DEVELOPING A SET OF ENERGY SUSTAINABILITY INDICATORS FOR NEW ZEALAND

By

Craig William Wadsworth
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ABSTRACT

Modern New Zealand society relies on the ability to use a number of different resources in order to function effectively. The continued existence of that society therefore requires a continued supply of those resources. Sustainable management, which focuses on enabling present generations to satisfy their needs and wants without adversely affecting the ability of future generations to do the same, is a key concept in ensuring the continued supply of resources. It also reinforces the fact that human society is linked with and has an impact on the functioning of numerous ecosystems. The concept of sustainable management highlights the effects of present decisions on the resource in question and on the linkages that those decisions have with other resources and other aspects of the functioning of the environment and society.

One of the key resources that is affected by the concept of sustainable management is energy. New Zealand society is totally dependent on energy to enable it to continue to function as it does at present. It is therefore important to ensure that there is a sustainable supply of energy that will continue to meet the foreseeable needs of New Zealand energy consumers, without causing significant adverse effects on the other matters that comprise a sustainable society. Some form of monitoring must be undertaken to determine whether energy is being managed sustainability. This thesis seeks to establish a regime of indicators to monitor energy use in New Zealand in terms of the major tenets of sustainability and to apply those indicators to the New Zealand energy system in order to assess the current state of energy use in New Zealand.

There are two stages to achieving the aims of this thesis. The first is to establish the scope of the monitoring programme. This process involved a number of steps. First was a literature review of various formulations of the criteria of effective indicator design and the establishment of a set of criteria that collated this work. A further literature review was undertaken to establish the key tenets of energy sustainability. A survey was then undertaken of the monitoring regimes that are presently in operation or are being developed in New Zealand and around the world. Given the base information that was provided by the reviews and the survey, the next step was the development of the indicators themselves.

The final stage of the thesis was an application of those indicators that could be developed within the constraints of existing data collection regimes. The results of this process clearly demonstrate that New Zealand is on an unsustainable energy path. Most of the indicators demonstrate a movement to an unsustainable state. Specific indicators that show this trend are the level of carbon dioxide emissions, energy intensity, renewable energy use, reliance on imported oil products, total primary energy supply (that is, total energy use) and household expenditure on energy. Although the levels of economic rent being earned by ECNZ are high, it is difficult to form a conclusion about this indicator as it is uncertain how these profits are used once they are paid into the consolidated fund. While real energy prices are decreasing, a number of the benefits of this decrease are being lost as consumption levels increase.

As well as providing an insight into the nature of energy use in New Zealand, this thesis highlights a number of issues concerning the state of information concerning indicator development, energy sustainability and the state of energy data collection in New Zealand. There is an abundance of information available concerning indicator development, so much so, that there is little to be gained from developing the issue further. By contrast, there is

a paucity of detailed information concerning energy sustainability. The majority of that information either focuses on one issue in great detail or takes a very generalised global picture. What is needed is information that fits between these two levels, so that multi-objective sustainable energy management policies can be developed.

The most serious concern is however directed at the state of the energy statistics that are available. There are numerous omissions from the data that is available and numerous inconsistencies. Specific matters to be addressed focus on increasing the subject coverage and the geographic coverage of the data. The time periods that data applies to and the consistency of the collection also need attention.

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