

Iceland

Good Times for Good Ideas Icelandic Construction Sector Catching up on Sustainability

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From Plenty to Cheap (Good Old Times)

Iceland has a unique environmental position. A sparsely populated island (330,000 inhabitants) with clean water and indigenous energy in plenty, Icelanders are wallowing in natural resources. The country is a world leader in terms of the ratio of renewable energy used. Yet, in some other fields it has fallen far behind most European countries in adapting to sustainability. The abundant supply along with lack of financial motivation have resulted in a merely lukewarm interest in environmental issues, not least in the construction sector. It is just in recent years that

we started catching on and catching up.

A Nation of Energy Hogs

The energy situation in Iceland is in various ways different from that of most other countries and we have the second highest energy consumption per capita in the world. Being situated on the Mid-Atlantic Ridge, there is constant volcanic activity beneath the land surface. As a result, hot water reservoirs in the ground can be used for producing geothermal energy. In addition to this, hydropower is generated from glacial rivers and waterfalls, both of which are plentiful. A record-high 82 percent of Icelandic primary energy consumption is derived from indigenous renewable sources. The remaining 18 percent is imported fossil fuel which predominantly goes to the transport sector and ironically makes the country one of the highest GHG (green house gas) emitters per capita in Europe even though our emissions are not half of those in the U.S. (Fig. 1).

As is often the case, a carefree attitude leads to inefficiency and wastage of resources. Iceland still possesses extensive untapped energy reserves and the economic benefit is substantial – in 2008 the total cost of hot water for space heating was around 15 percent compared to that of oil.¹ The “abundant cheap green energy” and seemingly limitless resources seem to be the >>>

Figure 1 – Chart showing Energy Consumption and GHG Emissions (for Iceland, USA, Canada, Denmark, and Saudi Arabia)

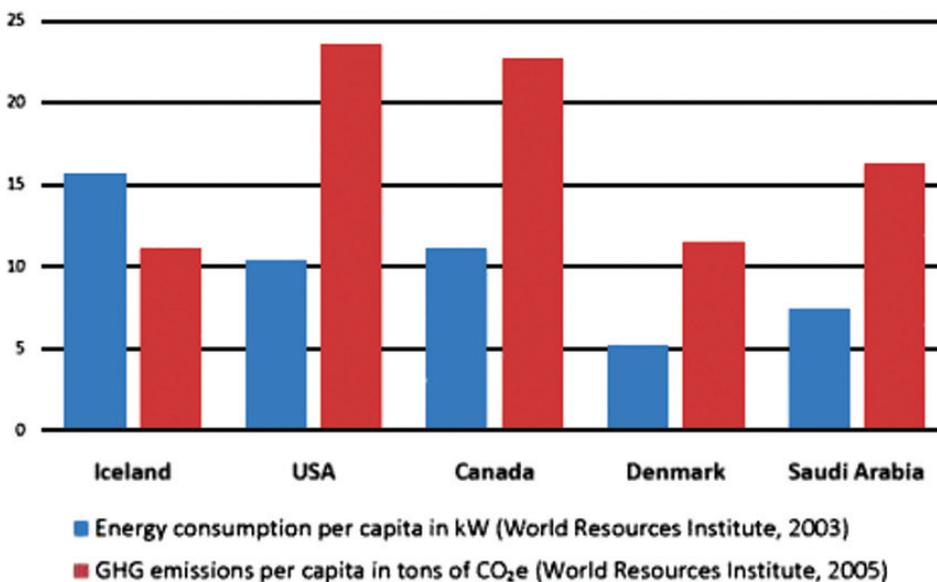


Figure 2 – Graphic indicating Water Resources per person in m³/tons (Reykjavik Energy, 2010)

>>> basic reason for an indifferent attitude towards environmental challenges.

Cheap Electricity

Iceland is the only country in the world which obtains 100 percent of its electricity from renewable resources and prices are low. In recent years an expansion in the energy intensive industry has increased the demand considerably. Almost five times more electricity is produced than in 1990. Today 75 percent of the electricity produced in Iceland is consumed by aluminum smelters and less than five percent is sold for domestic use. Electricity for household appliances represents about one percent of the operating costs of the average home and has therefore not been a case of concern.² As a matter of fact, prices have been sinking in the last few years and were in 2008 up to 30 percent lower than in 1990.³ However, Reykjavik Energy (utility company serving about half of Iceland’s population) recently decided to drastically increase their prices in their efforts to strengthen their difficult operations. Still, despite this, electricity prices will be considerably lower than in most other countries, e.g. about one third of those in Denmark and Germany.⁴

Cheap Heating

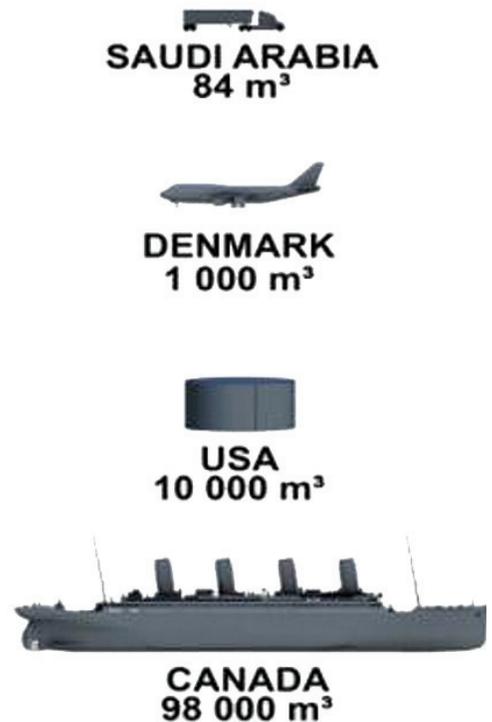
Almost 90 percent of all buildings in Iceland are heated by natural hot water, harnessed from geothermal fields. In all, 98 percent of the energy used for space heating comes from renewable resources. The share of oil is less than one percent and still decreasing. Prices for water heating are low and have increased only insignificantly in the last 20 years.⁵ However, last October Reykjavik Energy drastically increased these

prices as well. Still, district heating is only about one fifth of the prices in Denmark, Sweden and Norway.⁶ Whereas the other Nordic countries have been prioritizing measures such as refining air tightness and thermal insulation since the 1970’s oil crisis, Icelanders do not even today bother to do energy calculations for new-builds.

The additional heating cost resulting from this lack of design is claimed to be lower than the cost of thicker insulation.

Cheap Water

Despite high water consumption, Iceland uses the least of its water reserves of all the OECD (Organisation of Economic Cooperation and Development) countries. While more than a billion people lack access to clean freshwater, Icelanders possess 554,000 m³ (19,500,000 cubic feet) of freshwater per person – 50 times more than Americans and 500 times more than Danes (Fig. 2). Moreover, the water is of the highest quality and normally no treatment is required before consumer distribution. Inexpensive hot water can be collected from underground fields and after a cooling process it can be pumped straight into nearby homes.



And – surprising as it may sound, in residential homes the cold water usage is neither measured nor paid for. Instead, a low fixed fee based on the number of square meters of the home, is collected through the real property tax. In short – efficiency measures cost while wastage is free.

Exceptional Exceptions

Under the Kyoto Protocol, Iceland is entitled to increase its GHG emissions for 2008-2012 by 10 percent, compared to the benchmark year 1990. In addition “the Icelandic provision” enables us to report heavy industry emissions separately, without being included in national totals. In that way we can expect to reach our Kyoto targets, although our GHG emissions have increased by 43 percent.⁷

The Energy Performance of Buildings Directive, which aims to reduce energy consumption, was implemented in all of the >>>

>>> European Union (EU) in 2006. It requires buildings to undergo an “energy certification” process when constructed, sold or leased, and national Building Codes to be updated regularly as well. By 2018, new public buildings must consume “nearly zero” energy, a demand that applies to all new buildings from 2020. The directive has, however, not been implemented in Iceland, although the country is a member of the European Economic Area (EEA). In 2006 the Icelandic authorities requested an exception “due to the specific features of the Icelandic energy situation”. Today the Icelandic Building Code calls for far less insulation in buildings than the EU directive sets as a minimum.

From Cheap to Valuable (Bad Times)

The Icelandic bank system collapsed in October 2008 and as a result, priorities have changed in all parts of society. The Icelandic Government is now “greener” than ever before. A part of the political program is changing Icelanders’ attitude towards sustainability and creating “a new, green economy”. Bad times are the best of times to re-examine and optimize the use of available resources. In compliance with a changing world, our abundant green energy should not be considered a cheap, but a valuable resource – not to be wasted in ignorance. Efficiency must be the precondition for any morally acceptable use of resources. Moreover, it falls within the purview of economics.

New Public Policies

The Icelandic Planning and Building Act (1997) is currently being rewritten

and will place considerable emphasis on environmental matters. The newly-founded Icelandic Green Building Council has been given the opportunity to work with the Government on this. The EU Water Framework Directive (2000) is being adapted to Icelandic conditions and an energy conservation plan is being prepared.

An Ecological Procurement Policy, adopted in 2009, should ensure all government purchases to be based on environmental as well as economic and qualitative issues. Public construction is also a part of this policy. Furthermore, the Government Strategy in Architecture states that the public sector should serve as a role model in the field of sustainability and that investment decisions should be based on Life Cycle Costing (LCC).

Seizing opportunities

Iceland’s extraordinary natural resources hold extraordinary opportunities – but with wealth comes responsibility. Globally, reduced access to resources is a growing problem and there is a finite quantity of energy and matter on earth. We must respect and maintain the resources that provide essential life support, both locally and globally.

By starting work on energy efficiency, we prepare ourselves for the future. All energy production has some negative environmental effects. The Icelandic energy production is to be weighed against interference in landscape and wildlife, pollution and safety hazards. Moreover, renewable energy sources can be utilized either in an excessive or a sustainable manner. There is no reason for using more energy than necessary and it should be remembered that wasted

energy is money lost. Energy issues and environmental issues are often two sides of the same coin, as the international debate on climate has demonstrated. The solution to the threat of climate change is based on diverse clean, renewable and environmentally sound sources of energy. Iceland could be a part of that solution.

Leading the way (Good Ideas)

In the middle of a crisis there is opportunity. The recession gives the Icelandic construction sector time to acquire new knowledge and skills.

Building Information Modeling - BIM

In 2008, the Government Construction Contracting Agency (GCCA) and nine other big property developers, launched “BIM-Iceland”, a workgroup within the Icelandic Construction Technology Platform (many European countries have established National Technology Platforms that address the future needs of the built environment, and particularly the challenge of innovation and industry transformation in the construction sector). The objective of this workgroup is to introduce the methodology of BIM into the Icelandic construction market and make use of its enormous benefits.

Icelandic Green Building Council

GCCA was in the core founding group of the Icelandic Green Building Council (IGBC) founded in 2010. IGBC is a non-profit organization which aims to influence and develop environmental work in design, construction and operation of buildings and communities. >>>

>>> The organization consists of 32 companies, agencies and municipalities from different areas of the construction industry – a number expected to increase during the first operation year. An overall objective is to achieve a cross-section representation, to ensure diverse expertise as well as a high level of credibility. IGBC is currently setting up and has employed a managing director. One of the priorities is to examine the possibility of developing a national environmental assessment system for buildings. Most likely this will be an Icelandic adaption of one of the international systems already in use.

Iceland's, as well as GCCA's, first building to be environmentally certified was taken into use in June 2010. Seven other construction projects are currently registered for assessment. The awareness and interest in sustainability issues have been growing rapidly in the last few years and constitute a breakthrough in the Icelandic construction industry.

International Collaboration

Collaboration is fundamental for

Snæfellsstofa Visitor Center



small countries just as for small agencies. The Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden) have a long tradition of extensive formal cooperation. IGBC is a part of a reference group supported by the Nordic Innovation Center (NICE), discussing green public procurement and green rating systems in the construction sector (the Nordic Innovation Centre is governed by the Nordic Council of Ministers and is co-located with other Nordic organizations in Oslo, Norway).

GCCA and its corresponding Nordic agencies have created a collaboration platform, NKS, where issues like energy efficiency and BIM are discussed and benchmarked. The Nordic Council of Ministers is among other things examining the need for a Nordic innovation program for minimizing energy consumption in buildings (the Nordic Council of Ministers, formed in 1971, is the forum for inter-governmental co-operation).

Green Building Councils (GBC) are presently being established in all the Nordic countries, which makes collaboration and experience-sharing

a matter of course. Just as essential as making use of existing knowledge is adjusting foreign methods to local context and conditions. All the five Nordic countries are looking at the possibility of adapting international methods into national rating systems. The Swedes founded SGBC in June 2009. In addition to EU Green Building and the Swedish "Miljöklassad Byggnad", they have decided to adapt both LEED and the British BREEAM (BRE Environmental Assessment Method) into national rating systems. The Danish and the Finnish GBC's were formed in April 2010. They have not decided on a national rating system yet. The Norwegian GBC, established in September 2010, has on the other hand already decided to make a Norwegian adaption of BREEAM. All GBC's are to benefit from a Danish comparison of four certification systems (LEED, BREEAM, HQE and DNGB), which was released last June.⁸ Moreover an international coalition called Sustainable Building Alliance, supported by both USGBC and BRE, works to develop common metrics that can be used to compare sustainable performance through different building rating systems.

GCCA supports a pilot project in Iceland that is participating in the Sustainable Sites Initiative (SITES). SITES is a new green rating system for landscape design, construction, operations and maintenance, supported by both USGBC and the American Society of Landscape Architects.

Green Pilot Projects in Iceland

Snæfellsstofa Visitor Center is located in the Vatnajökull National Park, which is Europe's biggest >>>

Center for Icelandic Studies

>>> national park and covers more than 13 percent of Iceland. The building serves both as information center and headquarters for the park's eastern territory. It is designed and built according to BREEAM and expected to reach a rating of "Very Good". The center was opened in June 2010 and will be the first building in Iceland to be environmentally certified. New procedures introduced through the assessment process have made the visitor center a milestone – not at least because of the construction work, which had to be managed in an environmentally, socially considerate and accountable manner. Snæfellsstofa Visitor Center is the first step in constructing a service net with three more visitor centers within the Vatnajökull Park, which all are to be constructed according to environmental standards. (Illustration from Arkís architects.)

New Landspítali University

Hospital will relocate the operations of Landspítali Hospital, now a couple of kilometers away, and thus merge the two hospitals in the capital region. The old hospital building in central



Reykjavik (capital of Iceland) will be incorporated and the new complex will gradually spring up around it. The project's first stage assumes additional 66,000 m² (710,418 SF) for hospital-related and 10,000 m² (107,639 SF) for university-related operations. The concept is to facilitate a further development of cooperation between the hospital and the university. The hospital will cater for a great proportion of Iceland's health care needs, including highly specialized national functions. All design and construction work will be performed according to BREEAM, with the intention to reach "Excellent". Groundwork operations

are expected to begin in the summer of 2011. (Illustration from Spital design team)

Center for Icelandic Studies is a project within the University of Iceland. The new building will house research and teaching facilities, as well as a reserve for ancient Icelandic manuscripts. Center for Icelandic Studies is a pilot project in several aspects. It is one of the first Icelandic projects where the design process is carried out in BIM. Moreover, it is the first Icelandic project using tools developed by bips (Byggeri, Informationsteknologi, Produktivitet, Samarbejde), a Danish membership organization of companies within the construction sector. In addition to this all design and construction work will be performed according to BREEAM and is expected to reach a rating of "Very Good". New procedures during the design stage were life cycle cost analysis of aspects of the building structure and several main construction materials. This was carried out in collaboration with GCCA's Norwegian colleagues at Statsbygg (Statsbygg acts on behalf of the Norwegian government as property manager and advisor in construction and property affairs). (Illustration from Hornsteinar architects.) >>>



*Icelandic Institute of
Natural History*

>>> **Icelandic Institute of Natural History** is part of the new green community named Urriðaholt, in the vicinity of Reykjavik. The master plan has received awards both from LivCom and Boston Society of Architects and was recognized by the Scandinavian Ministries for the Environment. Meandering streets, barrier buildings and landscape belts provide public spaces sheltered from strong winds. Still maximum levels of sunlight will be able to reach the streets. Sustainable surface drainage systems ensure the ecologically sensitive lake in Urriðaholt will not dry up in summer. The Icelandic Institute of Natural History will contain scientific specimen collections, offices and laboratories. An innovative double glass facade offers shading and enables opening of windows and natural ventilation, regardless of weather. At the beginning of the design phase, the building was designed according to LEED, but is currently in a BREEAM Post Construction certification process. (Illustration from Arkís architects)

Verne Global Data Center will be Iceland's first server farm and store data for companies in Europe as well

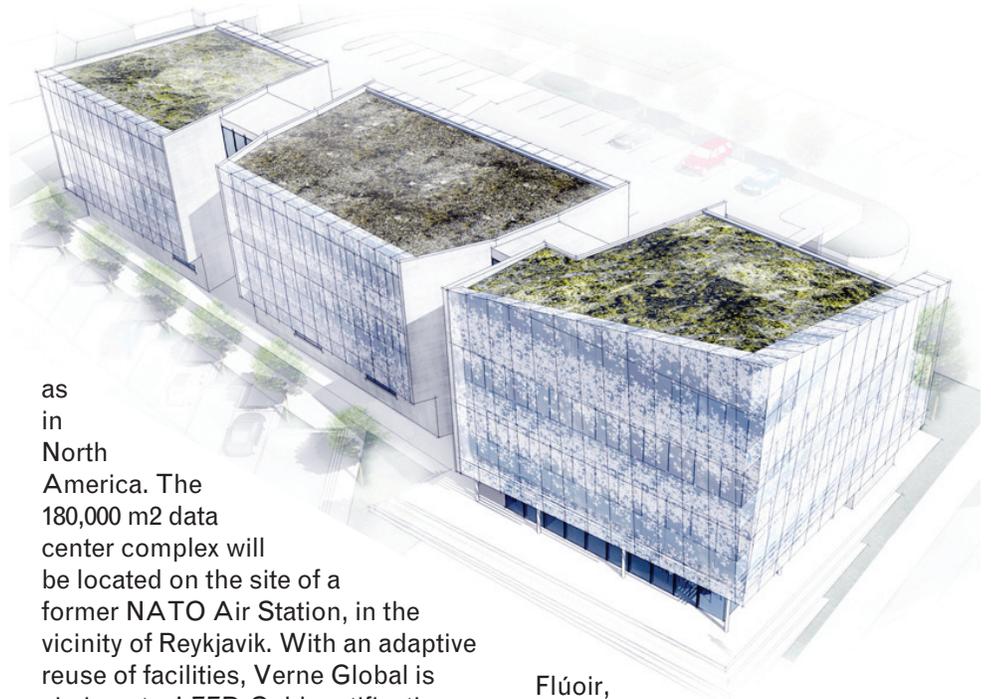
as in North America. The 180,000 m2 data center complex will be located on the site of a former NATO Air Station, in the vicinity of Reykjavik. With an adaptive reuse of facilities, Verne Global is aiming at a LEED Gold certification. Iceland's steady year-round cool climate and an innovative HVAC system will omit the need for cooling towers and make the complex highly energy-efficient. By locating its server farm in Iceland, Verne Global minimizes both electricity costs and carbon emissions. The first phase of the rebuilding is expected to be completed in 2011 which will make it the first LEED certified building in Iceland. (Illustration from Tark architects.)

Flúoir Health Village is the first health resort project in Iceland. It comprises 60,000 m2 (645,834 SF) of open land in the pastoral village

Flúoir,
70 km
(43 miles)

east of Reykjavik. The health village is expected to consist of a service complex (restaurant, hotel, spa and medical service) and 50 apartment buildings, in all 200 apartments. Flúoir Health Village is participating in the Sustainable Sites Initiative's (SITES) pilot program, stretching from June 2010 to June 2012. SITES is a new green rating system for landscape design, construction, operations and maintenance. Over 150 projects (three outside the U.S.) are participating in the pilot program and these will be the first projects to demonstrate the application of the SITES guidelines released in 2009. Both USGBC and the American Society of Landscape Architects are participating in this initiative and it is anticipated that SITES will be incorporated into future iterations of LEED. Flúoir Health Village is expected to be in operation by the summer of 2012. (Illustration on following page from SAV architects.)

Höfoabakki Office Center (25,000 m2 (269,097 SF) is owned by a real estate management firm specialized in commercial property lettings (leases), which has developed an environmental policy for its >>>





Efla Health Village

>>> properties. This will be their first green office building and in connection with this effort, the part of the building used by engineering firm Efla was submitted to a BREEAM certification (3,800 m² (40,902 SF). Efla manages various projects concerning environmental issues and are themselves the BREEAM assessor for this project. The interior has been completely refurbished and the insulation has been improved. Both ventilation and electrical systems have been replaced. Even space planning was changed to some extent. Projects like this can be submitted under BREEAM Fit Out, which provides rating for refurbishment projects to demonstrate the environmental credentials of the refurbishment work itself. Pre-score shows “Excellent” and the building will be assessed when completed. This will be the first Icelandic refurbishment project to get a BREEAM certification. (Illustration from Reitir real estates.)

The Way Forward (New Times)

The objective of GCCA is to make green assessment and certification a requirement for all its projects in the near future. The ideology of BIM integrates particularly well with the

basics of green construction and therefore it stands to reason for GCCA to develop these two methods parallel in its projects. The purpose is to raise the overall quality in public construction, e.g. by reducing negative environmental impacts, creating healthier workplaces and lowering operating costs.

A key factor for achieving this would be to explore GHG emissions and energy and water efficiency. The productivity in the construction sector being the least compared to other industries, the sector clearly has a need for standards and new technologies. Green assessment gives building owners and operators

the tools they need to have an immediate and measurable impact on the performance of their buildings and can be seen as a “checklist for good design”. We are offered the “building blocks” for a more sustainable construction, with multiple benefits for both economy and society. Saving the best for last, the actions we take now will continue to have an impact for the years to come – probably with a net profit.

Basing investment decisions on first cost alone is inadequate and life cycle thinking easily casts a new light on green decision making. Studies show construction costs of green buildings to be only slightly higher than those of regular projects.¹⁰ Moreover, green buildings provide economic advantages such as increased property value, lower operating costs and less maintenance.¹¹ In addition better Indoor Environmental Quality (IEQ) leads to better health – with better employee productivity and attendance as a result.¹² GCCA is just now examining the possibility to adapt LCC tools developed by our Norwegian colleagues at Statsbygg. The aim is to make LCC >>>



Höfoabakki Office Center

>>> calculations part of our normal design routine.

The concept of green building is not just a development trend; it is an environmental approach whose importance will only continue to increase. Without a doubt, we have got some major problems to tackle and they cannot be solved “by using the same kind of thinking we used when we created them”. Both in Europe and the U.S. the construction industry is responsible for about 40 percent of energy and raw material use and it is therefore indisputable that the environmental impacts related to the construction sector are of great importance. A large proportion of all construction work is publicly financed, which enables public contracting authorities to exert considerable influence on the market as a whole. If public procurement in general was focused on investing in products and services that foster sustainability, a huge step forward could be made.

Most countries, including Iceland, have committed themselves to building a more sustainable world and the conceptual and legal mandate for sustainability is already in place in government regulations and policies. But more importantly, tools and procedures must support sustainable government operations.

Starting with ourselves, we must reconsider attitudes and actions, adapt and finally roll up our sleeves, because making use of the knowledge of yesterday and today, we can build a better tomorrow. ¶

Footnotes:

- 1 Geothermal Development and Research in Iceland, National Energy Agency (2010).
- 2 Reykjavik Energy.
- 3 Statistics Iceland.
- 4 Reykjavik Energy.
- 5 Statistics Iceland.
- 6 Reykjavik Energy.
- 7 The Environment Agency of Iceland.
- 8 Comparison results available at www.byggevaluering.dk/object.php?obj=1a40029.
- 9 BIM Iceland.
- 10 Green Building Costs and Financial Benefits, Gregory H. Kats (2003).
- 11 In the U.S. energy and water savings allow an average green premium recovery period of 3-5 years. Making the Business Case for High Performance Green Building, U.S. Green Building Council (2003).
- 12 The U.S. Environmental Protection Agency reports major reductions in work losses and health care costs resulting from commonly recommended improvements to indoor environments. Energy Cost and IAQ Performance of Ventilation Systems and Controls, U.S. Environmental Protection Agency (2000).