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# **SOCIAL IMPACTS OF AN ALUMINIUM PLANT IN EAST ICELAND 2002-2008 MAIN FINDINGS**

*Prepared for comparison with a proposed aluminium plant  
in Maniitsoq, Greenland*

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***A report prepared for the  
Government of Greenland***



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## 1. MAIN CONCLUSIONS

Impacts were observed to be confined to primarily two municipalities where the projects are located, this was narrower impact area than many anticipated.

Sample surveys indicated positive attitude towards impacts on economic conditions in the area closest to the projects and increased diversity of jobs.

Population increase was only observed in the area closest to the projects. In areas further away decline continued and outmigration to other regions was more pronounced than to the area closest to the projects. Age and gender structure changed much in the area closest to the projects due to many migrant workers. After the projects were finished males still outnumber women to a considerable degree which is a cause for concern.

Participation of foreign workers was much more than anticipated. Globalization, size of the projects many other projects in other locations in the country and the high value of the Icelandic krona (ISK) are among the main reasons for this development. The Icelandic system of governance was not prepared for this great influx of foreign workers. This applies to both the state and the municipalities and official data on foreign population did not reflect their real number.

The structure of the local economy changed during the construction period and beginning of the operation period. There was especially a decrease of jobs in fisheries and fish processing. This cannot be directly related to the advent of the aluminium plant but more likely that this is due to continued rationalization and automation in these fields.

The relative size of the aluminium plant compared to the local labour market makes it important for the social rhythm. Issues such as work shift schedules may become more pronounced due to this fact and in the case of this plant a system of 12 hours shifts appears to be less suitable, e.g. for parents of young children. Another indicator of its impact on the local labour market is the fact that participation of women has been unusually high. It was 32% soon after the plant began operating in 2007 but had dropped to 26% in the end of 2009. However it was much higher than in the other two aluminium plants in Iceland. There was a negative impact on social life in the area closest to the projects when the activity was at maximum. Operation of the large workplace also appears to have some adverse impact on social life in its vicinity.

Infrastructure was considerably strengthened as a result of the projects. This applies especially to a new export harbour at the site of the aluminium plant and a number of new roads. The airport buildings in Egilsstaðir in central East Iceland were enlarged in 2007 but this was too late to meet increased traffic related to the projects in 2004-2006.

Income of municipalities rose considerably but their economic condition did not change similarly due to diverse costly projects. For the municipality where the plant is located income continues to be high due to taxes from the company and its staff. Much investment in infrastructure and services is one result of the competition between the two main municipalities for new inhabitants and companies.

Planning of new building areas should have been carried out more carefully and increased cooperation between municipalities on planning issues desirable. This is the policy area where the most obvious mistakes were made during the construction period, the most striking of which being the excessive building of residential housing. This applied especially to apartment buildings but single family houses have traditionally been the most important building type in the area.

The experience of huge house-building programmes demonstrates that municipal councils must ensure, not only that a suitable quantity of housing is constructed, but also that the type of houses built conforms to community practice in each location. Too many apartment buildings were built.

A sample survey among companies indicated inter alia that tourism companies experienced considerable positive effects from the projects.

During the construction phase Icelandic society was in an unusual state of turmoil. There was much expansion in the economy of the country with rising housing prices and a credit and housing bubble which burst in October 2008. Also there were cuts in fishing quotas and other negative changes in the traditional economy. Taking this into account cause and effect due to the megaprojects becomes even more blurred.

It can be said with certainty, that the burden of the construction work has not proved to be too much for the communities in East Iceland to shoulder, and therefore the area seems to have survived this phase satisfactorily. On the other hand, the various social institutions, both municipal and state, do not appear to have been sufficiently prepared to bear the weight of the strain placed on them during the construction period.



It seems to be the case that Alcoa Fjarðaál has succeeded in working well with the inhabitants of the area during the short time the plant has been operational. The effect on society was all in all good. The inhabitants are in general pleased with the decision to go ahead with the project, are happy with their remuneration and the population has increased. Optimism rose in the area when construction began.

Concerning regional development, it appears that the construction has strengthened Egilsstaðir as a service centre. The gap between the largest and second largest towns in East Iceland has widened. The interests of the different communities of the central impact area appear to converge to a significant extent, and therefore it is possible that these communities will either continue to work closely, or even merge to form larger units.

## **2. INTRODUCTION**

This report is carried out for the Government of Greenland and has a focus on social impacts of an aluminium plant and hydro power project which was established in East Iceland during the period 2003-2008. These impacts were studied by University of Akureyri Research centre during the period 2004-2009 and funded by the Icelandic state (Hjalti Jóhannesson et. al, 2010). The valuable experience obtained in East Iceland and this project can be of considerable relevance for a similar project which is being planned in Maniitsoq on the west coast of Greenland. Of course various conditions are different but the Icelandic case is probably the case which resembles most conditions in Greenland as the project took place in rural Iceland, both energy harnessing and the manufacturing plant. In previous aluminium projects in Iceland, the manufacturing plants have in all cases been built either in the capital region or its immediate vicinity. Power plants have both been built in rural location as well as in the vicinity of the capital Reykjavík in SW Iceland. This report provides examples from the Icelandic social study and sheds a light on how positive effects of such projects may be maximized while negative impacts are minimized. It is the hope of the authors that this report will provide valuable information for the planning process of a proposed aluminium plant in Maniitsoq.

This report has been prepared by Hjalti Jóhannesson, Jón Þorvaldur Heiðarsson and Valtýr Sigurbjarnarson researchers at University of Akureyri Research Centre. The authors wish to thank staff at the Government of Greenland for good cooperation, especially Freia Lund Sørensen who has been the main contact with University of Akureyri Research Centre.

### 3. THE PROJECTS IN EAST ICELAND

In this chapter the large projects in East Iceland will be shortly introduced along with the setting in which they were carried out and the social and demographic context. Clearly this differs much from the site in Maniitsoq especially regarding the regional context where there is a considerable hinterland of the site of the aluminium plant in Reyðarfjörður East Iceland. Commuting to work in the plant is possible from a number of towns and villages in East Iceland, thus enlarging the labour market.

Contracts on Kárahnjúkar and the Alcoa Fjarðaál aluminium plant in East Iceland were signed 15<sup>th</sup> March 2003. These were together the largest construction project in Iceland's history and consisted of large hydropower project and aluminium plant.



**Figure 1. Approximate location of Kárahnjúkar hydro power project and Alcoa Fjarðaál plant in Iceland.**

For several decades, there had been plans to use the energy supplies of the glacial rivers East Iceland to build large industry and create jobs (see appendix). Therefore, there were very high hopes for the project and its socio-economic impacts on the surrounding area. The region's population and economy had been in a relative decline for decades (Figure 7) with limited diversity of jobs and dependency on the primary sector, i.e. fisheries and agriculture which have been rationalized and thus needing ever less manpower. Furthermore, quota system in both fields has stimulated changes usually resulting in fewer and larger companies/farms. This has been especially notable in fisheries where quota has been transferred from many small fishing villages. Fewer jobs have been available and limited diversity of jobs.

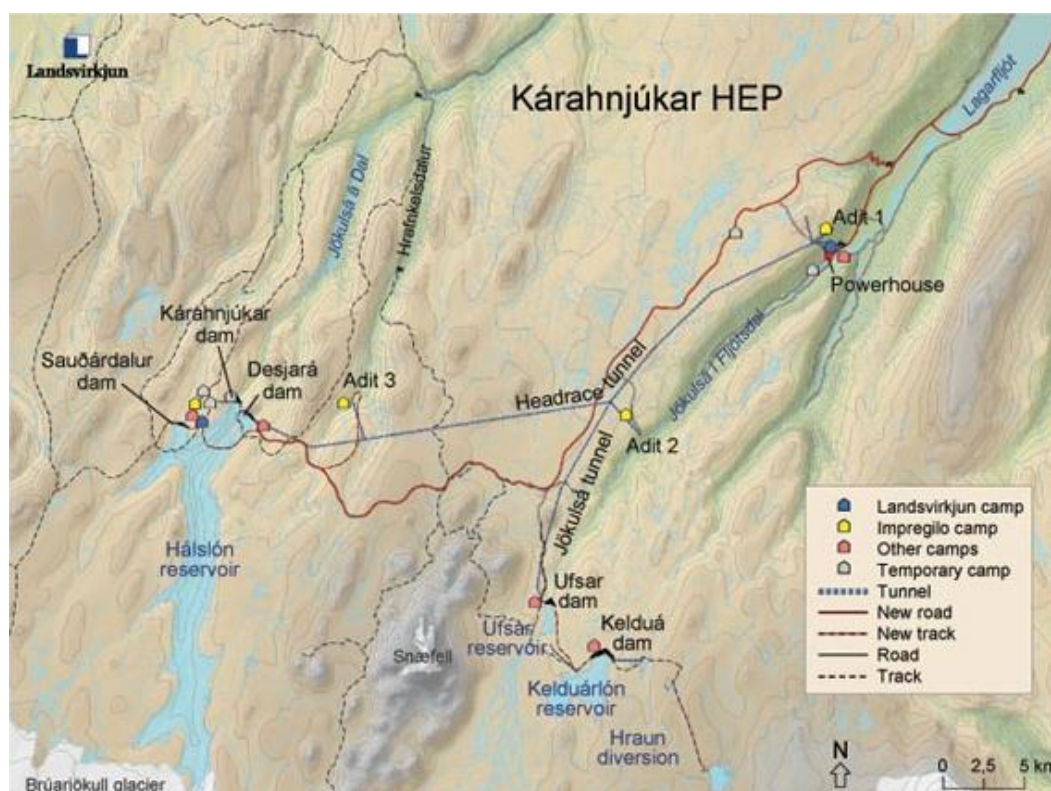
The age and sex distribution of the area shows signs of lengthy out-migration, resulting in relatively fewer young adults and women who historically tend to

migrate to the capital area, its vicinity or other regional centres to seek education and jobs.

### 3.1. Kárahnjúkar hydro project

In 2003 building of the Kárahnjúkar hydropower plant commenced in the eastern part of the central highland (Figure 2), an area mostly untouched by human activities. During the construction period there were many protests against the project, probably more than in any construction project in Iceland to date<sup>1</sup>.

Kárahnjúkar power station was formally opened November 30 2008. In December 2008 all six dams and 54 km of waterway tunnels of the project were finished. In addition there are access tunnels and similar, so in total there were 73 km of tunnels in the project.



Source: [www.karahnjukar.is](http://www.karahnjukar.is)

Figure 2. Map of the Kárahnjúkar project.

The main contractors were foreign firms and the single largest was the Italian firm Impregilo. Similarly, the majority of workers in the project were foreign for reasons

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<sup>1</sup> In a report by the Minister of Justice delivered to the Parliament, 40 cases were registered in the files of the police during the period 2005-2007. 83 persons were accused, 69 foreign citizens and 14 Icelandic.

such as low unemployment rate and high value of the Icelandic krona. Cultural and economic relations probably had much impact regarding which nationalities came to work on the Kárahnjúkar project. For example there was not a single person of Portuguese nationality in the region before 2003. But in 2004, a year after the project commenced, the Portuguese were most numerous among foreign nationals followed by Italians. In the Environmental Impact Assessment of the Kárahnjúkar project (2001) it was anticipated that some 20-25% of the workers would come from East Iceland. This prediction did not materialize as 9 out of 10 workers were of foreign nationality in the summer of 2007 at the peak of the project. The share of Icelanders became 50% at the end of the project in 2008 when only 22 workers remained. The staff needed to run this largest power station in Iceland is very small or 13, there of only one female.

For the Greenlandic case it is important to expect a high foreign participation and that cultural and economic relations impact which nationalities will primarily be involved. Based on Icelandic experience authorities need to keep good register of this additional workforce.

### ***3.2. Alcoa Fjarðaál aluminium plant***

Smelting of aluminium began in April 2007 and in 2008 the aluminium plant had reached full capacity. Kárahnjúkar power station provides Alcoa Fjarðaál with 690 MW / 4,600 Gwh of electricity to produce 346,000 tons of aluminium annually<sup>2</sup>.



*Photo: Hjalti Jóhannesson*

**Figure 3. The Alcoa Fjarðaál plant in Reyðarfjörður.**

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<sup>2</sup> Actually the production for 2009 was 350.000 tonnes. Kárahnjúkar generated more electricity than anticipated.

The aluminium plant was built 6 km away from the town Reyðarfjörður, a town of just over 600 persons when the project commenced. The labour market of the plant within 45 minutes driving distance however consists of some 8,000 inhabitants. This makes conditions in East Iceland radically different than in Maniitsoq. This is also quite different from a project which Alcoa is also planning in Húsavík, North Iceland. In that location, the labour market of adjacent Akureyri region with some 24.000 inhabitants will partly be accessible via commuting from that region (Hjalti Jóhannesson et. al., 2009). Furthermore strong service base in that region will be accessible.

During the construction period, the region in central East Iceland witnessed huge changes. Foreign citizens became the majority of the workforce and huge investment also took place in the housing sector and infrastructure construction.

It took some 2,100 man-years to build the aluminium plant and at the height of the project Icelanders were 17% of the workers but the Polish were most numerous or 70%. This was planned, since the main contractor Bechtel aimed at hiring Polish, Icelandic and English speaking staff. There were around 1.700 workers on site at the height of the project.

During building of the aluminium plant there were protests along with the protests aimed towards the Kárahnjúkar project. The picture below shows a display put up by protesters close to the aluminium project site during the summer of 2007. These protests were probably among the most difficult consequences of this project as it divided social groups and caused much unrest in the country. In a report from the Minister of justice in the Parliament 2008 it was said that during the period 2005-2007 there were 40 cases in the files of the police connected to the construction and 83 individuals were suspects, thereof 14 Icelanders and 69 foreign nationals.



Photo: Hjalti Jóhannesson

**Figure 4. Display by protesters by Alcoa Fjarðaál plant in the summer of 2007**

In the beginning of 2008 the staff of Alcoa Fjarðaál plant consisted of 400 persons. 54% of them originated from East Iceland. Most of them or 70% were living in the municipality where the plant is located i.e. Fjarðabyggð but the remainder was mostly living in the town Egilsstaðir and vicinity, some 35 km from the site of the plant. Females were at this point in time 32% of the staff and this was the highest share among Alcoa's aluminium plants<sup>3</sup>. In 2008 it was decided to increase the number of staff to 450 due to more processing of aluminium. In September 2009 there were 464 working in the plant. Around half of the workforce originated in East Iceland, 47% came from other locations in Iceland and 3% came from abroad, most of those were Icelanders. In September 2009 the share of females had dropped to be 26% of the workers.

Besides the direct jobs in the aluminium plant itself, there were 301 other persons working on the site of the plant in maintenance jobs, catering, transportation, janitorial services and so on, i.e. directly induced jobs. Altogether the number of staff on site was 765. This makes it a huge workplace compared to the size of the town Reyðarfjörður which only had 625 inhabitants in 2002 before the project commenced, but in January 2010 its inhabitants counted 1.090. As indicated previously, commuting to work in Reyðarfjörður from many towns and villages in East Iceland is considerable. Maniitsoq does not have a similar hinterland and thus a higher number of new residents can be expected to work in both direct and indirect jobs than in the case of Reyðarfjörður.

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<sup>3</sup> It had even reached 33% in the spring of 2007.

## 4. RESEARCH ON SOCIO-ECONOMIC IMPACTS

In 2003 the Icelandic Parliament agreed a resolution to fund a research project monitoring the socio-economic impacts of the large construction projects in East Iceland. The University of Akureyri Research Centre (RHA) carried out these studies during 2004-2009 in cooperation with the Development Centre of East Iceland<sup>4</sup>. There was a sociological emphasis in the research which had the purpose of using the opportunity during the construction of the large scale projects in East Iceland to monitor its diverse effects as this was for the first time in Icelandic history that both energy harnessing and its utilization for heavy industry took place in rural Iceland. Thus the findings may be used to minimize negative impacts of future large scale projects and maximise the positive. Furthermore the research is important for the field of regional development studies.

Three large surveys were carried out among individuals in the region. Two surveys were sent out to companies and qualitative interviews taken with 15-20 individuals in four rounds. Statistics on demographic development and similar were collected and analysed. Similarly, data from municipalities was collected and analysed as well as data from the main contractors on the projects. The research project came to an end in 2009 and covered changes in the region during the period 2002-2008. In total 9 reports were published. They are all available on the website of the University of Akureyri Research Centre, [www.rha.is](http://www.rha.is).

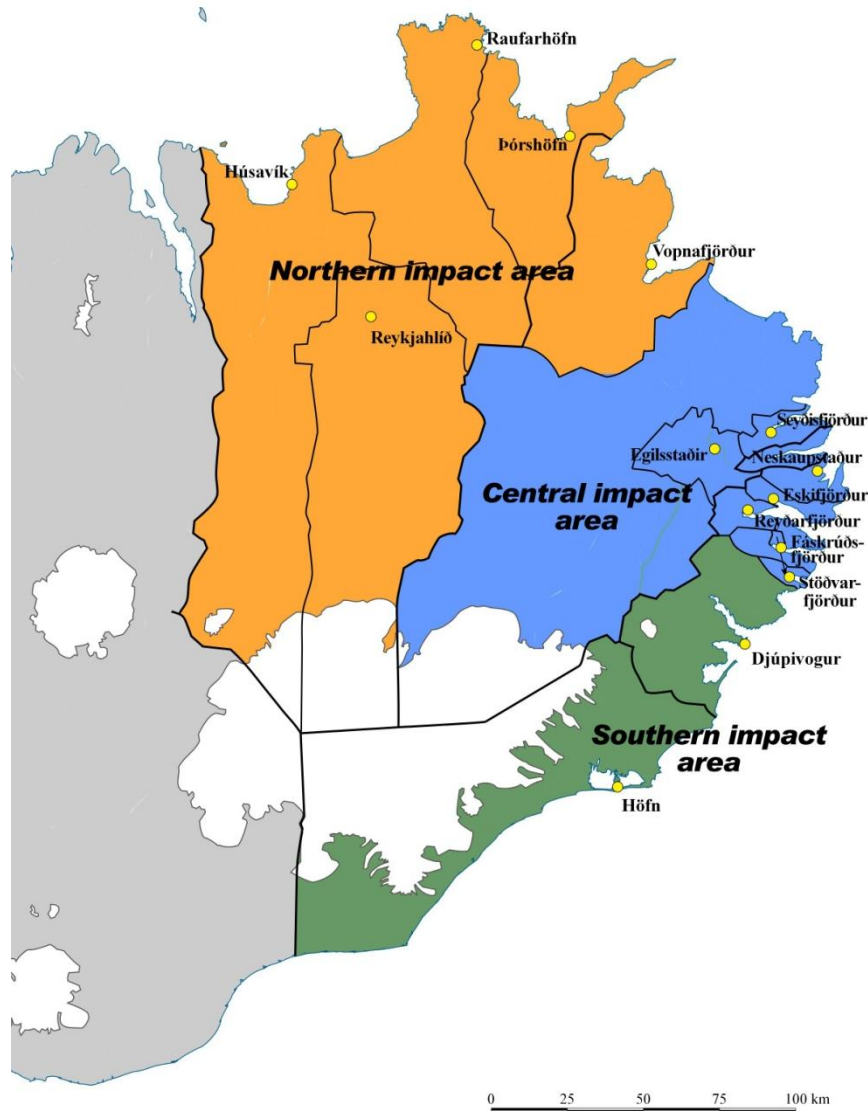
### 4.1. Research area

In cooperation with local actors, the impact area was defined as the eastern part of Iceland, divided into three sub-regions. These were a *central impact area* within two hours average driving distance from the main building sites, and *northern and southern impact areas* outside beyond this distance. This geographical division can be seen on the map below.

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<sup>4</sup> An institute owned by local municipalities and companies for the purpose of enhancing local economic development.





**Figure 5. The impact area and its three sub-regions.**

Generally, the geographical division into central-, north- and south impact areas was used for data analysis<sup>5</sup>. However, another geographical division into 14 small sub-regions can also be seen on the map above. These sub-regions got their names from the main urban settlement within their boundaries. It is important to stress that this is not based on administrative division. The problem with using this geographical division is the low population number in the smallest areas which limits its use for statistical analysis.

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<sup>5</sup> This division does however not coincide with division of Iceland into regions for statistical purposes.

In 2008 there were 15 municipalities in the study area but their number was 26 in 2002 as there have been many mergers of municipalities in the region in recent years similarly as in Iceland in general.

**Table 1. Municipalities and inhabitants 1 December 2008.**

Municipality	Inhabitants Dec. 1 2008	Municipality	Inhabitants Dec. 1 2008
Norðurþing	2,998	Seyðisfjarðarkaupstaður	717
Skútustaðahreppur	388	Fljótsdalshérað	3,707
Tjörneshreppur	58	Fljótsdalshreppur	143
Þingeyjarsveit	945	Fjarðabyggð	4,736
Svalbarðshreppur	108	Breiðdalshreppur	197
Langanesbyggð	511	Djúpavogshreppur	456
Vopnafjarðarhreppur	674	Sveitarfélagið Hornafjörður	2,110
Borgarfjarðarhreppur	142		

Alcoa Fjarðaál plant is located in Fjarðabyggð municipality but Kárahnjúkar hydro power project in Fljótsdalshérað<sup>6</sup> and Fljótsdalshreppur<sup>7</sup> municipalities.

#### **4.2. Fields of study**

Even if impacts from the projects can be observed widely, some spheres of society will observe more impacts. This is depended on distance from the projects in two ways. On the one hand impacts are observed due to *geographical proximity* as has been discussed. On the other hand impacts can be observed due to *sociological proximity* where certain actors may be involved due to close contact with contractors or even taking part in the project. Beforehand it can be difficult to define exactly which spheres will observe most impacts. In the research the following spheres have however been identified:

- Economy and possibilities to earn income
- Labour market
- Population development
- Municipal affairs
- Housing
- Private services
- Public services
- Land use and resources
- Tourism
- Lifestyle and social spirit

<sup>6</sup> Especially the dams.

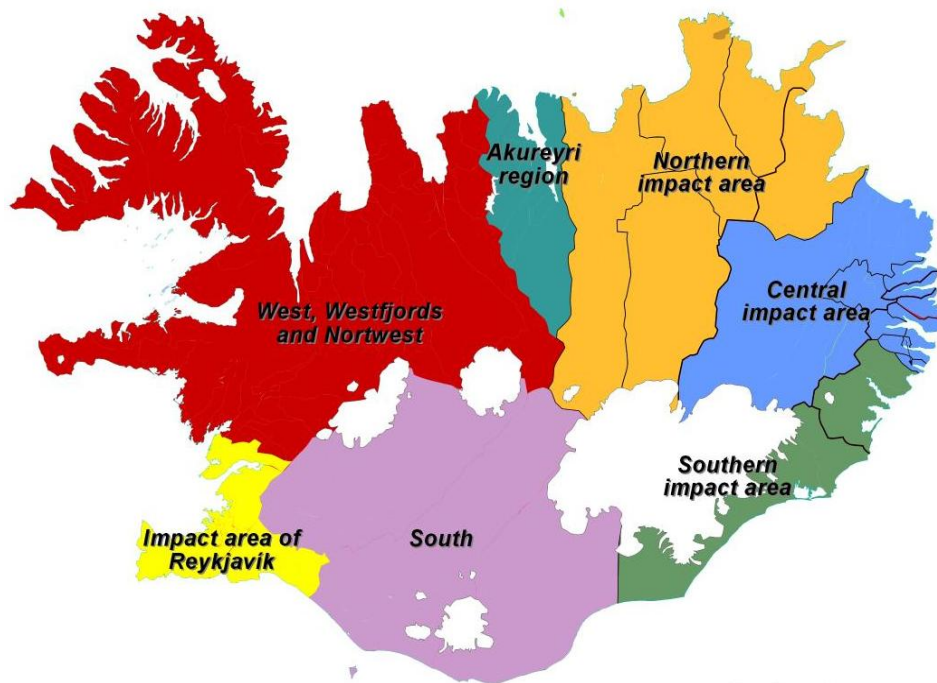
<sup>7</sup> Especially the powerhouse.

There is for the most part a consistency regarding these themes or spheres with the social impact analyses carried out beforehand<sup>8</sup>.

#### **4.3. Data**

At the onset, it was decided to make use of different data sources and build upon ideas on methodological triangulation (Denzin, 1970; Silverman, 1997). In this way, both qualitative and quantitative data was used to search for better understanding of the processes taking place in the communities. Furthermore both primary and secondary data were used. The importance was on data that shed a light on the changes in the communities while they were actually taking place.

The primary data consisted to a large degree of three large mail surveys carried out in 2004, 2007 and 2008. The surveys in 2004 and 2008 were carried out only among persons living in the impact area while the survey in 2007 was carried out in the whole of Iceland. These mail surveys used the same questionnaire with little changes during the three surveys, which enabled comparison of changes between surveys. Two mail surveys were sent to all companies in the impact area. This was in 2005 and 2008.



**Figure 6. Geographical analysis of the survey in 2007.**

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<sup>8</sup> That is, the ex-ante studies.

Other primary data consisted of interviews with individuals living in the central impact area. These interviews were carried out in 2002<sup>9</sup>, 2004, 2007 and 2009. Interviewees were chosen on the basis of location; both living in towns and countryside, a mix of different economic sectors and gender. 15-20 individuals were interviewed each time. Initially, the regional economic development agency in East Iceland<sup>10</sup> was approached to suggest a number of individuals fulfilling certain criteria. Researchers then selected from this a group of around 20 individuals for interviews. Later on, a snowball method was used to find new interviewees instead of those dropping out between rounds. These interviews were not meant to describe the opinions of the general public but rather give an insight into how individuals experience changes in their community. Also these interviews proved important to direct the study into certain directions to further research certain issues.

Data from Alcoa Fjarðaál, Landsvirkjun<sup>11</sup> and the contractors on the projects were also obtained. However, it proved difficult to obtain some of the requested data. This may be a result of the relatively short time span of the construction projects and their relative complexity regarding number of contractors and many nationalities involved. This kind of data appeared to be less accessible than in former projects in Iceland. This may be of relevance to the Greenlandic case, that emphasis is put on collecting certain data concerning the projects and their scope while they are in progress. Data of relevance is e.g. number and nationality of workers, wages and project costs.

Statistics were of course important for study of issues such as population development, economy, labour market, housing and municipalities. However, the nature of such data and delays in making them available may make them more suitable in ex-post studies, i.e. 2-3 years after the event.

The objective of the research was to study the changes taking place in community while the projects were carried out. Therefore the researchers believe that the initial emphasis on collecting and analysing primary data from surveys and

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<sup>9</sup> The interviews in 2002 were a part of another study of RHA but gave important information on issues such as expectations towards the projects before they commenced.

<sup>10</sup> [http://austur.is/index.php?option=com\\_content&task=view&id=7&Itemid=9](http://austur.is/index.php?option=com_content&task=view&id=7&Itemid=9)

<sup>11</sup> The national power company and owner of Kárahnjúkar power plant.

interviews was right. Relying to a larger degree on statistics and data from the Alcoa and Landsvirkjun, the National Power Company and their contractors would have resulted in less sufficient data due to delays and unavailability. The same would probably apply to Greenland if there will be carried out a similar study while proposed projects will be carried out.

## 5. MAIN RESEARCH FINDINGS

The research findings have been delivered in a total of nine reports in Icelandic. Three of these are main reports; two interim reports and a final report. Other reports deliver findings from surveys among individuals and companies, one focused on the requirement for housing and one reported on a special survey among workers on the project sites. These main findings are primarily based on the second interim report and the final report (Hjalti Jóhannesson et al., 2008 and 2010).

The single most important finding of the study is how confined the impacts of the projects were within the two municipalities closest to Alcoa Fjarðaál and Kárahnjúkar power station<sup>12</sup> (Hjalti Jóhannesson et al., 2008 and 2010). Individuals' responses in surveys indicate that there was much optimism about the impacts even before they started. This had to do with issues such as personal income, diversity of jobs and diversity of services. Background information in the last survey in autumn of 2008 indicated much change. Among this is that the area around the aluminium plant is becoming more of a common labour market. There is relatively much commuting for work to the town Reyðarfjörður where the plant is located. Similarly, there is much commuting to the town Egilsstaðir, which can be termed the main service centre in East Iceland with some 30 minutes driving distance from Reyðarfjörður. These findings are among those which may be of less relevance to the Greenlandic case since Maniitsoq does not have a similar hinterland as Reyðarfjörður does with the road network connecting a number of towns and villages within a "tolerable" driving distance<sup>13</sup> to seek work or services.

Qualitative interviews indicate that individuals experience much change in the local spirit i.e. more optimism and belief in the future of the region. Data from the municipalities show e.g. that financial impacts are seen in three municipalities. The area originally defined as the impact area for the research counted however 15 municipalities at the end of the research.

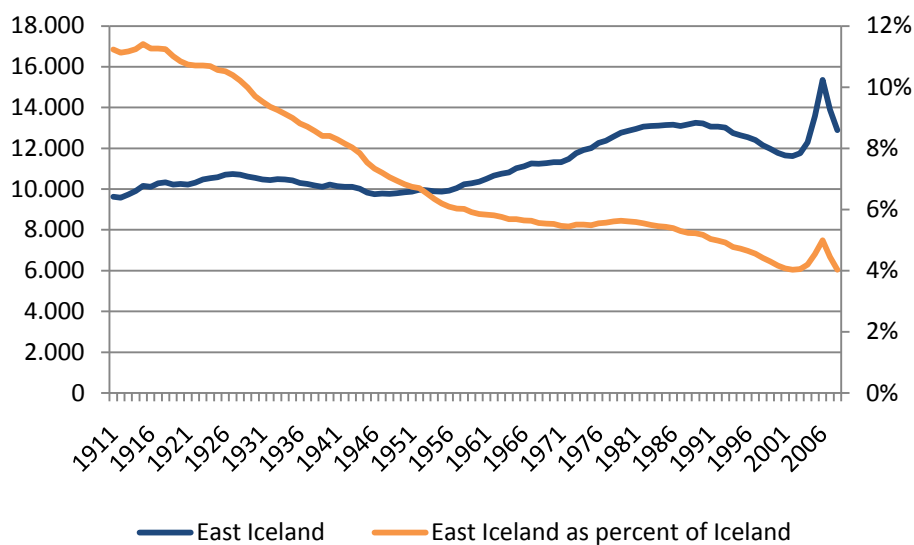
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<sup>12</sup> Fjarðabyggð and Fljótsdalshérað (4,637 and 3,465 inhabitants respectively in Dec. 2009)

<sup>13</sup> In research in Iceland 45 minutes driving distance has often been used as a criterion.

## 5.1. Demography

In East Iceland<sup>14</sup> there was a little population growth during the 20<sup>th</sup> century. During the first half of the century there was however little change and the population number remained around 10 thousand. After World War II population increase took off and until around 1980 there was a relatively steady but slow growth. Growth continued until 1989, however at much slower pace and at the end of that year there were 13,243 persons living in the region. During the last decade of the 20<sup>th</sup> century there was however a sharp population decline as was the case with rural Iceland in general while the capital region was growing rapidly<sup>15</sup>.



Source: Based on data from Statistics Iceland.

**Figure 7. Population development of East Iceland 1911-2008.**

This development can easily be identified in the figure above as the relative size of East Iceland's population has been decreasing while there has been an increase in the capital region.

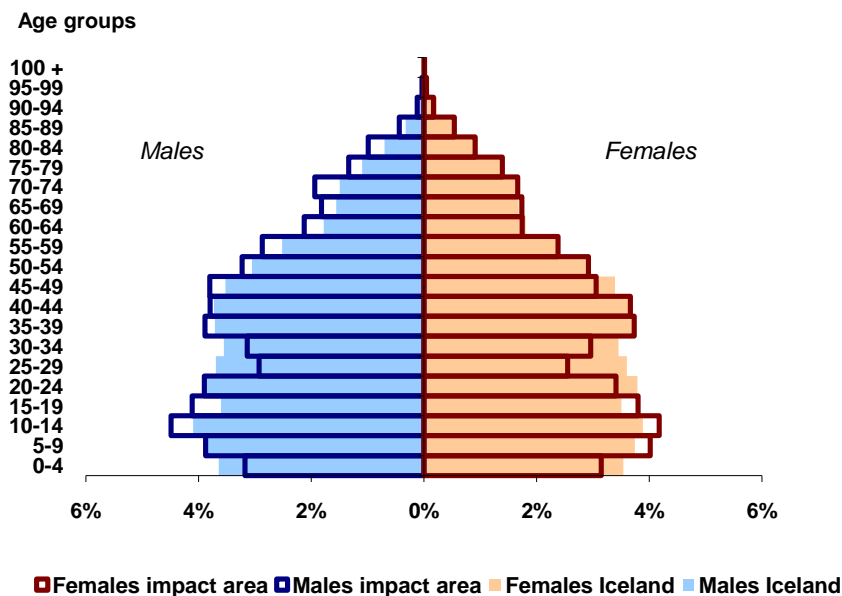
In the social study in East Iceland the focus was on the last few years on the figure above where the population in East Iceland experienced a sharp rise followed by a decline, primarily due to in- and out migration of foreign workers.

<sup>14</sup> Note that this is not the same geographical area as the impact area of this study but a statistical region used by Statistics Iceland (see. appendix) and also one of the constituencies during the period 1959-2003.

<sup>15</sup> In fact the capital region was growing rapidly during all of the 20th century, urbanization took off later in Iceland than many other western countries. The capital region has 63% of the inhabitants and some 75% of Icelanders live in Reykjavík and adjacent commuting area of approximately 45 minutes driving distance.

### ***Demographic characteristics at the onset of the projects***

When the construction projects commenced in 2003, demographic conditions in the impact area were to a large degree similar as in Icelandic rural areas in general. Males outnumbered females by 52% to 48%; young adults were underrepresented as well as young children. East Iceland shared these general characteristics with most of rural Iceland which has generally experienced out-migration to the capital region. As is the general trend in migration patterns, young adults are over-represented among migrants as well as women. Older males are overrepresented in the local population compared to the Icelandic population. The population pyramid below demonstrates this situation in 2002:



Source: Based on data from Statistics Iceland.

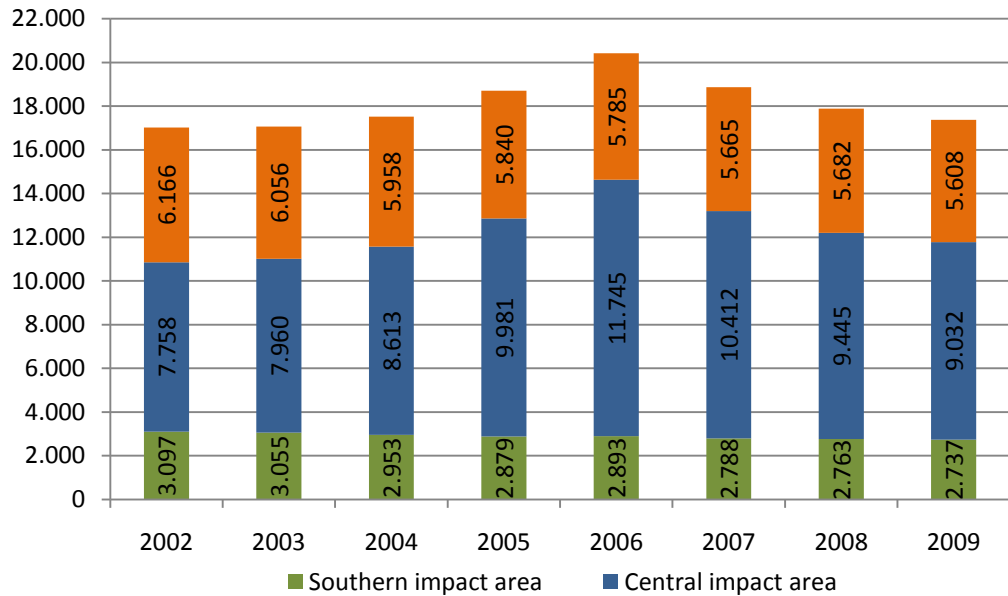
**Figure 8. Age and gender structure of the impact area in 2002.**

The three sub regions of East Iceland; central-, northern- and southern impact areas all had similar characteristics in this regard prior to the projects.

### ***Population development 2002-2008***

Population increase as a result of the projects was confined to the central impact area. Population decline however continues in the southern and northern impact areas just as if nothing happened. The figure below shows this development by the three sub regions:





Source: Based on data from Statistics Iceland.

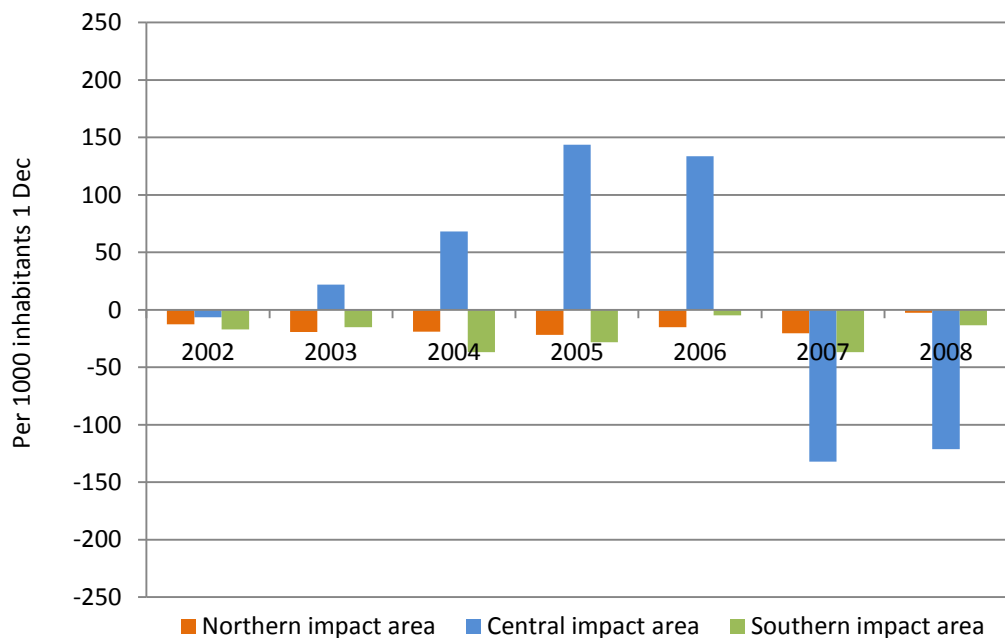
**Figure 9. Population development of the three sub regions 2002-2009**

In the central impact area the population growth was to a large degree caused by influx of foreign migrant workers. During the latter half of 2007 the maximum number was reached and just fewer than 11,800 persons were registered in municipalities of the central impact area. As expected, the population declined again after this but at the end of 2008 when most of the projects were finished, the population growth in the central impact area was 22% since 2002. In the southern impact area the decline was 11% and 8% in the northern area. Net population increase in the impact area as a whole was therefore just less than 900 persons 2002-2008 but it was very unevenly distributed between municipalities. Growth was primarily confined to two municipalities, Fjarðabyggð, where Alcoa Fjarðaál is located and Fljótsdalshérað where much of the Kárahnjúkar project is located. Furthermore the small municipality of Fljótsdalshérað<sup>16</sup> where Kárahnjúkar powerhouse is located experienced much growth. In fact at the end of 2008 there were still foreign workers registered in area, even if most of the construction work was finished. This is primarily due to delay in registration but does not reflect real domicile. It appears that neither state nor municipalities were not fully prepared to receive foreign workforce in such large numbers. This is a valuable lesson to learn from for the Greenlandic authorities. The figure above is extended until the end of

<sup>16</sup> Merely 143 inhabitants in 2008 and 89 in 2009.

2009<sup>17</sup>. This shows a continuing decline in all of the three regions. For the whole of East Iceland there was only an increase of 356 inhabitants since 2002. Increase in the central area was 1,274 persons but a decrease in the two outer areas of 918 persons. This primarily shows the struggle that rural Iceland in faced with and that a large project like the one which has materialized just merely can act as a counterbalance for East Iceland during this period. The researchers believe that the decrease in the two outer regions would have been similar without the aluminium plant and that a significant decrease would also have been observed in the central area.

As for migration during the period 2002-2008 statistics show that there is a change in 2003 with much in-migration to the central impact area. Little changes are observed in the northern- and southern impact areas, see the figure below.



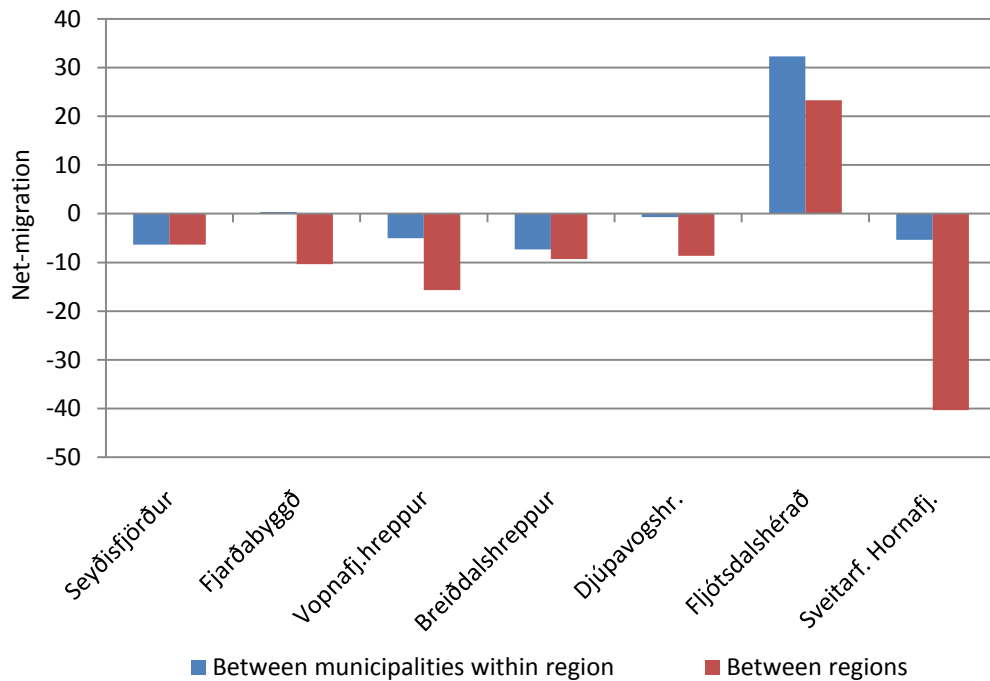
Source: Based on data from Statistics Iceland

**Figure 10. Net migration by areas 2002-2008 (per 1,000 inhabitants).**

In the figure above the most striking change is in the central impact area resulting from the huge influx of foreign workers. This commenced in 2003 and increased until 2005/2006 but reversed in 2007 when majority of the workers returned to their home countries.

<sup>17</sup> The research was however only meant to study impacts until the end of 2008.

Most municipalities in East Iceland were losing people to other regions rather than to other municipalities within East Iceland. This in fact means that the pull effect of the capital region is still stronger than the pull of the two large municipalities in East Iceland where the projects are located.



Source: Based on data from Statistics Iceland

**Figure 11. A few municipalities in East Iceland, net-migration against other municipalities in East Iceland and against other regions. Average of the period 2006-2008.**

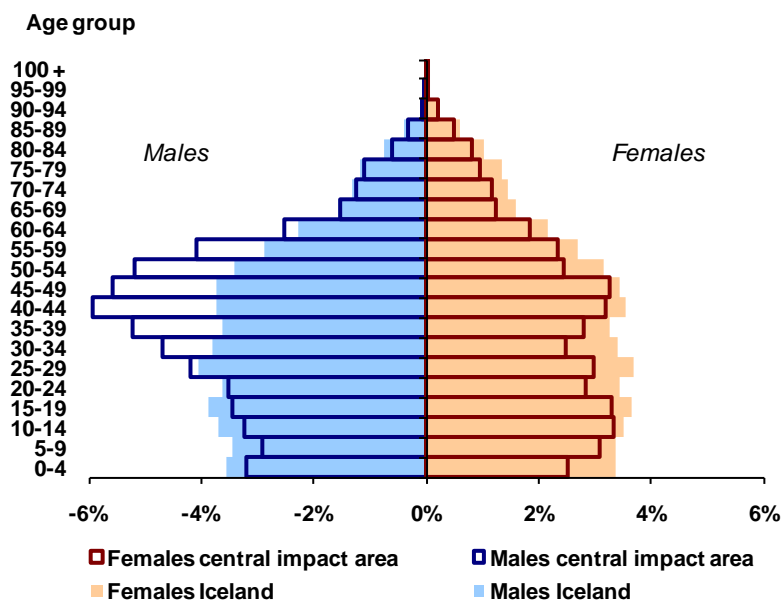
These figures show that Fljótsdalshérað municipality which enjoys a central location in East Iceland, and is its main service centre, gained people from other municipalities within the region as well as from other regions. The other large municipality, Fjarðabyggð, where the aluminium plant is located was in balance concerning migration within the region but was losing people to other regions during the period.

But how well did the population development of East Iceland compare with estimates that were put forward in social impact assessment for the projects? In a SIA report for the Alcoa Fjarðaál plant from 2006<sup>18</sup> it was estimated that inhabitants

<sup>18</sup> Originally an EIA was carried out in 2001 for Norsk Hydro which stepped out of the project in 2002. Due to different ownership with Alcoa stepping in and different planning of the project, e.g. pollution mitigation the EIA was repeated in 2006.

would increase to 11,400 in central East Iceland in 2007 at the height of the construction and then decrease to just less than 10,000 at the end of the construction period. This projection was pretty accurate as 9,781 inhabitants were living in the central impact area 1 December 2009.

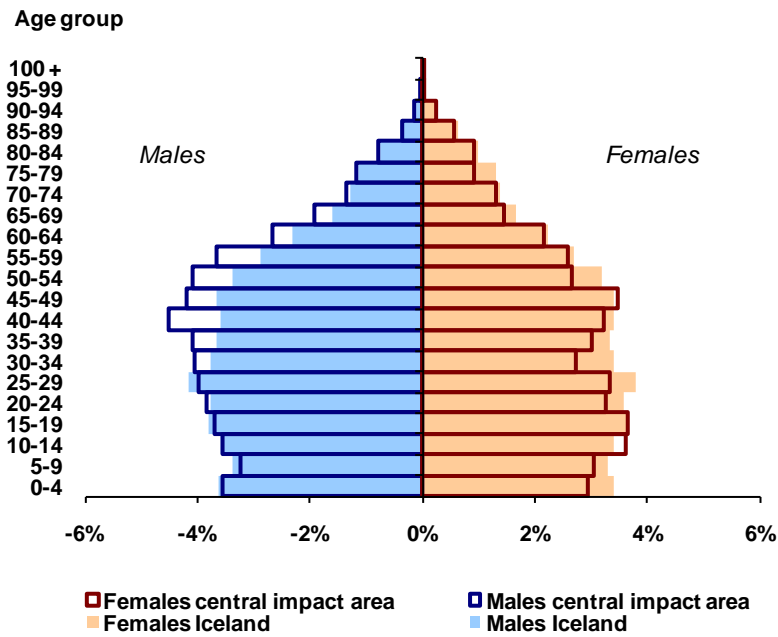
Population structure changed during the construction period as a result of migration. Males on working age coming to work on the projects overshadowed other segments of the population. Thus age- and gender pyramids for those years are very strange. The figure below depicts this situation for 2007. Males were 59% of the population in the central impact area that year.



Source: Based on data from Statistics Iceland

**Figure 12. Age and gender structure of the central impact area in 2007.**

After most of the construction work was finished in 2008 this situation reversed to a large degree as expected when foreign workers returned to their home countries. However males were still 55% in the central impact area at the end of 2008 and if this situation remains, it is a sign of a lack of balance in the community and may hamper its future development. This may be an indication that available jobs appeal more to males. There were however signs that some workers who had already left the area at the time were still on the population registers. When looking at the figure below with the age and gender structure in December 2008 one can see the symptoms of out migration regions such as lack of young women and young children.



Source: Based on data from Statistics Iceland

Figure 13. Age and gender structure of the central impact area in 2008.

In Reyðarfjörður this situation was even more pronounced as males were 57% in 2008 and in January 2010 little had changed as males were still 56%. In Egilsstaðir the picture is quite different as 51% are males (similar to the average for the country) which is a positive sign for future development and may be an indication of more availability of jobs which appeal to women.

## 5.2. Economy

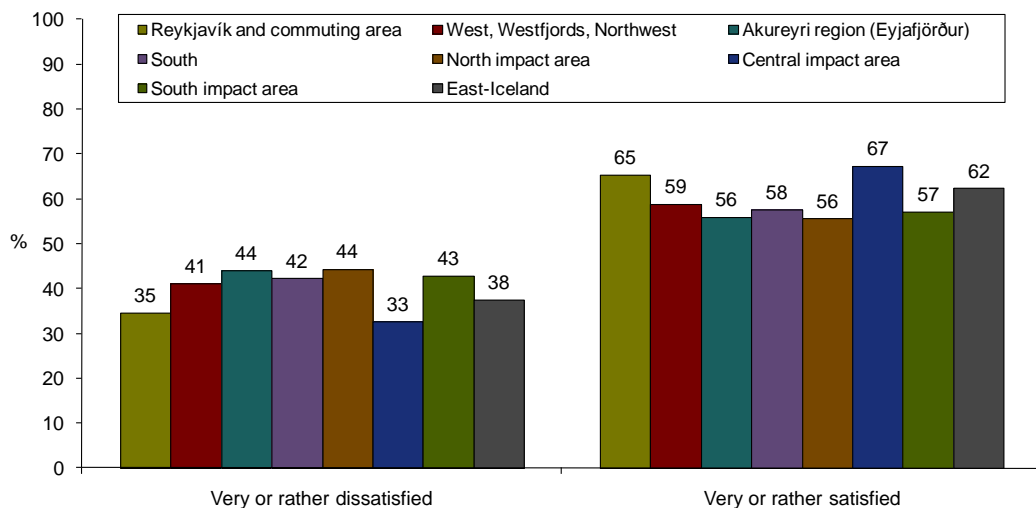
The long-term impact of the construction project on the economy of East Iceland relates first and foremost to the aluminium plant, for which the building of the power plant is a necessary premise. Otherwise, the impact of Kárahnjúkar power plant on the economy of East Iceland during its period of operation mainly focuses on the fact that the power plant has 13 employees and that, jointly, the plant and Landsnet, which owns and operates the power grid, pay approximately ISK 80 million (just over 4 million DKK) per year in property tax to municipalities<sup>19</sup>.

It is estimated that ISK 36 billion (just over 1.7 billion DKK) of total investment in the aluminium plant has entered into the Icelandic economy. It is not known how large a proportion of this amount found its way to East Iceland, apart from the fact that

<sup>19</sup> At exchange rate of June 1 2010 (1 DKK = 20.94 ISK).

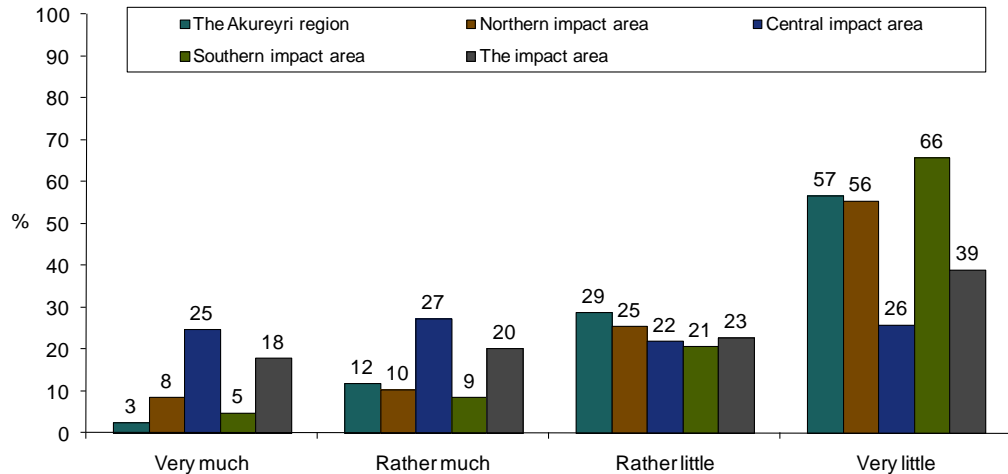
Fjarðabyggð municipality received approximately ISK 3 billion (143 million DKK) in the form of local income tax. In 2009, compensation of employees at Alcoa aluminium plant was ISK 3.6 billion (172 million DKK), with average salaries being ISK 540 thousand per month (25,790 DKK). The purchase of goods and services from domestic operators amounted to ISK 13 billion (621 million DKK) and tax and payments to Fjarðabyggð municipality of taxes and other charges were ISK 600 million (28.7 million DKK). Probably 40-45% of the income of the aluminium plant finds its way into the Icelandic economy.

According to sample surveys, the number of people who were satisfied with their employment income grew in the central impact area. It is of particular interest to note that the survey from 2007, which was carried out countrywide, indicated that a proportionally larger number of people in the central impact area were very satisfied or rather satisfied with their income than was the case in the capital and its impact area, as defined in this particular survey.



**Figure 14. How satisfied or dissatisfied are you with your personal income? (Survey spring 2007)**

When respondents were asked in autumn 2008 whether they felt the heavy industry construction had improved their financial situation, about half the respondents in the central impact area, either strongly agreed or rather agreed, compared to just below one in five in the northern impact area and 14% in the southern impact area.



**Figure 15. Do you believe the heavy industry construction has improved your financial situation? (Survey autumn 2008)**

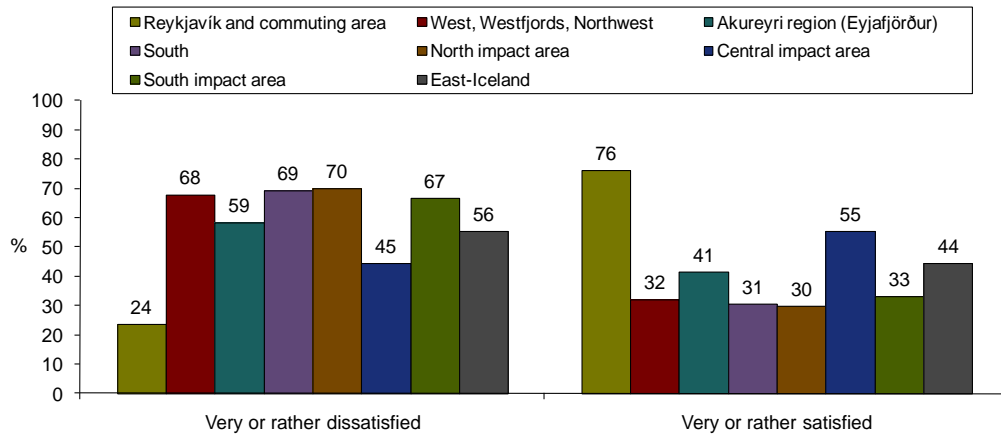
Belief in improved financial situation connected with the operation of the aluminium plant is therefore obviously geographically limited to the central impact area.

It is hard to estimate the crowding-out effect of the advent of the aluminium plant. Jobs in fish processing were sharply reduced during the construction period, more, in fact, than had been predicted. The aluminium plant, however, is unlikely to have been the main cause of this additional downward trend. The crowding-out effect appears to have been for the most part positive; i.e. companies which previously had been under pressure to maintain the level of employment, were now given the opportunity to economise and reduce staff, thus building strength for the future. With a view to this steep reduction in fish processing jobs, which probably would have occurred to a large extent whether the aluminium plant was built or not, the population of East Iceland probably would have fallen significantly without the advent of the aluminium plant - even by a thousand persons or more. This reduction in jobs in fisheries and fish processing was however one of the things that local politicians say that they had not anticipated and therefore allowed too much housing to be built in the area.

### ***5.3. Labour market***

As for the labour market, a highly significant aspect of surveys among the residents was their increased satisfaction with diverse job opportunities. One of the Achilles heels of the provinces has long been monotony of employment and lack of opportunities for young people who have obtained an education. It would seem,

therefore, that in this respect a satisfactory result has been achieved in the respondents' opinion. According to a survey in 2007 which was conducted all over the country (Figure 6), that satisfaction with job diversity was highest in the central impact area of East Iceland, second only to the capital region, which must be regarded as a significant result. In the northern and southern impact areas, attitudes to this aspect resembled those expressed in other regions of Iceland and there was little change.

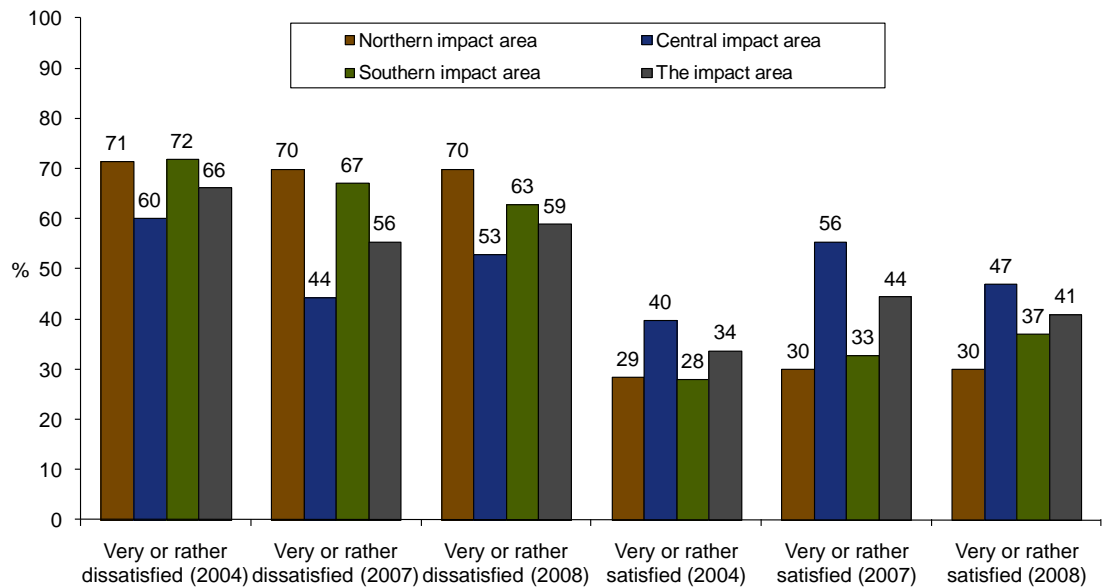


**Figure 16. How satisfied or dissatisfied are you with the diversity of jobs in your community? (Survey 2007).**

When the survey was repeated in the fall of 2008<sup>20</sup>, it was discovered that satisfaction in this regard had to some extent diminished in the central impact area as can be seen in the following picture. This may be linked to the decrease in jobs in fisheries and fish processing. Furthermore, at the height of the construction work with there was much demand for diverse goods and services from new residents and temporary workforce and their employers. But this demand fell sharply when the construction work was finished.

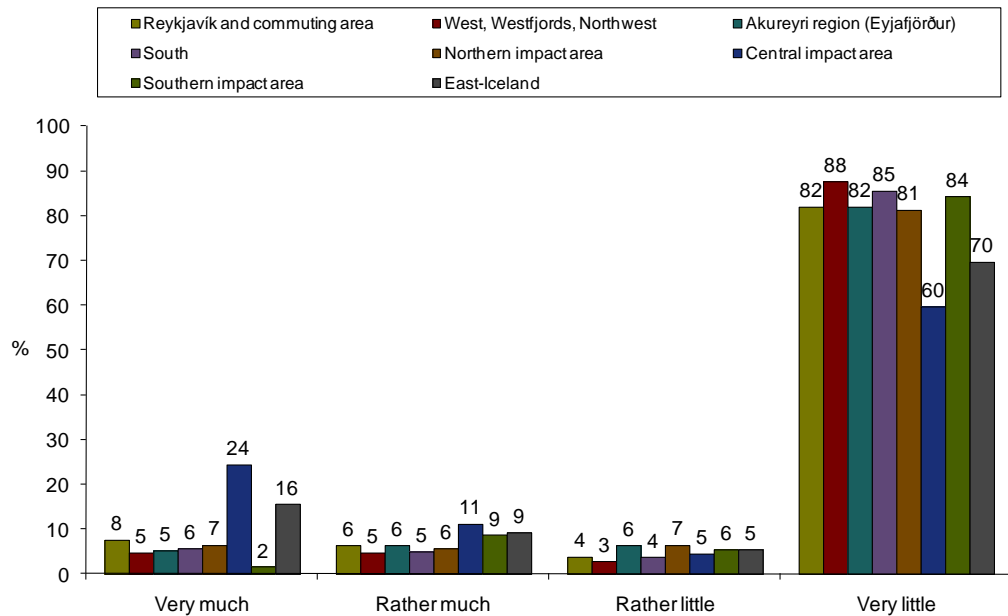
<sup>20</sup> This time carried out only in the impact area as well as Eyjafjörður or the Akureyri region in northern Iceland for benchmark comparison.





**Figure 17. How satisfied or dissatisfied are you with the diversity of jobs in your community? (Surveys 2004-2008)**

The degree of residents' participation in the construction work was examined in surveys. As was to be expected, participation was highest by far in the central impact area, where approximately 30% of respondents aged 18-65 were directly connected to the construction project in 2007, according to a survey conducted in that year. Next in line were the capital area with 11% and the northern impact area with 12%. With regard to the strong impact in the capital area, the development of the transport- and communications system should be kept in mind, which is a related aspect of considerable significance. Air communications with Reykjavík, for example, are excellent and heavily used. Furthermore, the diverse industries and services of the capital area, as well as the size of its economy, are bound to contribute to a proportionally significant extent to a construction enterprise of this type. The following figure shows too how a large extent, respondents believe the companies they work for have been involved in the construction work in East Iceland. Generally the largest urban centre in any given country should experience economic impacts due to such large construction projects due to its advantage in services and economic structure.



**Figure 18. How well does this describe your situation? “A company I work for has been involved in the construction in East Iceland” (survey in 2007)**

The proportion of women in the total workforce of the aluminium plant has been unusually high by both Alcoa’s standards as well as in comparison with other aluminium plants in Iceland. The ratio of women reached a high of 32% in autumn 2007. In February 2008 this proportion was at approximately 28% and 26% in December 2009. This is a considerably higher proportion than in other aluminium plants in Iceland. In comparison this ratio at Norðurál plant, West Iceland, was 20% in December 2009 and 18% at the Rio Tinto Alcan plant in the capital region. The Alcoa Fjarðaál plant received recognition by the Equal Opportunities Council for its successful recruiting of women 24 October 2008.

In the aluminium plant’s social impact assessment, certain objectives were established with regard to the level of education of the plant’s workforce. Those objectives were very satisfactorily achieved and probably the company’s recruitment policy has been decisive in obtaining a result so close to what was specified in the social impact assessment. When 400 employees had been hired, about 17% were university educated, 19% had an upper secondary certificate, 20% a trade qualification and 42% had completed compulsory school.

With regard to the labour market, work shift schedules are among those aspects which the researchers believe need to be carefully considered when a large employer is located in a small population area. It is clear that in such a setting the place of employment has a decisive influence on the social rhythm. As brought out

in interviews with municipal and state church employees, situations may arise where the 12 hour shift schedules, originally chosen by the Alcoa Fjarðaál staff, are ill-suited to the needs of a family. In such cases, for example, supervision of employees' children after school or playschool hours may be impossible to arrange. The researchers recommend a revision of these work shift schedules and their impact; it is seen as positive that a work shift committee, consisting of employee representatives, has been appointed at the plant to look into such matters on behalf of the company.

A survey in autumn 2008 demonstrated the importance of Reyðarfjörður as an employment centre attracting people from other regions. Thus, it might be said that this former traditional fishing village has now been transformed into the main employment magnet for the entire region of the East Fjords. A matrix showing location of home and location of work is displayed in table 2<sup>21</sup>.

**Table 2. Commuting between locations in East Iceland 2008, divided into 14 sub regions.**

		Location of work place														Total		
		Húsavík	Reykjahlíð	Raufarhöfn	Þórshöfn	Vopnafjörður	Egilsstaðir	Hérað	Seyðisfjörður	Reyðarfjörður	Eskifjörður	Neskaupstaður	Fáskrúðsfjörður	Djúpivogur	Höfn			
Location of home	Húsavík	92															100	
	Reykjahlíð		100															100
	Raufarhöfn	9		91														100
	Þórshöfn				100													100
	Vopnafjörður					100												100
	Egilsstaðir						72	14	1	12			1					100
	Hérað						43	52	2	4								100
	Seyðisfjörður						7		87	4		2						100
	Reyðarfjörður						2			89	7		2					100
	Eskifjörður									19	78		3					100
	Neskaupstaður						1			8		89					1	100
	Fáskrúðsfjörður						3		2	17		2	76					100
	Djúpivogur						17			9					74			100
	Höfn									1			1			98		100

The table shows e.g. that of those who live in Reyðarfjörður 89% also work there, 2% work in Egilsstaðir, 7% in Eskifjörður and 2% in Fáskrúðsfjörður.

<sup>21</sup> This analysis used a division into 14 sub regions, created by the researchers for this study where each of these sub regions got the name of the main urban setting within its "boundaries".

Changes in education level have occurred between individual surveys and in the last survey, from autumn 2008, this is slightly lower in the southern impact area than elsewhere. When considering the major shifts in the demographic composition of the central impact area, with people being recruited for the aluminium plant and related work, a significant change in level of education need not come as a surprise. It is worth noting that the number of respondents with compulsory education grows proportionally in the central impact area, after a reduction between surveys in 2004 and 2007. The number of people who have completed a first university degree goes down again, however, after a very significant increase between surveys in 2004 and 2007. There is, nevertheless, a steady rise among those with a postgraduate degree. It should be kept in mind that since the research spans a considerable length of time, a concurrent upward swing is taking place in the national level of education. The proportions regarding several categories of education are similar in the central impact area, the northern impact area and the Akureyri region in North Iceland. Approximately 45% have completed compulsory education, 6% have gained a matriculation certificate, 11% a trade qualification, 10% a lower secondary school certificate and 25% have graduated from university. In the southern area, the level of education appears to be somewhat lower.

#### ***5.4. Housing***

This is the policy area where the most obvious mistakes were made during the construction period, the most striking of which being the excessive building of residential housing. Two specialist reports presented the assessment that 70-80 thousand m<sup>2</sup> of residential housing needed to be added in Central East Iceland in the wake of the aluminium plant construction. When the municipalities allocated building permits, however, little regard was apparently paid to those forecasts. When the end result was achieved in 2008, residential housing had expanded by 135,000 m<sup>2</sup>, or around 60,000 m<sup>2</sup> in excess of research estimates. Population growth in the central impact area, however, was 1,687 during the period 2002-2008, or similar to what had been forecast in the two specialist reports.



*Photo: Hjalti Jóhannesson*

**Figure 19. Apartment buildings in Reyðarfjörður**

House prices rose dramatically at the outset of the construction period, but this trend had mostly reversed itself when the plant began operating. This is shown, for example, by comparisons with other provincial areas. Prior to the commencement of construction, house prices were similar or higher in other fishing towns than in municipalities within the plant's central impact area. This changed significantly during the construction period, with house prices in the central impact area surpassing to a considerable extent those of other Icelandic regional communities. When the aluminium plant became operational, however, the situation appeared to be reverting to an earlier pattern. Thus, house prices in the central area appear not to have undergone a permanent change, as a result of the advent of the aluminium plant, in comparison with other fishing towns. Too many houses were built in the central impact area during the construction period, which has negatively impacted house prices. One may ask what the current prices would be, if the building programme had been properly adjusted to circumstances. This question probably cannot be answered, until perhaps many years from now. It is by no means unreasonable to maintain, however, that the advent of the aluminium plant raised house prices in the area in the long term, but that this trend was temporarily blocked by oversupply.



*Photo: Hjalti Jóhannesson*

**Figure 20. An unfinished family house and apartment building in the background, Egilsstaðir town in January 2009.**

In October 2009, 218 apartments were vacant in the area, thereof 73% in multi-dwelling buildings. As a result, the question is being asked whether the building of apartment blocks has not been placed too high on the agenda. The proportion of detached houses is higher in many outlying regions than in the capital area. In 2002, single family dwellings constituted 12% of all residential housing in Reykjavík, whereas at that time this proportion was 57% in Egilsstaðir, East Iceland. The proportion was totally different in housing built during the construction period. In Reyðarfjörður, detached houses constituted only 17% of all housing built from 2003 until and including 2008. The proportion of single family homes in this case, therefore, appears to be more in line with the capital area, rather than the proportion of single family housing characterising regions like Central East Iceland. The experience of this house-building programme demonstrates that municipal councils must ensure, not only that a suitable quantity of housing is constructed, but also that the type of houses built conforms to community practice in each location. This must be kept in mind the next time a large project is embarked upon anywhere in the country. According to the respondents, there appears to have been a certain amount of competition between the municipalities Fljótsdalshérað and Fjarðabyggð with regard to building programmes and new inhabitants settling down in connection with the construction project.

In hindsight, it might have been advisable to pay more attention to the external appearance of new buildings and the overall visual impact of towns and town districts. The opportunity to design population centres in the area, almost from scratch, as it were, as was the case in Reyðarfjörður could have been utilised in a more felicitous manner.



*Photo: Hjalti Jóhannesson*

**Figure 21. For sale in January 2009: a vacant unit for shops or services in Egilsstaðir.**

But there were cases of overinvestment and general lack of prudence and caution in other areas than that of the building industry. Some contractors acted unscrupulously and invested excessively. When conditions became tougher due to lack of available work and, later, with the addition of a poor state of the economy and the concomitant devaluation of the Icelandic krona, some people were unable to live up to their obligations. It should be remembered that the society in general was characterised by high expectations and a strong degree of optimism at this time, and, as a result, other parts of the country experienced similar troubles and tribulations, especially in the capital area. In fact there was a housing bubble in many parts of the country which burst in 2008.

### ***5.5. Infrastructure***

The new infrastructure created by the construction of an aluminium plant and power station in East Iceland, has been of use to the local communities in different ways and to differing degrees. As would be expected, the effect of this is more obvious in areas closest to the construction sites. New roads in the region of the plants would be used by those travelling in that part of the highland, and improved road conditions within Fjarðabyggð are of the utmost importance. New port installations at Mjóeyrarhöfn, along with regular import and export from that area, are among the most significant new developments.



*Photo: Hjalti Jóhannesson*

**Figure 22. Alcoa Fjarðaál plant and the harbour Mjóeyrarhöfn**

The port is the second largest in the country, with regard to cargo volume, and many jobs have been created in connection with this transport operation. Alongside the construction itself, considerable work has been underway to build up a powerful telecommunications system on the sites themselves and in the immediate neighbourhood. Many respondents, both experts and members of the general public, express the opinion that to reap the best and most positive benefits from the plants, further improvements to the roads in the region will have to be made. In this connection, the aspects most often mentioned are tunnels to Norðfjörður and Seyðisfjörður. The authors of this report are in full agreement with that view.



*Photo: Hjalti Jóhannesson*

**Figure 23. A road tunnel in Reyðarfjörður, opened in 2005, enlarged the labour shed of the aluminium plant**

Flights to and from Egilsstaðir airport increased significantly because of the huge construction projects, and domestic traffic through the airport doubled between 2002 and 2006. There was also some international air traffic through Egilsstaðir, as well as chartered flights carrying foreign staff connected with these major



construction enterprises. Air communications constitute one of the aspects which could have gone better when planning the construction operations. For example, the extension of the airport facilities in 2007 came rather too late to meet the increased flow of passengers during the period 2003-2007. With regard to overland communications, one of the most important undertakings has been the tunnel between Reyðarfjörður and Fáskrúðsfjörður, which increased the employment area, and is extremely important for the central and southern impact areas, although these cannot, strictly speaking, be directly linked to the construction of the plants.

### **5.6. Municipalities**

The income of the municipalities in the central impact area rose considerably; thus the increase in municipal income tax during the period 2002-2006 was proportionally highest in the country in Fjarðabyggð, Fljótsdalshérað and Fljótsdalshreppur. The large number of foreign staff who paid income tax to the municipalities was the main reason for this increase. The municipalities in the areas around the construction sites would have received much less income if the staff had been made up of more Icelanders. The tax would have been paid to their home municipalities in other regions. Between 2007 and 2008, when construction rate began to decrease, the total income of Fljótsdalshreppur, and to a lesser extent Fljótsdalshérað, also decreased. The income of Fjarðabyggð, however, has continued to grow, since the changeover from construction phase to operations phase is more economical there than in Fljótsdalshérað municipality. A sharp fall in income does not, therefore, explain the sluggish operating result for 2008 in Fjarðabyggð, and only partly accounts for that of Fljótsdalshérað.



*Photo: Hjalti Johannesson*

**Figure 24. A large sports arena and four apartment buildings dominate the skyline of Reyðarfjörður.**

Anticipating an increase in population, the municipalities grossly overinvested in facilities. For example, we may mention the planning and construction of new

residential areas together with the relevant infrastructure and the development of buildings to house sporting activities. It is obvious that there was a certain degree of competition between municipalities to attract new residents to their respective areas with the evident result that many new houses now stand empty in Fjarðabyggð and in Fljótsdalshérað, together with underused infrastructure in the form of roads and drainage systems.



*Photo: Hjalti Jóhannesson*

**Figure 25. A street in Reyðarfjörður in November 2009, infrastructure ready but empty lots. Power lines from Kárahnjúkar hydro power station in the background.**

From this, the conclusion may be drawn that more consultation between municipalities regarding planning would have been desirable. Also, in connection with this, the advantages and disadvantages of further amalgamating the municipalities of East Iceland might be deemed worthy of consideration.

### **5.7. Services**

The two main municipalities in the central impact area, Fljótsdalshérað and Fjarðabyggð had two different approaches regarding development of infrastructure. Fjarðabyggð was upgrading its municipal services and infrastructure during the construction phase to be able to meet demands of new residents right at the beginning of the operation phase. Fljótsdalshérað on the other hand postponed such expenditures until at the end of the construction period to dampen the downswing when the construction period ended.

In 2007, during the height of the construction, a survey among residents showed dissatisfaction with health services in the central impact area. According to interviews this was because of much pressure on the system due to much increase

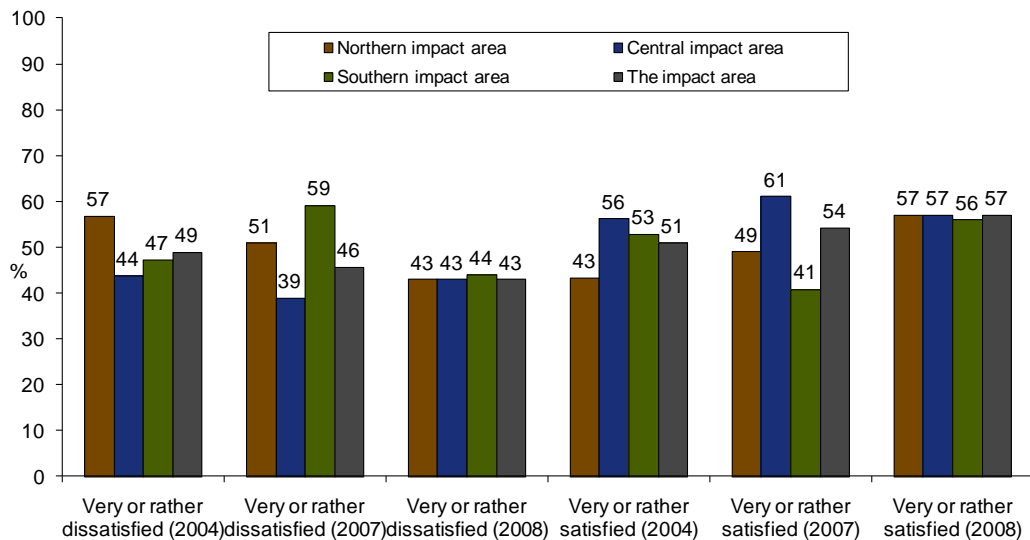
in population without sufficiently funding the health care system in the area. In a survey in 2008 when temporary residents were for the most part gone and less pressure on the system there was more satisfaction with the service. This happened despite of the fact that at both major sites of construction there were health facilities with medical doctors and other staff.

Surveys indicate that residents are satisfied with accessibility of secondary education but less so with access to tertiary education. This applies especially to the central impact area. This may be linked to the generally expectations to the changes which might take place in the region.

There was not much change in crime levels in East Iceland, they remained low during the period<sup>22</sup>, however there is concern that funding to the police precincts are too low and the areas they serve too large.

The fire department of the plant became a part of the local fire department and ambulance service and thus strengthened this type of services.

In the survey in 2007, during the peak of the constructions there was less satisfaction with social life among residents of the central impact area. This is one of the indications of much pressure on the central impact area during the peak of the construction.



**Figure 26. How satisfied or dissatisfied are you with the provision of retail and general services in your community? (surveys 2004, 2007 and 2008).**

<sup>22</sup> Crime levels per 10,000 inhabitants in 2008; Iceland 2,416, capital region 1971 and other regions 2981.

According to surveys there was more satisfaction with retail and general services than in the northern and southern impact areas at the peak of the construction in 2007. In 2008 this seems to have become more even between the three areas.

### ***5.8. Society and lifestyle***

Expectations ran high and, as far as can be seen, little was done to damp these down. In such conditions, there is always a certain danger of disappointment if all does not go according to plan. Those responsible for making decisions and planning the constructions must draw up as realistic a picture as possible of changes which could occur and keep expectations within the limits of moderation.

From interviews with inhabitants it was clear that when the agreement to start the project was signed there was increased optimism in the region. People for example began maintaining better their properties and more general spending was observed.

At the onset some interviewees located close to the projects were afraid that they would be somehow threatened by the huge number of migrant workers. These worries proved unnecessary. In hindsight the views towards migrant workers could rather be described as sympathy for them for having to deal with Icelandic weather and conditions.

According to interviews, during the peak of construction there was less participation in diverse social and cultural activities, people had simply too much to do. Also it was mentioned that in the aluminium plant diverse activities were organized for its staff and this might hurt other social life in the area. People would be occupied with work and diverse events within the company instead of taking part in social life in the community.

According to surveys 2004, 2007 and 2008 respondents saw no change in personal security. Over 90% were either very or rather satisfied with their personal safety. This may be linked to the fact that there was a certain separation between temporary residents and local people.

### ***5.9. Structural changes in the economy***

As mentioned before the crowding-out effect of the aluminium plant is very unclear. The large decrease in jobs in fish processing leads one to consider how the economy of East Iceland would have developed had there been no heavy industry on the scene. It is impossible to give a definite answer to this question, but there is every

indication that the communities would have had to fight a highly defensive struggle with recession, and a decrease in population, the latter even to a significant extent. In a survey carried out among tourism services within the impact area, it appeared that about 20% of the companies said that some changes in their operations after January 1 2002 could be traced back to the construction of the plants and over 30% considered that other changes in society, excluding the plants, had a great influence on their operational conditions. Other changes within the community seem, therefore, to have had more influence on their service operations than the construction projects. It would appear that the tourist services have connected themselves in a rather positive way to the construction enterprises, in spite of negative forecasts by many relating to the alleged incompatibility of heavy industry and tourism. The construction phase seems to have brought operators in tourist services considerable extra income, especially those providing accommodation and restaurant facilities.

## 6. RECOMMENDATIONS

Below are a few highlights from the results of this study and how it may assist in planning future projects of similar scope. The project being studied here is located in a setting which has some resemblance to Maniitsoq. However there are diverse differences in the two societies which definitely play a large role in how impacts may be observed.

It is right, here, to emphasise how difficult it can be to separate the effect of construction projects such as this from other aspects occurring in society at the same time, and which have also proved themselves to be highly influential. At the top of the list must be the credit crunch which hit in October 2008, alongside a price explosion in the property market and other areas, both of which struck at the same time as we presented the final survey of this research to the residents. Therefore it is desirable to begin such a project when there is not a general economic upswing in the economy.

Expectations ran high and, as far as can be seen little was done to damp these down. In such conditions, there is always a certain danger of disappointment if all does not go according to plan. Those responsible for making decisions and planning the constructions must draw up as realistic a picture as possible of changes which could occur and keep expectations within the limits of moderation.

Before construction work was set in motion, an environmental impact assessment was carried out, as required by law, where it was attempted to forecast the probable effect of the project. At the conclusion of this research, it may be said with certainty that too many backward looks had been brought into play regarding the possible effect of the construction work, i.e. too much attention was given to how previous projects had been organised. Conditions in society can change with lightning speed and this is true of the period under discussion here. Therefore it is advisable not to look too much into the rear view mirror and past projects regarding impacts. However it can justifiable to take notice of what is similar but to be aware of changing economic and social conditions and their impacts.

The effect of globalisation had most likely become stronger than people of Iceland realised. That applies to the impact of the "four freedoms" which came into being through the European Economic Area Agreement and other aspects. It is clear that Iceland is no longer an island in every sense of the word. This is certainly true as far

as economic effect is concerned. The Icelandic system of governance was not sufficiently prepared for the project and it can probably be seen in other areas of society, that the Icelanders were not equipped to live in an open economic system with its resultant free flow of labour, capital, goods and services. One of the consequences of this was that the participation of foreigners exceeded forecasts and this put a great deal of pressure on official institutions. However, the influx of hundreds of foreign workers caused less social disruption than might have been expected. Therefore strong institutional framework is necessary with sufficient information systems in order to respond swiftly to changing conditions.

The emphasis placed on assessing the construction phase, as was done in the research this paper is based on, is of particular interest and clearly demonstrates what many people have seen as the most desirable stage of the entire construction enterprise, i.e. creating construction jobs and related. The construction phase can be an attractive period, but it was certainly not so in this case, as compared to the operational period, as was foreseeable. The construction phase was shorter than was desirable in order to allow for better preparation of the project, and also to give the people of the area more time to fully understand the changes which were on the horizon. Therefore it is important when planning similar large projects, not to have too stringent time limits. This is particularly important where weather conditions are such that they can disrupt stringent construction plans. Also, time limits and pressure to deliver finished projects within strict time limits affects working conditions and probably risk.

In the East Iceland study the impact area of the construction work was different and narrower than had been imagined in the beginning. Beforehand it was apparent that e.g. local politicians believed that the impact area would be relatively large. The real impact area however proved to be relatively narrow around the projects, i.e. within two hours driving distance as e.g. portrayed by surveys.

Large construction projects like these in an environment previously untouched by human activity are bound to be a subject of protest. How to deal with this depends on circumstances in each location but it is important that there is sufficient preparation carried out by the authorities.

A large project like this can give an unusual opportunity to recreate towns. This opportunity seems to have been missed in many ways in the case of Reyðarfjörður. If a new aluminium smelter will depend on workforce from one town only (like in

Maniitsoq) creating need for many new buildings in the town, this opportunity becomes even greater. In such a transformation of a town it should be emphasised to make it a better place to live in after the construction period. It is not enough to think only of increasing total square meters. Things like what types of houses people like to live in, how they look and whether the town gives the feeling of being an attractive place are all important. They all play a role in the competitiveness of a region. How easily one region can attract skilled people who might otherwise choose to live elsewhere, even abroad.



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## **APPENDIX 1: THE BACKGROUND OF MEGAPROJECTS IN EAST ICELAND**

For nearly three decades there had been discussion or plans on constructing large industrial projects in East Iceland by harnessing the glacial rivers in the region. The site of a possible manufacturing firm was during the whole period designated on the shore of the fjord Reyðarfjörður. Below are the main cairns on the path towards establishing a manufacturing plant in the region. This information is derived from [www.karahnjukur.is](http://www.karahnjukur.is) (visited, 6 May 2010):

- 1975-1976 the Norwegian company Norsk Hydro examined possibilities of building an aluminium plant in Reyðarfjörður. The power was to come from the Fljótsdalur hydroelectric power plant.
- 1980-1985 the Australian company Rio Tinto Zink had plans about building a silicon metal plant in Reyðarfjörður. The power was again to come from the Fljótsdalur hydroelectric power plant. This project was well on its way before it was abandoned.
- 1989-1990 the multinational firm Atlantál, owned by Hoogovens, Alumax and Gränges, was searching for a site for an aluminium plant. The final choice was Keilisnes in South of Iceland but the power was still to come from Fljótsdalur hydroelectric power plant. The National Power Company, Landsvirkjun, had already started constructions when the project was suspended in 1991.
- 1998 discussions were taken up again with Norsk Hydro about an aluminium plant and a hydroelectric power plant in East Iceland. Memorandum of understanding was signed in June 1999, for a 120.000 tonnes smelter and a power plant in Fljótsdalur with reservoir at Eyjabakkur, known as the Noral Project.
- In 2000 investors came to the conclusion that the smelter needed to be bigger in order to be profitable. In May a new memorandum of understanding was signed for an aluminium plant of 240.000 tonnes annually with a second stage of 120.000 tonnes. A company jointly owned by Norsk Hydro and Icelandic investors was to develop the plans but Landsvirkjun would supply power by Kárahnjúkar hydro power station.
- March 2002 Norsk Hydro announced it could not meet deadlines set in the decision process but claimed interest in the project at a later stage. The Icelandic government however immediately established a commission to look into other company's interest in the project and shortly afterwards talks started with Alcoa.
- April 19th 2002, a joint action plan was signed with Alcoa to explore the possibility of constructing an aluminium plant in East Iceland. Alcoa would own and operate a

320,000 tonnes plant which would receive power from a 500+ MW hydroelectric power station in East Iceland, constructed and operated by the National Power Company of Iceland.

- July 19th 2002 a memorandum of understanding was signed in Reykjavík between the Government of Iceland, the national power company and Alcoa formalizing their cooperation on a 295,000 tonnes plant in East Iceland. Landsvirkjun should begin development of a 630-megawatt hydropower facility in East Iceland, and Alcoa should complete environmental and engineering studies of the smelter near Reyðarfjörður. The memorandum also encompassed a harbour facility by the smelter as well as related infrastructure improvements in East Iceland.
- 15 March 2003, marks the date when these three parties signed an agreement to commence the project.