Unintended Consequences of Renewable Energy. Problems to be Solved

**Funding:** National (Norway)
**Duration:** Jan 2012 - Nov 2013
**Status:** Complete with results

**Background & policy context:**

It is well known that fossil-based energy has multiple, negative environmental consequences. From initial production, through to distribution and final use, fossil fuels (coal, oil, gas) are the source of emissions and spills that cause serious impacts on both the environment and our health. Renewable energy is, in contrast, commonly held to be a clean form of energy. To substantiate this claim, it is important to scrutinize the environmental impacts of all forms of renewable energy. This includes assessing the unintended consequences from initial production, through to distribution and final use. The aim of this book is to introduce the reader to the concept of unintended consequences and how this relates to renewable energy technologies. Drawing upon a series of case studies from around the world, this book also illustrates the methods and tools that can be applied to identify the unintended consequences from these technologies from development through to implementation.

Of course, people may question the urgency of the issue, why there is a need to highlight the unintended consequences of renewable energy in the first place, and the risk that such a focus will impede the development and uptake of renewable energy. A good way of framing this issue is to consider the effects of the largescale implementation of fuels produced from biological materials, so-called biofuels. This transition has been motivated by the goal to reduce emissions of the greenhouse gas carbon dioxide (CO2). In 2008, an international debate emerged connecting biofuel development with increases in world food prices [2]. The debate also highlighted a reduction of biological diversity, and questioned the efficiency of biofuels as a measure to reduce GHG emissions. However, such unintended consequences of the biofuels policy could have been predicted, and measures could have been taken to avoid them, much earlier. The problems connected to the large-scale implementation of biodiesel had already been outlined in the mid-1990s through the Intelligent Energy Europe (IEE), a sub-programme of the Competitiveness and Innovation Programme (CIP) of the European Commission.

In the IEE-ALTENER1 project “Biodiesel in heavy-duty vehicles— Strategic plan and vehicle fleet experiments” key issues raised that were thematized included the large land requirements as well as the large greenhouse gas emissions in the life cycle of biodiesel [1]. For example, it was shown that in the “worst case” scenario, a transition to biodiesel would actually increase GHG emissions. However, it was not until a decade later that these issues were factored into the biofuel debate pointed to above, and are now central to the efficiency the requirements made today of these fuels e.g., through the sustainability criteria of the EU [3]. This book demonstrates the need for researchers, policy makers and the energy industry alike, to pay greater attention to the potential unintended consequences. By obtaining knowledge of unintended consequences we put into practice a principle of precautionary science - to be aware of potential negative effects before any damage is done.

**References**


**Objectives:**
Energy technologies in the future will need to be based on renewable sources of energy and will, ultimately, need to be sustainable. This book provides insight into unintended, negative impacts and how they can be avoided. In order to steer away from the pitfalls and unintended effects, it is essential that the necessary knowledge is available to the developers and decision makers engaged in renewable energy. The value of this book lies in its presentation of the unintended health and environmental impacts from renewable energies.

**Other funding sources:** Stiftinga Vestlandsforsking

Stiftinga Vestlandsforsking / Western Norway Research Institute

**Organisation:** (WNRI)

**Contact country:** Norway

**Organisation Website:** [http://www.vestforsk.no](http://www.vestforsk.no)

**Key Results:**

The book presents results from cross-disciplinary research on the implementation of alternative fuels in the transport sector, namely hydrogen, electricity and biodiesel. This is followed by an assessment of environmental impacts from the production of solar cells. Critical reviews on the use of nanotechnology and nanomaterials in the energy technologies is then provided, with the formation of nanoparticles during combustion of bio-blended diesel and their toxic effects, discussed in detail.

**STRIA Roadmaps:**

Low-emission alternative energy for transport

**Transport mode:** Multimodal transport

**Transport sectors:** Passenger transport, Freight transport

**Transport policies:** Decarbonisation, Environmental/Emissions aspects