Social assessment of hydro-electricity development: lessons from the New Zealand experience

Paper prepared for the Annual Meeting of the International Association for Impact Assessment, Vancouver, 26-29 June 2004.

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Abstract

New hydro electricity generation projects in New Zealand and elsewhere are meeting increasing competition for water resources from irrigation, urban use, tourism, conservation and recreation, and they are being challenged over the disruption they cause to existing communities. There is therefore increasing need for project decision making to be informed by social assessments. Most of the benefits from large-scale, capital-intensive hydroelectricity schemes are derived at the regional and national levels, while negative social impacts are experienced regionally and locally, and these projects potentially contribute little to the economic welfare of rural communities in either the short or long term. Thus the impacts of such projects on local communities should be projected, mitigated, monitored and managed over the project life cycle at the community, district and regional levels. In particular, the benefits to the local community (e.g. additional employment, increased business turnover, better amenities) should be maximised and the costs (e.g. negative environmental effects, social dislocation) minimised. Research on a series of New Zealand hydroelectricity projects shows that changes in the population and economy of new hydro towns and existing host settlements involve periods of both rapid growth and rapid decline, as the area moves through phases of the arrival, settlement and the eventual departure of the construction workers and their dependants. Unlike other communities that are economically dependent on a single industry, the main workforce impacts of hydro projects occur during construction. The subsequent operation of the power schemes involves relatively small workforces which are not always located at the same site as the construction workers. Social assessments therefore need to pay particular attention to construction workforce characteristics, labour supply, accommodation requirements and demand for social services.

INTRODUCTION

Future hydro-electricity projects face major environmental obstacles worldwide and have to compete with other demands for scarce water resources. New Zealand is no exception, with project proposals meeting opposition from national environmental and recreation groups, and from local communities concerned about social impacts of project construction.

The generation of hydro electricity requires the construction and operation of large-scale production facilities (dams, reservoirs and canals) and the investment of considerable sums of capital. The development of these energy projects is usually justified in terms of the benefits they are expected to provide for the national economy, yet many of their economic, social and environmental costs are borne by the regions and rural districts in which they are located. In some cases, rural communities are displaced or changed comprehensively to make way for the project. They may, however, be rejuvenated by, or even be created for, construction of these energy projects. Either way, they experience rapid economic and social change as they adjust to the boom-bust cycle associated with this type of natural resource production.

Hydro electricity developers therefore need to bring affected communities on board through an impact assessment process, including social assessments, that contributes to the decision framework. In addition to identifying the social consequences of environmental impacts such as noise and dust, landscape changes, changes in access to natural resources, and impacts on local transportation, these assessments require careful workforce planning, relocation and resettlement planning, and strategies to deal with local economic impacts and boom-bust cycles. Longer-term strategies may include economic diversification through, for example, irrigation and agricultural development, and tourism and recreation around rivers and new reservoirs.

Extensive international experience points to the need to apply impact assessment to hydro-electricity projects (World Commission on Dams, 2000). Socially-responsible energy utilities will aim to apply experience of social impact assessment to develop social trust. As the E7, a grouping of major world energy utility companies, say "For the purposes of the energy industry, social trust can be defined as the quality of a relationship between a company and its stakeholders, where any action performed, service provided, or information given will meet the needs, expectations, and concerns of all parties involved". E7 guidelines for social trust and the energy industry include being proactive for the well being of the community, being involved in communities where they have facilities, including social considerations at the same level as environmental, technical and cost considerations in design of projects, and taking perceptions and "strong emotions" into account (E7, 2000).

To assist future application of social impact assessment to project planning and development of social trust with all stakeholders, this paper looks at the comparative-case experience of hydro-electricity developments in New Zealand (Taylor, et al. 2003). The cases are based on research into community change, including workforce issues in particular[1]. The paper starts with an overview of the major areas of social impacts to consider in planning hydro-electricity projects, through uncertainty, displacement and resettlement, and through the location of construction workforces. The paper then reviews the experience in New Zealand hydro towns, places where large construction workforces were located, and draws some conclusions about how this experience can be applied in future projects.

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[1] The paper draws on research into community formation and change in resource based communities in New Zealand, funded by the Foundation for Research Science and Technology (contracts TBA601, TBA801, TBAX0001).

SOCIAL IMPACTS OF HYDRO-ELECTRICITY PROJECTS

Impacts in the planning stages

Despite the urging of peak organisations groups such as the World Bank, ADB, and the IAIA itself, social impacts are often neglected in the planning stages of a project. In the case of large projects such as hydro-electricity developments, these impacts can be considerable, and yet can fall outside the formal process of impact assessment and management. Experiences with projects show that these impacts include:

- psychological impacts and stress due to uncertainty over land acquisition, mitigation of potential effects and compensation
- social conflict over the pros and cons of the project
- diversion of existing social capital and community resources into dealing with project planning issues - which is especially critical if there has been a history of population loss and struggle to maintain social services in the face of fluctuating fortunes for agriculture and rural industries.

As illustrated by the recent (now abandoned) "Project Aqua" proposal for a canal-based scheme in the lower Waitaki River in the South Island of New Zealand[2], negative local social impacts during planning can include:

- individual stress in dealing with project preparation processes such as land acquisition and compensation agreements
- individual and community uncertainty round relocation of homes - temporary and permanent
- individual and community uncertainty about workforce requirements, recruitment and worker accommodation options, and their impacts
- uncertainty for businesses, including physical displacement and relocation and their impacts on business operation, business planning for the "boom" construction period, and compensation for losses
- the effect of these uncertainties on decision making and investment by households and businesses
- social conflict and relationship breakdown around the acceptability of the project and the fairness of any plans for compensation or mitigation, extending into inter-personal animosity and abuse with people "blaming" each other for what has or has not happened, often leaving a legacy of conflict that the community has to work through
- a very considerable demand on local social and human capital, such as community volunteer resources and leadership, in dealing with the planning process - energy that could be directed more positively. Considerable costs can be incurred by individuals (such as for communication and travel) in addition to their time
- uncertainly due to the lack of or abrupt changes in local strategic direction, and the potential for exacerbation of boom-bust economic cycles
- escalation of property and accommodation prices, especially in communities which may serve as hosts to the construction workforce

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[2] Project Aqua would have added further generating capacity to a river that already supplies 1,738 MW from eight power stations on the upper catchment. The new project was to produce a further 570 MW from six new power stations along a canal that diverted about 70% of the flow, at a cost of $NZ1.2 billion.

- the creation of barriers to the development of social trust or the deterioration in an existing relationship between the utility company/developer and the community.

Positive impacts may include:

- social and human capital building through involvement, including community group formation and revitalisation, and the up-skilling of community members on planning processes, and becoming familiar with technical matters
- the gathering of a large amount of natural resource and social data that is publically available through the published EIA
- local project employment and business activity especially for accommodation houses and those providing services to project investigations
- increased national publicity for the local area and its attractions due to media attention on the development.
- development of a longer-term strategic vision for the local area and its resources, including identifying new and revitalising economic and livelihood opportunities.

Management of the negative impacts can include putting community liaison mechanisms in place from the earliest opportunity in project formulation, through timely provision of information on planning progress and technical issues being addressed, financial and technical assistance for community groups that are involved, and support for community development and adjustment processes and initiatives from the outset.

Impacts of displacement and resettlement

Construction activity (dams, canals, power plants, new roads and associated project infrastructure) often require farms, households and businesses to relocate permanently. Furthermore, physical impacts such as noise, dust and heavy traffic during construction may be of sufficient magnitude to require temporary relocation or resettlement. Assessment of the potential for involuntary resettlement and strategies for managing these impacts is an important part of SIA throughout the project cycle.

International best practice (eg Asian Development Bank, 1998) requires a mitigation strategy in the form of a Relocation Action Plan (RAP) for communities affected either as the source or the destination of relocation. A RAP should contain clear information as to who is to be relocated and on what terms, along with an assessment of the wider community impacts of relocation.

The analysis and development of a RAP should typically include:

- the identification and appropriate involvement of stakeholders. The overall analysis of stakeholders for the SIA might require a sub analysis relating to the process of involuntary relocation. Mechanisms are required for these people and groups to take part fully in the identification of issues and impacts, and the development of mitigation strategies,, including the design of new neighbourhoods, houses and facilities

- the identification of groups particularly vulnerable in a process of relocation, especially minority and vulnerable groups who may be poorly connected to the project planning or preparation of a RAP. These groups might include those without land title, the poor and socially disadvantaged, the elderly, ethnic minorities, and those with poor literacy or weak leadership

- compensation and financial arrangements, which need to be agreed by all participants well in advance of resettlement. This should include clearly defined and transparent criteria for eligibility for compensation, agreed compensation formulae, and an open and agreed system for dealing with grievances

- social preparation of the people who will have to shift. Clear timelines are required, along with arrangements for making any changes to an agreed relocation process. The actual relocation process should be set out clearly before any relocation occurs. Social preparation includes wide consultation (along with capacity building) and provision of full information on entitlements

- social planning and design of new housing and services for any new settlement sites - well in advance of any resettlement

- development of income earning and livelihood opportunities when people relocated loose income due to relocation. Livelihood development should be part of a broad project approach to workforce planning and training, agricultural development, business development, new community infrastructure and housing provision

- capacity building for communities and institutions involved. Where there is no policy framework for relocation this should be established as part of the RAP with the wide involvement of stakeholders. Opportunities to support community based organisations and local leadership should be identified and utilised

- assessment of environmental impacts and natural resource implications of the relocation proposals and their social consequences, especially where they lead to activities such as the construction of new access roads, housing and community facilities, and new livelihood development initiatives and projects

- monitoring and evaluation. The overall SIA monitoring framework for the project should include a specific section on the internal monitoring of resettlement activities, and provide for external evaluation of the resettlement against its established policies and objectives.

Construction workforce impacts

Construction workforces pose an important and particular set of social issues for hydro-electricity development. Key issues typically include:

- where the required labour and specialists would be sourced from, for example, from the local area, the wider region, or beyond
- where incoming workers would be located, and the type of accommodation provided for them
- the additional demographic impact, and the implications for existing social groupings
- impacts on the housing market
- impacts on social services.

These key issues have been well canvassed in the social impact literature on major energy projects both in New Zealand and internationally (Taylor, et al, 2001; Weber an Howell, 1982; Freudenberg, 1986).

An EIA should therefore include a workforce plan that covers a timeline from the beginning of construction to operation, as well as a full analysis of labour supply and workforce issues. This work should include development of a workforce policy taking into account the size, capacity and implications of the project for the local labour market, implications for travel to work, training options, accommodation options, and ways of assisting the housing market and social services to cope with an influx of construction workers.

One of the key issues to address is the sourcing and disposition of incoming construction workers. Options may include:

- dispersal around existing settlements of the region
- concentration into an existing town
- concentration in specially built construction settlements
- or a combination of these strategies.

Energy project construction in New Zealand has tended to favour concentration of workers and their dependents into specially built settlements, though the more recent projects involved concentration of workers and project management facilities in existing rural towns. Examples of social patterns associated with the construction phase of hydro electricity projects in such towns in New Zealand are provided below.

More generally, specially built hydro towns and towns that have hosted construction workforces show periods of both rapid population growth and rapid decline as a town moves through phases of the arrival, settlement, the eventual departure of the construction workers and their dependants, and the takeover by the operational workforce (Taylor and McClintock, 1985: 36-38). The life cycle of a hydro electricity power scheme provides a useful framework for examining the social and economic effects associated with this type of resource development (Taylor et al., 2004).

NEW ZEALAND EXPERIENCE WITH CONSTRUCTION WORKFORCES

There is a substantial experience of hydro-electricity construction for New Zealand projects to draw on today. A study of hydro towns and the social and economic effects of hydro electric development in New Zealand (Taylor and Bettesworth, 1983) compared experiences of the towns of Mangakino, Turangi, Twizel and Cromwell, although Roxburgh and Otematata were also discussed. The main findings of this study were:

Demographic patterns

- rapid population growth, averaging 15 percent over three years or more
- sudden decline in population after the construction workforce peak had been reached
- a preponderance of males over females
- a relatively low proportion of elderly residents and a relatively large proportion of dependent children.

Construction workforce

- high turnover rates in construction workforces compared with national averages
- migration between successive construction projects (e.g. from Otematata to Twizel to Cromwell)

- during construction, an occupational structure dominated by males employed in blue collar jobs, and few employment opportunities for women; and after wind down significant changes as new industries and employment opportunities emerge

Housing

- a gradual improvement in housing over time between projects - from the tents used before the second world war, to temporary dwellings not designed to outlast the project in the 1960s, and ultimately to better quality houses for families in the 1970s and 80s
- changes in settlement pattern - from different types of housing for staff and wage workers located in segregated areas in the earlier hydro towns, to higher quality dwellings of staff members dispersed throughout the settlement in later projects such as Turangi and Cromwell
- accommodation provided rent-free or for a low rental payment.

Local services and amenities

- provision of all local services and amenities by the Ministry of Works (MOW) in hydro towns built and owned by the government (i.e. Mangakino and Twizel), along with the establishment of welfare associations to manage community amenities in the absence of an official local authority.

Community identity

- the creation of a unique community identity due to the relative isolation of the settlements from the rest of the region and their single economic purpose
- the sense of community linked to the patterns of work associated with hydro construction activities and schedules and with the challenge of establishing local services and amenities
- the major role of a wide range of organised leisure activities and clubs in fostering social solidarity
- social and human capital continuity between successive hydro construction projects and their host communities, including transfer of leadership skills and relationships associated with community organisations

Disadvantaged groups

- disadvantage to some groups due to the special character of hydro towns
- limited job opportunities for women, and inadequate childcare facilities
- lack of recreational activities and employment for young people, with many moving to the cities for further education or careerers
- in some North Island projects, pressure on local Maori tribes and their traditional way of life due to loss of land and the introduction of urban values by incoming workers

Wind down

- rapid decline in population as construction activity wound down
- the sale and removal of shops and houses out of the town and a decline in local and regional economies due to loss of the income from construction workers
- difficulties in physically and financially sustaining physical infrastructure and services designed for a finite life and for a much larger population.
- temporary, purpose-built towns (e.g. Twizel) which managed to survive experienced more severe wind down effects than those that were planned to be permanent (e.g. Turangi) or attached to an existing town (e.g. Cromwell).

Since this comparative work in the early 1980s, three detailed follow-up community studies of hydro towns were completed in the late 1990s. These were studies of Turangi, Manapouri and Twizel. Highlights from these three community studies are provided below.

Turangi 1965-1997

McClintock and Taylor (1997) assessed the general social and economic changes in Turangi from 1965, when the Ministry of Works began developing the town, until 1997. The development of Turangi was analysed in terms of the life cycle of the various projects that comprised the Tongariro Power Development (TPD), and the effects the establishment of town had for the local economy and community were assessed. The effects were identified for four major development periods or phases:

- settlement of the town and arrival of the workforce 1965-1971
- period of stability 1972-1981
- withdrawal of workforce and wind down of the TPD 1982-1984
- after the wind down of the TPD 1984-1997.

The major social and economic changes for each of these periods are summarised below.

Settlement of the town and arrival of the workforce 1965-1971

- the population increased from 1,661 in 1966 to 5,858 in 1971 as MOW workers and their families arrived in the town
- about 50% of the hydro workers resident in the town during the early 1970's had come from other construction towns
- most of the community amenities were supplied by the MOW, but the local Ccouncil for the Taupo district took over many of the local body functions which had been the responsibility of the MOW in previous hydro towns
- the Tongariro Welfare Association was established which administered sports fields, a public library, a canteen, a weekly newspaper, and visitor accommodation.

Period of stability 1972-1981

- the population of the town slowly declined from 5,858 to 5,457 in 1981
- those residents employed by MOW or the New Zealand Electricity Department were more mobile than other residents
- uncertainty about the future of the TPD motivated community leaders to consider diversification strategies to broaden the economic base of the town
- a lack of employment opportunities for young people
- the MOW sold surplus houses and sections as the construction workers began to leave.

Withdrawal of workforce and wind down of the TPD 1982-1984

- withdrawal of the MOW workforce accelerated after 1981, with only a small number of employees remaining in the town after commissioning of the Rangipo project in 1983
- community leaders continued to seek alternative economic activities for the town such as forestry and tourism.

After the wind down of the TPD 1984-to late 1990s

- from the 3,861 persons left in Turangi in 1986 after the construction workforce had left, the population slowly fell to 3,747 in 1996 and 3,441 in 2001

- by 1991, Maori were the majority ethnic group in the town, and since then the population has been relatively youthful by national standards
- the incomes of the town's residents declined relative to the rest of the country between 1976 and 1996
- there was a loss of services and retail outlets and in the 1990's some government agencies moved out of the town
- the tourist industry in Turangi and the surrounding district prospered after hydo construction with the number of visitors increasing ten-fold between 1982 and 1997.

Manapouri (1960s-2000)

Manapouri, a township in Western Southland, stands 21 kilometres south of Te Anau on the eastern shore of Lake Manapouri near the Fiordland National Park and World Heritage area. For at least 10 years before 1981 the population of the immediate area, which relied on agriculture and a nascent tourism industry, was boosted by the presence of workers building the control structures for the Manapouri Power Scheme, who were housed nearby in a specially built village. After these construction workers left the district and the hydro village was demolished, the population fell, though those employed to operate the generation facilities took up residence in a specially constructed housing subdivision in the town itself. Subsequent changes in the electricity industry meant further population loss, and by 2001 there were only 243 permanent residents in the town.

Although Manapouri's economy has been dependent since the 1960s on the construction and operation of hydroelectric facilities, the restructuring of the NZ Electricity Department and the introduction of remote automated control of the generation facilities and control structures led to a major reduction in the number of production workers located at Manapouri, breaking the economic and social link between the community and the electricity sector. Moreover, the construction of the second tail race tunnel for the Manapouri Power Station in the late 1990s had relatively little social and economic impact on the township since it involved workers commuting long distance from homes outside the district to the site deep inside the Fiordland National Park and being accommodated on site. During the 1980s and 1990s Manapouri developed as a regional domestic 'resort' and a base for tourism focussed on Lake Manapouri, Doubtful Sound and the southern fiords. The number of locally-based tourism enterprises has subsequently increased and the tourism sector has become the main local employer (Fitzgerald, 2000).

Regional and local economic benefits

- during the first round of construction of the Manapouri Power Scheme the economic effects included employment for up to 1,000 construction workers over an 8 to 10 year period, 70 long-term jobs for the operational staff of the power scheme, contracts for lake transport which provided employment for local residents, and thousands of jobs for construction and operational workers at the Tiwai Point aluminium smelter which, hundreds of kilometres to the southeast, consumed the power generated at Manapouri
- with the selling off of the NZED houses, the local stock of housing available to the open market increased
- with use of a sophisticated tunnel boring machine and many workers commuting from a long distance, Manapouri derived little direct economic benefit from the construction of the second tail race tunnel apart from providing water transport services and some rental housing.

Diversifying the local economic base

- while tourism has been an important economic activity at Manapouri since the 1890's, a road built inside the Fiordland National Park for the Manapouri Power Scheme in the 1960's gave visitors access to Doubtful Sound and increased the variety of tourism experiences in the district
- nowadays tourist enterprises based in Manapouri are niche operations, such as specialist cruises, and adventure and ecotourism activities
- promotion of tourism in the Manapouri area occurs at both the district and regional levels.

Technology and the organisation of work

- workers employed in the initial construction and subsequent augmentation of the Manapouri Power Scheme required specific technical skills to use plant and equipment that was very sophisticated by New Zealand standards
- workers experienced rigorous climatic and living conditions and the unrelenting schedules of shift work
- technological improvements in the generation of electricity also demanded employees with enhanced technical skills who had to arrange their family and leisure activities around the continuous work schedules of the industry.

Community impacts

- after the initial construction of the power station and tailrace tunnel, the government agencies (the New Zealand Electricity Department and its successors) that employed the operational workforce acted as 'corporate citizens' by providing permanent housing, basic infrastructure (e.g. water supply and sewerage) and recreational facilities at Manapouri
- there was a definite association between a worker's place in the occupational hierarchy of the NZED, house location, and his/her social status in the community
- the close relationship between work, place of residence, and lifestyle typical of the NZED era has now largely disappeared, together with the social distinctions that separated electricity workers from other residents.

Twizel 1970-2001

Twizel is a town about 150 kilometres inland from both Timaru and Oamaru. Located in the MacKenzie Basin of South Canterbury, the town is near Mount Cook which is one of New Zealand's foremost tourist destinations. Twizel was established on a 'green field' site in 1970 by the Ministry of Works to house workers and their families from Otematata who were to construct the Upper Waitaki Power Scheme. The population of Twizel grew rapidly to 5,184 in 1976, and then peaked at just under 6,000 in 1977. When the Upper Waitaki Power Scheme wound down in the late 1970's there was an exodus of construction workers and their families from the town.

Though Twizel was intended to be removed at the end of the construction of the Upper Waitaki Power Scheme, during the wind down period government withdrew from direct involvement in hydroelectric project construction. The remaining residents, mainly retiring construction workers and MOW staff, lobbied central and local government to retain the town as a permanent settlement and a base for the operation of the various Waitaki hydroelectricity generating stations. The subsequent integration of the operation of the Waitaki power stations, dams and canals using new computer and communications technologies dramatically reduced the size of the onsite workforce, such that between 1986 and 2001 the number of permanent residents went from 1,179 to just over 1,000. The end of hydro construction and the various subsequent changes effectively dissolved the mutually dependent relationship between the Twizel community and the electricity generation industry. While making the difficult transition

from a MOW hydro town to a self administered rural community, even managing to retain its community facilities and most of its shops, Twizel has not become the main rural service centre for the district. However the local economy has slowly diversified through development of the abundant natural assets of the Mackenzie Basin, and Twizel's future now lies in outdoor recreation, tourism, fish farming (in the hydro canals) and new forms of land use (Fitzgerald and Taylor, 2000).

Regional and local economic benefits

- the Upper Waitaki Power Scheme provided some 12,500 people with jobs between 1968 and 1983, and at its peak the on-site workforce numbered over 1,900
- almost all the workers resided locally and most of their daily needs were purchased from shops in Twizel, which were largely supplied from within the region
- when the project wound down in the early 1980's the population rapidly declined, unemployment in the district increased, and the town struggled to maintain its basic community services
- the electricity generation industry continued to be the main contributor to the local economy through the wages and salaries of the several hundred operations workers who remained in the district
- from the late 1980's a series of restructuring measures in the electricity generation industry resulted in job losses for local residents.

Diversifying the local economic base

- most development efforts after the end of hydro construction have focussed on the tourism industry, with Twizel as the centre for a range of activities in the Mackenzie Basin
- salmon farming is a small but growing industry, with farms operating in the canals of the Upper Waitaki Power Scheme.

Technology and the organisation of work

- workers employed in the construction of the Upper Waitaki Power Scheme used a huge array of specialised mechanical equipment and pioneered new construction methods
- as at Manapouri, project workers experienced rigorous climatic conditions and the unrelenting schedules of shift work
- as elsewhere, technological changes in the generation of electricity have required staff with enhanced technical skills who have had to organise their family, leisure, and community activities around the work schedules of the industry.

Community impacts

- the MOW acted as a 'corporate citizen' at Twizel by supplying the housing, physical infrastructure, community facilities and support services that enabled the community to develop, while the rhythm of project construction activities set the pattern for community life
- married workers were allocated houses of different quality and size according to their occupational status and the number of family members, and single men were required to live in the segregated camps and hostels
- after the wind down of construction of the Upper Waitaki Power Scheme Twizel was gradually transformed into a rural town with many of the community facilities transferred by government to the MacKenzie County Council and its ratepayers
- with the departure of most of the original residents during the wind down period, many of community organisations and local services at Twizel ceased to operate and others reduced their activities

- the remaining residents benefited from the infrastructure and community facilities originally provided by the MOW.

DISCUSSION

Future hydro-electricity projects face major environmental obstacles worldwide and have to compete with other demands for scarce water resources. As a case in point, the major energy utility company Meridian Energy Ltd. announced early this month that it was stopping all planning for its flagship Project Aqua on the lower Waitaki River in New Zealand's South Island. As the planning process for this project unfolded, there was increased opposition from regional and national environmental and recreation groups, and also from local farming communities that were particularly concerned about the social impacts of project construction. Community opposition reflected a overall view that energy would be generated for the benefit of cities, while their rural areas would experience many social costs and few economic gains.

Experience in New Zealand shows many of the social impacts of hydro-electricity projects are experienced in the construction phase of development, and issues around the construction workforce lie at the heart of host community concerns. Uncertainty over the origins and location of the construction workforce should therefore be addressed alongside the social consequences of environmental impacts, including dislocation and resettlement.

Our research on hydro-construction workforces and their host communities in New Zealand shows that changes in the population and economy of specially built hydro towns, and existing towns acting as hosts to projects, involves periods of both rapid growth and rapid decline. Hydro-construction towns typically move through phases of the arrival, settlement and the eventual departure of the construction workers and their dependants. The main workforce impacts are during the period of project construction, since today the operation of hydro electric power schemes is highly automated. Operational workforces are relatively small and not always located at the same site as the construction workers who preceded them. Most of the social and economic benefits from the development of hydroelectricity power schemes are derived at the regional and national levels, and these large scale, capital intensive, energy developments often contribute little to the longer-term economic welfare of residual hydro town and existing rural communities.

Social impact assessments therefore need to pay particular attention to construction and operational workforce characteristics, accommodation requirements and demand for social services. They also need to address associated issues of resource cycles and economic diversification. The impacts of a project of this type on local communities should also be monitored and managed over its life cycle at the community, district and regional levels, so that the benefits (e.g. additional employment, increased business turnover, better amenities) arising from its operation are maximised, and the costs (e.g. negative environmental effects, social dislocation, and loss of livelihood assets) are minimised.

Community impact agreements and local capacity to respond to change

SIA is about establishing a process for planning and managing social change and not just about identifying impacts (Taylor, et al., 2004). As part of this process, community impact agreements (Smith, 1995) provide a useful tool and outcome focus for hydro-electricity project assessment. Development of a community impact agreement should take place in a series of steps supported by

information from the ongoing social assessment process. It also requires support for building the capacity of the affected communities to participate and respond. Matters to cover in such an agreement include:

- a workforce management plan
- a relocation/resettlement action plan
- an approach to dealing with social consequences of environmental effects (noise, dust, visual, traffic, ground water, etc)
- a community development strategy including plans for housing and businesses economic diversification and livelihood development
- a community liaison mechanism with full access to necessary information and the means to seek further information
- support for independent evaluation of impact assessments
- a social monitoring framework with mechanisms to put appropriate mitigation in place
- a process for dealing with public complaints if unanticipated effects or outcomes, or grievances emerge
- a package of support for community social and economic development.

Final conclusions

In New Zealand, as elsewhere, the search for a range of energy sources continues alongside growth in population and the economy. This search involves decision makers working through numerous resource and environmental constraints. Hydro-electric developments, while on the face of it sources of sustainable energy, potentially create a wide range of impacts, including social impacts. With an extensive body of experience, literature and comparative cases to draw from, SIA practitioners can make a strong and early contribution to project planning. Hydroelectricity project developers need to utilise this experience to build social trust and improve their project planning as new proposals will face strenuous appraisal from the impact assessment process and the general public. SIA will help to build social trust between the energy industry, people affected by their developments and other stakeholders.

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