Towards a Sustainable Balance of Bio-resources use Between Energy, Food and Chemical Feedstocks

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Contents

Abstract

Bio-resources are becoming increasingly contested as the demand for food grows. There is also a pressure to provide energy and materials from them. This monograph discusses the current flows of bio-resources, their inherent properties and the services that these resources could provide in a sustainable bio-based economy.

There are two possible pathways that could convert solar radiation — which would be seen as our planet's natural income — into material goods and storable energy carriers. This would be using electricity to generate hydrogen via electrolysis and convert it with CO_2 into hydrocarbons or utilizing bio-resources. Most uses of bio-resources compete for limited fertile land, requiring the highest possible efficiency in their use. Natural endowment of land, logistical requirements as well as economic and cultural factors in their utilization make bio-resources inherently contextual goods. Decisions about the rational use of bio-resources must therefore be taken into account with regard to concrete regional contexts.

Based on the analysis of services of bio-resources in a bio-based economy, their particular properties and the characteristics of current state technologies, this monograph develops rules to balance the utilization of bio-resources in the framework of regional context.

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Introduction

This monograph addresses the issue of future development from the vantage point of the concept of *strong sustainability* [Solow, 1993], assuming that human and natural capital are complementary but may not be mutually substituted. In extension, this concept requires human society to revert to a natural income as the basis of its development rather than exploiting limited natural stocks. It is perfectly clear that this starting point is just one of many possible ways to envision future development, and it is equally clear that current economic reality does not favor this pathway. It is however, within the framework of sustainable development that an increasing demand for bio-resources for non-food use could lead to a sizeable bio-economy whose consequences may become an issue of concern.

The current discourse about ecological sustainability is heavily influenced by the concurrent discussions about the ecological threat of global warming and the economic impact of diminishing fossil resources [Favennec, 2011]. As a consequence, an energy turn-around towards a renewable resource based energy provision (as well as increased energy efficiency) is seen as a win-win option, at once relieving the burden on limited fossil resources, working against climate change and bringing society closer to sustainability. Besides this there are numerous voices, including Daniel Yergin's [2011], linking the development and implementation of renewable energies to technological innovation and economic growth, adding to the sustainability credentials of an energy turn-around. This has led to the formulation of political goals (e.g., the European Union 20-20-20 Goals, EC, 2007a) and plans (e.g., the European Union SET Plan, EC, 2007b) to lay the foundation for a change to renewable energies within the 21st century.

Most of these plans call for equally dramatic increases in energy efficiency on the energy consumer side and in the capacity of renewable energy technologies on the provision side of the energy system. As an example, the European Union Energy Roadmap 2050 requires an energy demand drop between 32% and 41% and an increase of the share of the renewable resource-based energy provision by at least 55% in 2050 as compared to 2005.

Although this increase in the renewable energy provision will be shouldered by technologies drawing on different renewable resources such as hydro power, wind, direct solar energy, geothermal energy, wave and tidal energy, bioenergy will play an important role in the future energy mix. The International Energy Agency (IEA) [2012] estimates that by 2050 bioenergy will contribute 160 EJ of primary energy to the global energy mix, covering roughly a quarter of the total primary energy supply. This compares to 50 EJ (and a share of 10%) it contributed in 2009 to the global primary energy supply, more than tripling the amount and more than doubling its current share.

This increased demand however meets an already contested resource. By 2050 the world population will increase to more than 9 billion people (from its current 7.2 billion), requiring over 10^{16} kcal of food per year, an increase of over 40% from a current value of 7×10^{15} kcal/y.[1] Besides, well-entrenched industrial sectors, including most notable pulp and paper production and construction, already use large amounts of

[1] See, e.g., http://www.tasteofsustainability.com, based on FAO data http://faostat.fao.org/site/609/DesktopDefault.aspx?PageID=609{#}ancor [accessed June 2014]

biomass. According to the FAO,[2] the world consumption for industrial round wood will reach 2.436×10^9 m^3/y wood raw material equivalent (WRME), 45% up from the consumption in 2005 of 1.682×10^9 m^3/y WRME.

This means that bio-resource utilization will require a delicate balancing act. This monograph will discuss some issues that have to be taken into account if bio-resource utilization is to be aligned with the requirements of sustainable development.

[2] See ftp://ftp.fao.org/docrep/fao/011/i0350e/i0350e02a.pdf for more information [accessed June 2014]

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