rough and wood sawn or chipped. These items are combined for the purpose of this analysis.

These considerations enable the origins of the most important biomass commodities that are imported into the EU to be identified (see Fig. 14.3). A pattern of three main biomass flows emerges from the data on individual commodities: the first flow consists of soya beans and soya oil cake, which are primarily imported from the Americas, namely from Brazil, Argentina, the USA and Paraguay. The second flow includes palm oil and its solid residues, with Indonesia and Malaysia as the two dominant importers, both of which are located in Southeast Asia. The third flow is more diverse. It encompasses imports of wood

Fig. 14.3 Biomass imports to the EU-28 by country, 2016 (in Million Tonnes; Netweight for Wood) (Source UN Comtrade database; columns only show the biggest importers of each commodity with a combined proportion of at least 90% of imports for the respective commodity)

used for industrial and construction purposes and as an energy source. This wood is imported from the EU's northern and eastern neighbours: Russia, Norway, Belarus and Ukraine, as well as from the USA (mainly fuel woods). The three flows described here do not cover all of the biomass flows to the EU. Nevertheless, they illustrate the extractive relations between the EU and its most important trading partners in terms of biomass commodities.

Analysing the EU's external land consumption enables an assessment to be made of the importance of imported biomass for the EU and, hence, the significance of its extractive relations with its main biomass suppliers. In general, the EU is a net importer of embodied land, meaning that its consumption including exports exceeds the land-based production the EU can provide within its borders (UNEP 2015, p. 66). Quantifying the EU's external land consumption in more detail involves complex modelling, and this leads different indicators to be used. O'Brien et al. (2015) specify domestically available agricultural land as well as the land area embodied in imports and exports in absolute terms. They found that agricultural land in the EU-27 covered roughly 187 million hectares (ha) in 2011 with a slight decrease since 2000 (*ibid.*, p. 240). A further 45 million ha of agricultural land abroad was required for imports in the same year, showing considerable fluctuation over time but with a small decrease compared to the year 2000 (*ibid.*, p. 241). Around 19 million ha of embodied agricultural land were exported in 2011 and this trend has been increasing since 2000 (*ibid.*, p. 241). These figures clearly show the position of the EU as a net importer but also the considerable magnitude of imported agricultural land compared to the domestically available area.

To put these figures into a global perspective, European land consumption can be examined in proportion to the globally available land area. In their study of global land use for the domestic consumption of biomass, Bringezu et al. (2012) looked at per capita consumption of croplands in Europe and around the world. They calculated that the EU-27 required 0.31 ha per capita of global cropland in 2007 although only an average of 0.24 ha per capita was available globally (*ibid.*, pp. 227–228). The average European citizen thus consumed roughly 30% more cropland per capita than the average global supply.

For a future European bioeconomy, non-food applications of biomass are particularly important, as the widespread use of novel bio-based products in areas such as chemicals or plastics is at the heart of the project. Bruckner et al. (2019) quantified the cropland footprint of the EU's bioeconomy excluding the food sector.⁴ The study concluded that the EU is even more reliant on biomass imports for non-food applications compared to overall biomass imports. As stated above, imports account for 16% of total European raw material inputs in biomass. For the non-food sector, only 35% of products were produced from domestic land resources in 2010, whereas the vast majority—65%—was based on imported croplands (*ibid.*, p. 5). The cropland footprint of vegetable oils and oil crops represented the biggest share of imports of non-food products and make up one-third of total imports (*ibid.*, pp. 5–6). This mostly reflects the material flows of palm oil and derived products and the extractive relations with Southeast Asian countries.

By looking into material flows, trade data and analyses of the EU's land footprint, a clear picture emerges of the external dimension of the current European bioeconomy. Today the EU-economy relies on biomass imports to provide raw materials for a variety of uses. Three major biomass flows can be identified that constitute extractive relations with peripheral and semi-peripheral countries like Indonesia and Paraguay but also with extractive activities in the USA. The EU's land footprint adds a notion of the considerable overconsumption of global agricultural land by the EU and the central importance of imports for the core area of a developing bioeconomy: the non-food sector.

14.4 Projections for a European Bioeconomy

There are many uncertainties about the biomass consumption of a future bioeconomy on the European as well as on the global level. The question as to whether enough biomass can be produced sustainably as a substitute for the current use of fossil raw materials is a highly contentious

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⁴By taking croplands as the basic analytical category, Bruckner et al. exclude the forestry sector from their analysis.

topic (Priefer et al. 2017, pp. 7–8). The EU has been looking into the issue and commissioned its Standing Committee of Agricultural Research (SCAR) to report on biomass flows in a future bioeconomy in 2015 (Kovacs 2015). The SCAR-experts describe three scenarios for worldwide biomass demand and supply in the year 2050 (*ibid.*, pp. 88–91). While food and feed demand are expected to remain the same over all three scenarios based on forecasts of the Food and Agriculture Organization of the United Nations (FAO), figures for biomass supply and demand for material and energy uses vary. All scenarios are compared to a 2011 baseline with a supply and demand of 12.18 billion t of dry matter of biomass. The first scenario—“Bio-Modesty”—predicts a moderate growth of biomass demand to 18.2 billion t, which is matched by the same level of growth in supply. The second scenario—“Bio-Boom”—forecasts a high level of growth in worldwide biomass supply and demand to 23.9 billion t, respectively. However, the third scenario—“Bio-Scarcity”—expects a gap to occur as a projected high demand for biomass at 23.9 billion t cannot be matched with an almost stagnant level of supply of 13 billion t. The likelihood of each of these scenarios depends, on the one hand, on uncertainties about growth in demand arising from population and economic growth, the relative scarcity of classical resources and the evolution of bio-based and non-biomass-based technologies. On the other hand, supply growth is expected to be influenced mainly by the development and implementation of new technologies (*ibid.*, p. 88).

Overall, the scenarios underline the perceived necessity to intensify biomass production significantly in order to meet the demands of a future bioeconomy. The report also points to some broader socio-economic consequences and serious environmental risks associated with such developments (*ibid.*, pp. 90–91). However, the report does not draw any general consequences in terms of the feasibility of growing the bioeconomy. Furthermore, while the SCAR-foresight exercise serves as a basis for EU-policy projections and is cited in the European bioeconomy strategy, the scenarios themselves assume a global view without explicitly situating the EU in the global picture. As such, it does not deal with the question of how the growth of a European bioeconomy will fit in with global developments.

In another assessment of the role of biomass in a future bioeconomy, researchers from the Commission's Joint Research Centre (JRC) come to more detailed conclusions about the EU's relative position in terms of global developments: the EU will depend on biomass imports "to provide biomass feedstock for the bio-based economy in the future. Imports will mainly consist of crops, vegetable oils, wood and wood products, wood pellets or biofuels. An increase in the bio-based economy is expected to be a worldwide development. Therefore, only a part of the globally available biomass potential is available for the EU" (Scarlat et al. 2015, p. 27). The commodities mentioned here are the same that already make up most of the EU's biomass imports today (see above).

Combining the conclusions of both the experts from SCAR and the researchers from the JRC, it seems clear that biomass demand will grow globally as well as in the EU. The EU will be dependent on imports, mainly of the same commodities that it imports today. Increased European and global demand will only be satisfied in a scenario of intensified biomass production. The EU's situation is further aggravated by the fact that eight out of the ten countries identified above as the EU's main biomass suppliers have formulated their own bioeconomy strategies or biotechnology-focused development strategies (German Bioeconomy Council 2015, pp. 126–132; German Bioeconomy Council 2018, p. 13).⁵ If these strategies were to be implemented successfully, domestic consumption and processing of biomass in these countries can be expected to increase in the future. As such, exports of raw materials to the EU are likely to face increased competitive pressure from domestic processing undertaken in these countries. Concerning the transnational relations of the European bioeconomy, the questions arise as to where the additional biomass will be produced and what impact this might have on the three flows of EU imports described above.

A tentative answer can be found in a study by Piotrowski et al. (2015b), which also served as a basis for the projections provided by SCAR. As part of scenario development, Piotrowski et al. discuss the potential for expanding the land used for cultivation for biomass production. Summarizing their findings, they present three supply scenarios

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⁵Exceptions are Belarus and Ukraine.

for the year 2050 (Piotrowski et al. 2015a, pp. 4–5). In a low supply scenario, no expansion of agricultural land is necessary. Instead, they assume a loss of 100 million ha of agricultural land due to soil degradation. This scenario corresponds to the “Bio-Scarcity” scenario cited above and does not provide enough biomass for even modest growth of the bioeconomy. In a business-as-usual supply scenario, new agricultural areas of 435 million ha are forecast based on the conversion of areas currently not used for crop production, mainly pastures and meadows but also forests. This corresponds to the “Bio-Modesty” scenario. Finally, a high supply scenario would require 760 million ha of new agricultural land by converting formerly unused land or land that was used for other purposes. Given that all the cropland available today amounts to 1,400 million ha, and that FAO data estimate total agricultural land including pastures to cover 5,000 million ha,⁶ these increases would be substantial. Again, Piotrowski et al. found that the geographical distribution of potentially available areas for cultivation is uneven. Sub-Saharan Africa and Latin America are particularly mentioned as regions with a potential for increased rainfed agriculture (Piotrowski et al. 2015b, p. 111).

In summary, no definite projections about the biomass demand of a future bioeconomy in Europe or worldwide are currently available. Various scenarios can be drawn on depending on the magnitude of growth in the bioeconomy. As long as growth in the bioeconomy is expected, all of these scenarios include substantial increases in biomass production and agricultural land use. In this context, the EU will be even more dependent on imports, as the potential for domestic intensification of agriculture has mostly been exhausted (UNEP 2015, p. 69). If sub-Saharan Africa and Latin America are to intensify biomass production in the future, as projected, some material flows to the EU are likely to change, as material flows from Southeast Asia and the EU’s northern and eastern neighbourhood would lose importance in relative terms. However, extractive relations with the peripheries and semi-peripheries of the world system will continue to play an important role for the European bioeconomy under these circumstances. Moreover, the development of bioeconomies in the countries that are predicted to supply

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⁶See, <http://www.fao.org/faostat/en/>. Accessed 14 May 2019.

the EU with biomass questions the feasibility of an import-reliant future European bioeconomy.

14.5 Questioning the Transnational Sustainability in the European Bioeconomy

As this study has shown, the extractive relations embedded within biomass flows to the EU play a significant role in the existing European bioeconomy. The European economy relies heavily on biomass imports and will do so even more in the future especially when the resource needs of a growing bioeconomy are considered. The EU's extractive relations constitute unequal transnational linkages to those countries or subnational regions that extract raw materials for processing by European "bio-industries". These relations are hardly discussed in European bioeconomy politics. In fact, the updated European bioeconomy strategy, the most important document informing bioeconomy policy in the EU, pays very little attention to the EU's global role as an importer of biomass. Only a descriptive section on the European food-system mentions imports of several food commodities such as palm oil (European Commission 2018, p. 47). More comprehensive passages on biomass flows fail to mention the role of imports altogether (*ibid.*, pp. 35–38). The global context is discussed primarily in terms of the challenges posed by expanding food demand outside of the OECD-world and by escalating competition over resources (*ibid.*, p. 33). Based on this assessment, managing biomass supply is one of the five objectives drawn up by the updated strategy: "Managing natural resources sustainably, is central for a bioeconomy whose parts are increasingly interlinked. More than ever, a circular bioeconomy depends on an efficient and sustainable use of biological resources, against the backdrop of an increasing demand for biomass" (*ibid.*, p. 26). Developing the bioeconomy in Europe is then addressed as a remedy against increasing demand: "A sustainable bioeconomy is essential to tackle climate change and land and ecosystem degradation. It will address the growing demand

for food, feed, energy, materials and products due to an increasing world population, and reduce our dependence on non-renewable resources” (ibid., p. 15). While the strategy mentions the expectations of increasing pressure and competition over biomass supplies on a global scale as a concern, it fails to address the role of the EU and its bioeconomy policy as a possible driver behind these phenomena.

This blind spot leads to questions about the much-acclaimed sustainability of European bioeconomy politics, which is also expressed in the quotes above. Ramcilovic-Suominen and Pölzl (2018) resume that the EU’s approach to sustainability is too narrow and that it fails to address the social aspects of sustainability: “The current EU bioeconomy policy leans strongly towards conservationist, utilitarian and instrumental approaches to SD [sustainable development], as well as to weak sustainability”. Furthermore, the authors suggest that the “EU bioeconomy policy debate is likely to change the contemporary predominant policy discourse on SD by strongly emphasising technological solutions and [the principles of] economic efficiency”. They point out that these solutions are likely to include new materials and products as well as a focus on competitiveness, but that they will fail “to emphasise the environmental (biodiversity, ecosystem services) and social aspects (justice, equality, benefit sharing) of SD” (ibid., p. 4178).

Tackling unequal transnational relations between centre and periphery in terms of material flows is among the social aspects of sustainability that the EU has neglected so far. The extractive relations with other world regions are likely to grow even deeper as long as the problem of insufficient global biomass supplies for a growing bioeconomy is discussed in the framework of competition. In the light of bioeconomy-based growth strategies in the Global South, such forms of transnational extractivism appear particularly problematic. Therefore, instead of increasing the use of biomass in order to substitute fossil-based raw materials, Europe needs to reduce its consumption of biomass and its impact on global land use (O’Brien et al. 2015, p. 242). A sustainable European bioeconomy, therefore, would need to engage the problem of an unsustainably high level of biomass consumption along with developing other, cooperative forms of transnational relations.

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