

NATURAL RESOURCE ECONOMIC IMPLICATIONS OF GEOHERMAL AREA USE

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ABSTRACT

Large-scale use of geothermal energy is likely to result in depletion of natural resources that support both biodiversity and other human uses. Most of the problems could be averted with competent planning and adherence to agreed conditions, but they commonly develop because they are not perceived to be directly geothermal in origin and hence are not taken into account adequately. Some of the implications of such issues are discussed below, with particular reference to countries where all or most resources are held under traditional principals of custom ownership.

INTRODUCTION

Geothermal areas often play far reaching economic roles for local people, hence large-scale exploitation of such areas may have equally far-reaching consequences. This is particularly so where local people operate in a subsistence economy and have little access to the cash necessary either to benefit from rural electrification or to compensate for resources depleted as a result of new project developments.

The objective here is to outline some of the implications of proposals to use geothermal features for electric energy or process heat. The viewpoints taken are those of local people and of national government agencies that are required to promote responsible rural development.

It is also intended to promote recognition of some of the realities of working within tribal (custom) land and resource ownership systems, and the efficiency with which such systems are normally capable of managing natural resources on the basis of sustainable utilisation.

Despite their effectiveness under normal circumstances, custom resource management systems commonly break down under the pressure of "development". Principal reasons include their inability to take account of the scale, pace and totality of present-day resource exploitation methods; their inability to control exploitation using traditional methods, but supplying new and largely unlimited foreign markets; and the inability of governments and aid agencies alike to integrate northern hemisphere practices of good resource management with equally sound, or better, custom practice.

Subsistence economies vary widely in the quality of life they deliver, from desperate poverty (commonly where the national resource base has been systematically stripped over centuries of non-local domination, with North Africa providing some stark present-day examples), through to a relatively high quality lifestyle in a resource-rich environment. Paradoxically, some of what the conventional classifications would have us believe are among the world's least developed countries are in the latter category, Western Samoa, Vanuatu, Solomon Islands and Papua New Guinea being examples.

IMPLICATIONS OF TRIBAL/ CUSTOMARY RESOURCE OWNERSHIP

The majority of people in Melanesia and much of Polynesia, where the traditional ownership systems of land and maritime resources have not been destroyed by foreign influences, have what most of us in the rest of the world can only dream about. They have the absolute right to build and to occupy a dwelling in their home area free from any charges, and to take from that area materials for building, clothing, food, transport, and other services necessary to support their livelihood. They may have responsibilities towards their community, but no person and no government can charge or tax them for these rights, nor prevent them from being taken up.

For most eastern or western businessmen and "developers" this concept is not easy to comprehend. Even less so is it to understand that the governments of several such countries have no authority over the nation's resources and no rights of access to land except with the permission of the owners. Again, a dream for most of us in the "developed" world.

However, custom land and marine areas are not private property in the northern hemisphere sense, since the custom owners are not free to sell them even though they may sell the resources on or under them. Rather, the land is held permanently in trust, and its living and non-living resources are used as the present generation of human custom owners sees fit. In other words, a type of stewardship.

In this situation it may be helpful to regard the custom ownership clan as similar to a corporation. Members of the corporate body have inherited or

been elected to varying positions of influence, authority and rights to take goods or to be rewarded from corporate resources. These positions may change, but no one can be displaced from the corporate clan. However, neither individually nor collectively can members dispose of the corporate core, the lands and/or sea areas they control. In providing a true homeland, this core is the guarantee of corporate survival.

Whether understandable or not, the reality in such places that all resources have custom owners must be recognised equitably. Custom owners are powerful partners in the development process, and they are the ultimate authority. A well-known example with geothermal connotations is the Bougainville epithermal gold-copper mine. Consistent gross failure to pay equitable attention to custom rights, later coupled with attempts to control custom property by armed force, escalated into a civil war that has cost the national government and the mine owners several hundred million dollars, and that has yet to be resolved.

Defining custom ownership boundaries is often very complex, with boundary markers commonly being kept secret and even regarded as sacred sites. This can be highly frustrating, and may lead outsiders to the cynical conclusion that sacred sites can only be located by resistivity surveys or other prospecting equipment! In the context of corporate property with significant economic value, however, such secrecy is no different from that practiced by most corporate bodies.

Custom ownership also needs to be seen in the perspective of its promotion of sustainability in resource use, which is now recognised as being essential to continuing human socio-economic development. It is worth reflecting on how many of the world's remaining primary resources are located in those parts of South America, the South-West Pacific and South-East Asia where custom ownership is in force, or was until recently, and comparing them with the natural resources of Europe, North Africa and northern Asia that have been molested by humans for centuries.

DEPENDENCE ON THE RESOURCES OF GEOTHERMAL AREAS

Existing users that depend upon geothermal resources also have rights, ethically if not always legally. The fact that outsiders may be in a position to override these rights is no excuse to do so. It is now widely recognised that plants and non-human animals, and the ecosystems in which they occur, have rights that are independent of any uses humans may make of them. Indeed, humans are often parallel beneficiaries when such rights are given precedence, for example in preservation of some of the most spectacular geothermal fields where economic uses are required to be non-destructive, as well as the many living species of economic significance that have been discovered in protected areas.

Para-economic dependence may be defined as human dependence upon resources in a manner

that does not involve cash, but where alternatives would need cash if the resources were no longer available. The alternatives may be acceptable only if a method of acquiring the necessary cash is not only available but is regarded as equitable by local people.

Para-economic examples of using natural geothermal features occur in both economically developed and "less developed" countries, but the economic implications of losing those uses are very real for the people involved.

District heating is a common use, but may have adverse consequences which may or may not be reversible. (Recent restrictions on wasteful use of the Rotorua geothermal field have had the desired effect of reversing degradation in the Whakarewarewa geothermal area, thus enhancing one of New Zealand's foremost tourism assets).

Cooking in hot spring water or steam from fumaroles is also common. The alternative cooking heat source is usually fuelwood, but in areas of human habitation good quality fuelwood is usually in short supply. It is also usually the responsibility of women to collect it, which itself has development implications.

Food for humans is an important product of geothermal systems in parts of the Pacific, notably Papua New Guinea and the Solomons. Large birds called megapodes use geothermally heated forest soil to incubate their eggs. Adult birds do not tend either eggs or chicks. Apart from being a "free" food source, the megapodes support an inter-island egg trade that is part of the cash economy to the tune of tens of thousands of dollars per year for the custom owners involved.

Tradition is an important part of the social fabric of human communities everywhere, and is particularly well preserved in the S.W. Pacific where incursion of the cash economy tends to be a recent phenomenon. It is noticeable that areas with the highest levels of lawlessness and resource destruction are those where the local culture has been broken down by northern hemisphere styles of economic activity, with none of its safeguards being emplaced to support the former cultural controls. Maintenance of cultural integrity while still offering a range of economic development options is thus an important part of project planning.

"Bush medicines" are collected from primary forests by people in non-cash economies. Many of these compounds are highly effective, and are related to similar compounds used in "western" medicine that have been derived from similar sources. When forests are degraded as a result of new projects, the goods and services supplied by this free pharmacy decline along with the forest ecosystem. Imported alternatives to the bush medicines require cash which may not be available when required, so all too often no medicine is used and rural health standards decline.

Economic dependence obviously involves cash. However, even in cases where local people earn cash from using natural geothermal features, it is not always easy to develop alternative sources of income that are equally acceptable from the viewpoint of lifestyle or livelihood.

Tourism is perhaps the most widespread cash use, with examples from almost every country where there is naturally heated water or ground. In cash terms, tourism is also the most profitable single use. Other examples are numerous, and include drying pyrethrum plants for insecticide (Kenya), collecting megapode eggs for export (PNG), condensing steam to water for cattle (Kenya), collecting silica for white cement, drying stockfeed, and timber treatment (NZ).

The dollar numbers involved may be substantial. A recent study in a remote part of Solomon Islands assessed the annual value of harvested forest products to be \$10,512 per household, and the net loss suffered as a result of forest destruction by logging to be \$7545 per household, (Cassells, 1992). A study in the Philippines demonstrated that roading and logging destroyed tourism and fishing industries that were capable of grossing sustainable revenues \$4M per year greater than those resulting from once-only logging, (Hodgson & Dixon, 1985). A dive tourism enterprise near the Pokili geothermal area generates some \$700,000 per year for the Papua New Guinea economy, (Benjamin, pers. comm.)

So what has wise use of forest resources to do with a geothermal project? In a word, roads. If a forest is made accessible by road, whatever the reason, that forest will usually be logged unless an effective forest management scheme is in place before roading commences.

FURTHER ECONOMIC IMPLICATIONS OF RURAL RESOURCE DEPLETION

From the macroeconomic viewpoint, the potential negative implications of rural economic development projects need to be addressed seriously before approval to proceed is given.

Degradation of natural resources that are used by people outside the cash economy is counterproductive to the rural socio-economic development objectives that are claimed to be at the core of so many government programmes. Unfortunately for such programmes, collateral damage to natural resources usually results in urban drift, which in turn puts pressure on such facilities and services as energy, health, education, housing, roading, employment and sewerage, all of which have self-evident macroeconomic implications.

Rural electrification is often given as the primary reason for geothermal energy exploitation, but rarely is effective attention given to how scattered rural dwellings are to be supplied with electricity, or how their occupants are to pay either for it or for the appliances to use it. Without such

planning, power supply benefits only the towns or base-load industries, while the subsistence resources that supported rural people are all too often destroyed.

RESOURCE LOSS IMPACTS UPON WOMEN

In subsistence economies as in economically developed countries, women usually prepare the family food and act as the principal health practitioners and nutritionists. Women are also usually responsible for obtaining water, and are often also the main horticulturists.

Again, so what for geothermal? And again, careful planning is needed if project development is not to degrade women's lifestyle and prevent their socio-economic advancement by loading more work onto them. Such problems commonly result from depleting local resources of clean fresh water, fuelwood, geothermal cooking sites, garden soils that are not subject to accelerated erosion or droughts or flooding, medicines, and the housing and clothing fibres, fabrics and timbers that are normally obtained from a forest.

MANAGEMENT APPROACHES TO SUSTAINABLE RESOURCE USE

The most cost-effective management approaches are the well-known ones of using a comprehensive Socio-Ecological Evaluation system, (EIA or EIS system), coupled with an effective monitoring and compliance system, and an incentive-disincentive system that is designed to achieve results without need to resort to legal enforcement. All need to be in place before major financial commitments to project development are made.

Further, realistic accounting practices need to be used in assessing natural resource values. Natural resource accounting is an important tool in planning sustainable development, because it helps to assign defensible values to the primary natural resources that represent most of the wealth of economically developing countries. Conventional accounting methods are of limited use since they regard natural resources as having no value unless they are actually harvested or consumed in the year in question.

There is a need to assess the values of resource wealth that is still "in the bank" as represented by the environment; to value resources that are not destroyed when they are used to generate income or support human life, (e.g. geothermal areas used for tourism); and to value the non-replaceability and rarity of surface geothermal features.

Failure to undertake this type of assessment leaves decision-makers with information that is biased to the disadvantage of the resource-rich but economically underdeveloped landowners and their "developing" nations, and biased in favour of their resource-depleted but economically developed partners in the development process. The more cynical among us might perceive linkages between the overt reluctance to

introduce natural resource accounting practices and those whose economic interests are served by such bias.

Most of the problems outlined here are not strictly geothermal in their nature, hence it may be tempting to regard them as someone else's business. Professionally, however, it is not pleasant to return in later years to a technically excellent project, and see it presiding over an environmental wasteland populated by the impoverished remnants of human communities that once led a secure if basic lifestyle on lands rich in natural resources whose uses they controlled.

The lesson is to evaluate project proposals on comprehensive criteria of equity and sustainability, and to ensure that conservation principles are implemented effectively throughout all phases of a project. Even those of us whose primary interests lie elsewhere can help, by requiring assurance that such matters have indeed been addressed effectively by others.

REFERENCES

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DEFINITIONS

The following meanings are ascribed in this paper to some words which are commonly misunderstood.

Development means changing lifestyle and livelihood, or making something that did not exist before, or supplying new services. Development is not synonymous with exploitation of existing resources.

Sustainable Development means improving the quality of human life while living within the carrying capacity of the natural resources used to support that improvement, i.e. without using up all of the resources or the environment in which they exist.

Exploitation means using a resource in an unsustainable manner so that the resource stock continually declines until there is no longer enough left to use.

Preservation means protecting some living or non-living resource so it is not damaged in any way whatsoever, even by sustainable harvesting. However, that does not preclude making money from it.

Conservation means using natural resources so that people gain the greatest sustainable benefit, while at the same time maintaining biodiversity and retaining all of the ability of the resource to meet the needs of future generations. Conservation does not mean "setting aside" or "locking away" resources and never using them to earn a livelihood or to make money.