

## **BIOENERGY GOVERNANCE BETWEEN MARKET AND GOVERNMENT FAILURES: A NEW INSTITUTIONAL ECONOMICS PERSPECTIVE**

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Bioenergy is seen as an important option to reduce carbon emissions in the energy sector and increase the security of energy supply, while simultaneously offering chances for rural income generation and development. Consequently, many governments have adopted ambitious expansion plans, among them the European Union, the USA, Brazil, and China. However, the additional demand for biomass increases pressures on agricultural land use and natural ecosystems, resulting in conflicts with conservation aims and food security. To safeguard against sustainability risks and promote the efficient use of scarce biomass resources, establishing an effective governance framework for bioenergy is of the utmost importance. This task, however, is complicated by the existence of multiple objectives, multiple market failures and the variety of possible value chains (complexity of the regulative problem). Using the case of European bioenergy policy, this paper adopts a new institutional economics approach to systematically analyse the challenges of bioenergy governance and make recommendations for choosing between regulation and markets as governance mechanisms.

Since the environmental costs of energy production as well as innovation spillovers are not fully reflected in energy prices, market allocation provides insufficient levels of renewable energy use. To support the expansion of bioenergy, the EU and its member states employ a wide range of instrument combinations, complemented by regulatory sustainability standards. These instrument mixes are frequently criticised as inefficient, because neoclassical economic theory suggests that the climate change problem may be most efficiently addressed by internalising the costs of carbon dioxide emissions, e.g. by establishing a comprehensive emission trading system, and leaving technology choices to the market. However, the presence of other imperfections in the market for energy technologies, e.g. knowledge spillovers, market power, and institutional and infrastructural path dependencies, limits the viability of this argument. A more differentiated analysis of governance options is also called for by the existence of multiple policy objectives for supporting bioenergy, as well as the fact that bioenergy is associated with further, specific externalities, both negative (e.g. nitrous oxide emissions from fertilizer use, biodiversity loss following land conversion) and positive (e.g. increases in agricultural biodiversity by the introduction of new crops).

As markets fail in addressing these externalities, government intervention is warranted. However, establishing an effective bioenergy regulation is complicated by the existence of a large variety of bioenergy pathways, which differ considerably in their costs, carbon balances and environmental impacts. Further allocative and regulative problems result from the transnationality of value chains, competition for biomass resources between multiple uses, and indirect land use changes triggered by changes in relative prices. If the state adopts the responsibility for this complex allocation problem, information requirements are extremely high. In analysing policy options, the consideration of transaction and information costs is therefore highly relevant. Abandoning the assumption of disinterested, welfare-maximizing decision makers, the role of special interests in policy making also affects regulative outcomes.

To avoid a mere replacement of market failures by government failures (even in the case of an imperfect emissions trading scheme), it is necessary to determine where government intervention is required, and where it is possible to use the decentralised allocation mechanism of (real or administered) markets to govern biomass fluxes. This paper aims to make a contribution towards answering this question, by using a new institutional economics approach which explicitly considers transaction costs, the role of uncertainty, information asymmetries, path dependencies, institutional constraints, and political feasibility. Firstly, we analyse the allocative challenges of bioenergy use, to identify relevant market failures. Secondly, we apply transaction cost theory, the theory of institutional change, information economics, the principal agent approach, and second best theory, to determine where private governance structures fail in addressing these market failures and government intervention is necessary. Conversely, adding insights from public choice theory and constitutional economics, we discuss the problems of bioenergy regulation and the risks of government failure. From this, recommendations are derived for a balance between using regulation and the market mechanism for governing bioenergy use. Lastly, the findings of the analysis are contrasted with “first best” recommendations derived from neoclassical economics, showing the limits of a narrow efficiency perspective in a complex policy field with multiple objectives.