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Enjoying the outdoor pool in a cold climate

Appropriate technology, utilisation of geothermal resources and the socialisation of everyday practices in Iceland

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Abstract

Background: The article explores the significance of abundant geothermal resources Icelanders enjoy, the comfort of inexpensively heated homes and easily accessible year-round public spaces where young and old can gather irrespective of social standing, age and bodily condition.

Result: In recent decades, the outdoor public swimming pool has become the most frequented gathering place nationwide. In the harsh climate of the North Atlantic, the harnessing of geothermal resources has transformed everyday practices in terms of heat and cold. But the transformation did not occur through adoption of readymade generic technological solutions but through an interplay of social, political and technological factors. Thus, the article shows how the adoption of appropriate technology, case-specific technological advancements designed in the context of utilisation, in the use of geothermal resources played central role in instigating social change. Indeed, the successful introduction of appropriate technology has had pervading social and cultural consequences, normalizing its generous use and yet in a way that is responsible in quest for the ecologically sustainable.

Conclusion: The utilisation of geothermal water has come from being a response to a dire social, climatic and economic situation to contributing to issues of social welfare and overall wellness.

Keywords: Geothermal utilisation, Appropriate technology, Sustainability, Cultural practices, Iceland

Background

In 1918, the winter was exceptionally cold in Iceland; people crammed themselves together, even stayed close to the domestic animals to get some warmth. Dire economic conditions with high coal prices forced people to reside in overcrowded small rooms and closing off ventilation in an attempt to retain heat. Less than a century later, a young parent might take his infant child to the local outdoor pool in mid-winter and leave the windows of his or her apartment open all the time, even on a cold winter day. The abundantly available hot water, cheap and ecologically sustainable, has become an unquestioned part of everyday life.

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The successful introduction of geothermal water for universal household heating and its use for outdoor swimming pools and hot water tubs has transformed everyday practices and perspectives in regard to heat and cold. In this respect, heat and cold can be understood as both historical and contextual. Harnessing geothermal energy into a controllable resource, relating to temperature and corrosion, was a question of developing scientific and practical skills from scratch. Different kinds of problems relating to corrosion due to the specific chemical composition of the water presented themselves. Adoption of appropriate technology has been vital for its subsequent successful usage, which has led to unexpected diversity of use with diverse socioeconomic and cultural implications. The article explores the intersection between natural resources, case-specific technological advancements, political initiatives, fiscal circumstances and the socio-historical preconditions that led to this transformation of daily practices of an entire nation.

Utilisation of geothermal resources

In order to explain the socioeconomic significance of geothermal utilisation, something that has become an essential aspect of everyday living in Iceland, a comparison between the specific characteristics of the utilisation of electricity and the direct use of geothermal water is informative. In the case of electricity, the distribution system is all-important (Jónsson 2009). With the construction of a generic and reliable structure, the utilisation of mass-produced devices is enabled, based on standardised criteria (e.g. voltage set at 220 V in Europe).

In the case of geothermal energy, distribution results in considerable energy loss and, unlike electricity, the energy reaching the end user is not generic. For instance, the chemical composition tends to vary and is at times difficult to control leading to corrosion within the distribution system. In the study of innovation, a distinction is usually made between three types of learning processes and value creation: practical skills, tacit or informal knowledge and formal knowledge (Polanyi 1966). Practical skills include learning by doing or skills mediated by training, and tacit skills include the tricks of the trade (Arrow 1962). Formal or codified knowledge can, on the other hand, be communicated through writing and thus constitutes the core of scientific practice.

When an agreement has been reached on how to preserve and distribute the energy, electrification becomes a matter of engineering; energy is transformed into a codified and, even more significantly, a patentable property which means that it becomes worthwhile for private or public investment enabling the construction of large universal systems. If electricity is a clear example of a successful case of codified knowledge, the utilisation of geothermal water is a complex combination of diverse capabilities cumulated into tacit knowledge and, essentially, learning by doing. Controlling the geothermal energy has historically been 'on-the-spot problem solving', a user-driven innovation (Bleicher and Gross 2015). To illustrate this, it is instructive to turn to the historical context of how geothermal energy became harnessed in Iceland.

Iceland is endowed with rich geothermal sources, which until quite recently were hardly harnessed at all. In the beginning of the 20th century, imported coal was the primary source of household heating. It was first during the prolonged crisis of the 1930s that a systematic search for alternative energy resources became a political priority (Þórðarson 1998). Hydropower had become a possibility but required considerable

initial investments and a complicated distribution network. In earlier times, peat had been used in rural areas and was, for a while, an option in towns instead of oil and coal, as it fitted the existing distribution system. Peat is however a notoriously inefficient energy source, so making use of geothermal heat was becoming a more feasible alternative as it has been shown achievable to use natural hot water supplies for house heating in close proximity to hot springs. The main problem was the distribution system required to deliver the hot water to its users. In that context, utilisation of geothermal energy was a last resort for the urban centres around Iceland. It required a technologically novel and robust distribution system for which there was neither available on hand engineering expertise, practical knowledge nor sufficient economic means.

By late 1930s, a distribution system was however operational in a small section of the capital Reykjavík, 70 houses in all, exploiting resources situated a few kilometres east of the city. In anticipation of being able to compensate the entire emerging city, the authorities secured rights to the geothermal resources in the Mosfellsdalur area, 30 km from the city centre. Drilling began in 1933 but the enterprise soon ran into various political and fiscal difficulties, as no currency was available in Iceland for such a large investment, and then problems relating to the war. As a late-comer in the modernisation process, physical and financial infrastructure in Iceland was at that time minimal but the intricacies of the engineering and technology involved required considerable economic resources.

Having secured some funds and acquired pipeline and other materials from Denmark in 1939, with the mediation of the Icelandic national bank in collaboration with a Danish engineering company, building of the distribution system could begin. In 1941, at the height of the war, the United States offered Icelanders to make a prioritised wish list of things needed, to be provided as development aid, or as payment for the stay of their occupying forces. The materials and tools for the building of the hot water utility emerged on the top of the list. By this time the United States were participating fully in the war so metals and related materials were in high demand for armaments. This made the provision of materials for the Icelandic hot water utility difficult. But, as a token of Iceland's strategic importance in the war, and after lobbying on behalf of Reykjavík city's engineer and a representative of the Danish company in New York, the materials requested were finally delivered despite difficulties. As a case in point, two of the cargo ships transporting the pipelines across the Atlantic were shot down by German naval vessels (Sigurðsson 1947; Jónsson and Theódórsson 2003; Þórðarson 1998). By the end of the Second World War, some 2850 houses in Reykjavík were connected to the utility in the city of 44,000 inhabitants. By 1955, the proportion of people with geothermal heating had reached 23% (Jónsson and Magnússon 1997, table 8.7).

Technological limitations continued to hamper general adoption of geothermal heating. Around 1960, the Reykjavík energy authorities, for example, expressed serious doubts about the possibility of using geothermal energy for heating, due to both the damaging effects of corrosion and the technical complexity involved, as well as limited financial resources at the time. An important part of providing sufficient geothermal energy for the city was dependent on the instalment of pumps in the boreholes. Available pumps at the time were however not designed to withstand temperatures of up to 150 °C. A persistent problem regarding the pump bearings presented itself, and only after several years of collaboration between Icelandic engineers and different European and

American pump manufacturers and extended testing, a suitable solution was adopted using Teflon. The continuous on-site trials and repeated negotiations between the engineers of Hitaveita Reykjavíkur (Reykjavik District Heating) and foreign pump producers can be seen as a case of user-driven problem solving. After extensive experimentation with different makes and materials in the early 1960s that had proved defective in different ways, Jóhannes Zoëga, director of Hitaveita Reykjavíkur and Höskuldur Ágústsson, chief mechanic of the company, travelled to the United States to meet with the manufactures. The meetings took place in the summer of 1966 in New York and Kansas City. Reflecting on the negotiations, Zoëga recounts the events of a long meeting with C.J. Prestler, chief engineer of the company Fairbanks Morse in Kansas City, and four other engineers. In the end, after lengthy deliberations, Prestler and his colleagues conceded to develop the Icelanders' idea of using Teflon, an idea that would prove appropriate in terms of conditions found in Iceland (Zoëga 2004, pp. 5–10). Finally, in 1967 with the successful implementation of Teflon bearings sufficient hot water could be provided to serve households and industries in the greater Reykjavík area (Zoëga 2004, 2006; Björnsson 2010, p. 19). Using geothermal heat as a substantive or widespread solution must be seen as a clear case of a 'technological momentum' or a 'social construct' where the capabilities are eventually realised by sufficient capital and an appropriate organisational system, where the introduction of Teflon played a significant role.

The energy crisis in the beginning of the 1970s turned the concerns of a relatively few environmentalists, about the depletion of resources and the limits of growth, into popular fear of general energy shortage. The search for alternative energy sources, preferably renewable, became a global task, eventually manifested by the significance of the Brundtland Report in 1984 (Our Common Future 1987). In Iceland, the possibilities of the utilisation of geothermal power were close at hand in the Reykjavík area and many other towns around the country, because the distribution system already existed, and soon other areas followed. In 1970, oil accounted for 53% of Iceland's space heating. The ratio had dropped to less than 5% in 1985 and to 1% in 2010, with 10% coming from hydropower and the remainder from geothermal resources (NEA 1970–2010).

The use of geothermal energy in Iceland has developed in sync with time, as what was once a cumbersome necessity has become an economically and technologically feasible alternative to imported fossil-based energy sources. The importance of geothermal water as an energy source is to be found in its particular physiological properties and direct uses, rather than in its role as a generic source of electricity. Standardisation of electricity stands in sharp contrast to the harnessing of geothermal resources as is revealed by the fact, as Michael E. Porter (2010) has pointed out, that as of 2010 only two Icelandic patented problem-solving techniques had been issued relating to the use of geothermal utilisation.

Initially, as an alternative to imported oil and coal, which were too costly for widespread use, geothermal power has become one of the country's important assets, providing inexpensive space heating, facilitating locally grown vegetables and flowers all year round and even making the outdoor swimming pool the most frequented gathering place nationwide. From a technological perspective, the success of these innovative uses of geothermal resources is based on user-driven problem solving that can also be associated with what has been termed appropriate technology.

Appropriate technology

Willoughby (1990, p. 15) defines appropriate technology as "technology tailored to fit the psychosocial and biophysical context prevailing in a particular location and period". An understanding of the importance of appropriate technology gained ground in the 1970s and was popularised by Schumacher's book *Small Is Beautiful* (1999) as an alternative to capital-intensive tech-fix technologies. The underlying assumption reflected in the subtitle of Schumacher's book, *A Study of Economics As If People Mattered*, was a call not only for a more affordable and 'low tech' solutions but also for shifting the emphasis from production to utilisation. Appropriate technology has until recently been confined to developing societies but with the increasing capabilities to use between options the concept increasingly refers to the development in developed countries as well (Park and Ohm 2015).

The *cradle-to-cradle* approach advocated by McDonough and Braungart (2002) is, to a large extent, centred on the utilisation of up-to-date technology to simplify state-of-the-art products and processes in an appropriate manner. This involves modelling human industry on nature's processes—viewing materials as nutrients circulating in healthy and safe metabolisms, i.e. intergrade the criteria of usability, sustainability and responsibility into the artefacts at the outset. The criteria of sustainability and applicability are becoming a paradigm in knowledge-intensive product development focusing on articulated needs.

Direct transfer of geothermal water to users rather than turning it into generic energy has turned out to be an ever more significant dimension of everyday living in Iceland. Currently 60% of geothermal energy is used in this way (Sveinsdóttir 2014). Contextual utilisation becomes central; by combining the three elements—practical skills, tacit and codified knowledge—to serve ever more articulated needs, numerous opportunities and often unanticipated possibilities emerge. In the case of geothermal water, a shift from source to use is essential.

> *The degree to which a geothermal resource is renewable will depend on several factors. Geothermal energy resources comprise a fully renewable energy flow from the underlying heat source and a vast stored energy in the geothermal fluid. The importance of each of these two components will vary depending on the characteristics of the resource itself, such as volume or natural recharge rates, as well as on the rate of utilisation of the resource, which may be in turn influenced by the type of technology used for plant operation or the management strategies for production and water supply issues (Shortall et al. 2015, p. 399).*

It is this drift towards use, capabilities to control the source and the specificity of the source and articulating preferences that can be understood as the specific characteristics of geothermal energy, to acknowledge its plasticity coinciding with increasing capabilities of use and insights into its contextual limitations.

Along with residential heating and pool attendance, geothermal water is used in a variety of different ways and has far reaching socioeconomic as well as cultural implications, such as reducing ecological footprints by supplying foodstuff: vegetables, fruit in greenhouses, fish farming, enabling production of certain health care products and even turning it into fuel fit for cars. The crucial point here for innovation is not to be stuck in

the distinction between non-renewables and renewables as alternatives, but to focus on how different natural processes are appropriate for different purposes. As an innovation scholar, von Hippel (2006) stresses: "Users that innovate can develop exactly what they want, rather than relying on manufacturers to act as their (often very imperfect) agents". The possibilities to serve articulated needs increase as the direct use of geothermal energy becomes more controllable. A tomato is no longer a tomato but various strains, cherry tomato or plum tomato.

The contrast between location and production is probably most important in food production. McDonough and Braungart (2013) take the year-round greenhouse production as a prime example of their Upcycle thesis; everything exists within one of two nutrient cycles—biological and/or technical. By reference to their slogan: "Wind equals food" they use the example of how artificial light created by way of renewable energy in a cost-effective manner is a case of upcycling. With appropriate nutrition, it becomes possible to produce various types of edibles under circumstances that would otherwise be unattainable. The combination of increasing capabilities of horticulture and the increasingly articulated preferences can be seen as a classic case of Rogers' S-curve of innovation: successive groups of consumers adopting the new technology grow exponentially over time to eventually reach the saturation level (Rogers 1995). The quest for fresh vegetables and fruits has become a universal phenomenon but carbon footprints and waste are becoming unacceptable (Agnarsson and Jónsson 2015).

The success of the direct use of geothermal water is thus related to the emergence of the experience economy (Pine and Gilmore 1999). Conversely, the utilisation of geothermal energy for large-scale industry has, to date, proven unsuccessful in Iceland. The most grandiose project initiated in the early 1970s was to produce 250,000 tonnes of industrial salt using the rich geothermal resources of the Reykjanes Peninsula in the southwest of Iceland. In short, the pilot factory was a fiasco, not only due to the high costs but because the chemical composition of the water rendered it unusable for the production (Kristmannsdóttir 1989). The direct use of geothermal resources for industry remains low at 2–3%, mostly used for drying fish products and seaweed (Orkustofnun 2016).

For the time being at least, it is the experience economy, not industrial production that is the driving force in geothermal utilisation. Consumers are increasingly gravitating towards purchase behaviour dictated by the quality of the experience in addition to the quality of the service or goods. While industrial utilisation in the Reykjanes area failed in salt production, the Blue Lagoon spa in the same area, capitalising on the chemical composition of the geothermal waters for pleasure and health, has proven a success story. The number of visitors to the Blue Lagoon has risen sharply in recent years, reaching over 900,000 in 2015 generating an unprecedented profit (Bláa lónið hagnast um milljarða 2016). The impact of the geothermal utilisation on year-round greenhouse production has been impressive but it goes hand-in-hand with Icelandic producers increasing product development linked with the rising popularity of organic foodstuff. It has more to do with scope than scale. Access to abundant geothermal and unpolluted water as well as the use of state-of-the-art technology is becoming more a question of preferences rather than technological or economic limitations. Radical innovations such

as LED lighting and more ecologically positive cultivation techniques make it possible to grow vegetables locally in Iceland for competitive prices.

This situation constitutes a sharp contrast to the dire conditions found in the late 19th and the early 20th century generated by the extreme climatic conditions and shows the pervasive socio-cultural impact the successful providence of cheap geothermal energy has had on everyday life. It is to this context we now turn.

Normalisation of the quest for comfort and convenience in a cold climate

The first Icelanders were European settlers and followed the lifestyle they were accustomed to although the actual living conditions in Iceland were in many ways closer to what the Inuits and the Samis had adapted to in the arctic north. Wood became increasingly scarce in late medieval times due to overexploitation, which meant that materials for housing were confined to stone and turf. In most cases, up until the late 19th and the early 20th century, the population lived in turf housing of some sort.

During harsh winters such as that of 1881, an exceptionally cold winter, famine reigned and the severe cold led people to literally lose their limbs due to frostbite:

> *Many have had frostbite here in the East during winter; it is said that two men in the Hérað-district will lose their legs in addition to those three that suffered frostbite in Seyðisfjörður. I will name this winter 'Footbite' both due to how many able men have lost their legs and also because I fear that it will lead to devastation as regards peoples' livelihood, i.e. the livestock, if this continues (Norðanfari 1881, p. 63).*

As a means to keep warm during the long winter months, farmers in some cases moved in with their cows. Because of the cold, people resorted to installing living quarters directly above the cow stalls using the heat from the animals for heating, so people were forced to "breathe the vapour that rises from them", as the journal *Skuld* reported despairingly in 1880 (Skuld 1880, p. 254).

During the 19th century, the turf houses were increasingly rejected, especially in urban areas, in place of housing built from imported timber and, after the turn of the century, concrete. For most of the century, the turf houses had been objects of critique, often referred to as dirt hovels, unbecoming as dwellings of a civilised nation. The medical profession was also highly critical of the turf houses, considering them unsanitary to the extreme and recommending their systematic eradication to enhance the nation's physical health and hygiene (Hafsteinsson and Jóhannesdóttir 2015). But even though the turf buildings had their disadvantages, they were more economic and sustainable in terms of heating—the buildings having through time adapted to the harsh climatic conditions of the country. Residents of modern housing were however dependent on imported coals for household heating, especially, of course, in extended periods of severe cold. Following an unusually cold winter of 1918, the population was severely hit by the Spanish flu, especially in Reykjavík and neighbouring fishing villages, areas where people relied heavily on coals for house heating. The pandemic coincided with rising coal prises, due to the war. The combination had devastating effects on the already fragile economic conditions in many families. A letter to the weekly *Dagsbrún* from the town of Akureyri in early January 1918 described a glum outlook:

> *Freezing storm from the north shakes the house. The inside walls or the room are hoary from the frost, even though the expensive coals burn brightly in the stove, and even though the coals are good. The temperature is about minus 20 centigrade. Seven days like this, and that's the end of the coals, what then? (Dagsbrún 1918, p. 25).*

Another report, from the town of Ísafjörður, told of the freezing cold, even in well-heated rooms, being so severe that the ink in the inkpots on the desk did not melt for days (Læknablaðið 1918, pp. 102–103). In such conditions, the poorly insulated timber houses and the new concrete buildings proved deficient. In some cases, "old people" were reported to have resorted to moving out of the new housing and into lofts in cow-sheds to obtain heat from domestic animals (Læknablaðið 1918, p. 182). In other cases, people crowded in single rooms or confined basements without windows, escalating the spread of the pandemic.

> *It has come to light that in some places up to 12 bedridden persons share the same cubbyhole; that damp and dim basements are crowded by people; that airshafts in rooms are often left unattended and in some places it is not at all possible to open a window (Læknablaðið 1918, p. 182).*

With the introduction of geothermal resources for household heating, this situation changed radically. In a modern household, the cost of heating is negligible in comparison to the cost of living in general. With 90% of modern households enjoying cheap geothermal heating, the practice of leaving windows open for extended periods, even in the midst of winter, is common—even in environmentally concerned households.

Shove et al. (2014, p. 113) have argued that the "simple observation that flows of thermal energy depend on the social ordering of material is hugely important … [in] understanding … trends in global energy demand". Utilisation and exploitation of geothermal water turn at times into routines that are taken for granted as fulfilments of needs. This can be set in the context of what Roberts (1997) describes as the quest for comfort. In other words, whenever possible, people will use energy and adopt technologies that will allow them to maintain a steady indoor temperature, which Elizabeth Shove (2003) claims is around 22 °C. Individuals seek ways of coping with temporal pressures of coordination as they look for convenient solutions to otherwise intractable problems of scheduling and order. As Tim Ingold (2010, p. 132) suggests, "for persons or things to interact at all they must be immersed in the flows, forces, and pressure gradients of the surrounding media". This effort towards a comfortable level becomes a social demand reproducing what people take to be normal and, for them, ordinary ways of life. The use of water is bound up with routine and habit as much as the acquisition of tools, appliances and household infrastructures.

Thermoception has a historical as well as a behavioural dimension. In a surprisingly short period, Icelanders have accustomed themselves to the comfort and convenience of the hot water. It is now regarded as polite conduct to keep housing temperature at a comfortable level but keep the air fresh with open windows. Regulating temperature provided by geothermal water is hardly insignificant. In this context, environmental issues are not a concern. The increasing tension between what is becoming a pressing

problem almost everywhere is not an issue in Iceland due to the ample cheap geothermal energy, the use of which has negligible environmental effects.

That the present culture of public bathing outdoors has become an important feature of everyday life in Iceland is a spectacular example of how freely accessible renewable energy makes an impact. Each and every village and neighbourhood in the bigger towns has a pool with a character of its own. The central position of the pool and hot-tub in the present everyday culture is however dependent not only on ample energy but also on the national significance that became associated with swimming during the formative years of the Icelandic nation state in the first half of the 20th century.

During the period of nation-building, swimming became often referred to as the 'sport of all sports' and sometimes 'the queen of sports', emphasising that swimming was something everybody could learn and offered exercise to all regardless of gender or age. This was a novel approach to swimming at the time, as Icelanders generally did not master the technique until the 20th century and swimming did not become a part of the national curricula until the 1930s.

> *One of the best things a child is endowed with at birth is a strong will. What is a ship without the helm? Men can enhance their willpower and endurance in many ways. I'm going to mention but one thing. That is swimming, which is rightly referred to as the sport of all sports. Swimming is the sport, that trains all the muscles equally and keeps the body clean, but the cleanness of the mind is grounded, in a sense, on the cleanness of the body. It is insufficient to wash the face and hands, or that which can be seen, and letting the cloths cover the dirt on the body. Those who do that are "like unto whited sepulchres, full of dead men's bones" (Skinfaxi 1928, p. 32; from Mathew 23:27).*

Even though periodic fisheries on small boats had for centuries been a part of life for many, swimming had not been regarded as an important means of survival, drowning being quite common. Commonly, it was believed that it was better to drown in the icy waters rather than prolonging the fight against the inevitable in an agonising manner by means of swimming. By the end of the 19th century, the popular attitudes towards swimming were changing. In 1892, the bi-monthly periodical *Norðurljósið* reported on the overturning of a boat: none of the crew could swim and as they 'helplessly attempted to climb on the hull the foreman shouted: "Now it would have been good to know how to swim"' (Norðurljósið 1892, p. 17).

Soon arguments advocating the spread of swimming also referred to health benefits for the general population, emphasising the need to subject the body to physical exercise or to use the understanding of the World Health Organization's conception of health in an anachronistic manner, as wellness: health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO 2017). Arguing that swimming lessons should be made compulsory, one commentator claimed that the "prime gain of swimming education is not the lives that would be saved—even though such benefit would be substantial—but the lives that would be indirectly saved by way of the enhanced health that results from practicing swimming" (Dagsbrún 1919, p. 8).

A third line of arguing for the importance of swimming (apart from drowning prevention and health advancement) adheres to the civilising effect of the practice, swimming "is only practiced for fun, but also to cultivate civility" (Tímarit Hins íslenzka bókmentafélags 1904, p. 59) and thus a vital part of the civilising process in generating what Norbert Elias (1968) terms a 'second nature'. By the 1920s, the dual role of swimming as promoting general health (or wellness) and civility is well established. Swimming, it was claimed, is called "the sport of sports", firstly because it exercises all parts of the body, both inside and outside, and makes the mussels malleable yet hefty and tough, and secondly because the swimming also develops the personality of men, enhances courage and strengthens the will. Swimming also improves the flair for cleanness, for it is said that "the way to virtue lies through the pool". Swimming is thus one of the best means of successful upbringing (Íþróttablaðið 1926, p. 20).

The Youth Movement, which was at that time one of the strongest social institutions, prioritised swimming as a constructive way to resist corrupting influences on the local youth and the flight of the older generation into the oblivion of alcohol. Cleanliness took on a metaphorical as well as a practical meaning, cultivating a neo-romantic regard of past achievements of the mythical heroes of the Sagas, but leaving their barbaric characteristics behind.

The Youth Movement was closely associated with the progressive party that came into government in the late 1920s. One of the party's main objectives in terms of educational policy was to locate public schools in areas where thermal water was accessible. This became a success and fitted well with the comprehensive strategy of strength or empowering each and every Icelander to realise his or her inner potential for the good of society (Rastrick 2013). The goal was a good and clean disciplined world, which coincided with the positive value of a balanced egalitarian society. Upbringing, aimed at enhancing the capabilities of all, became the core of the Icelanders' fight for independence.

Sundhöllin (literally the Swimming Palace) was another favourite of the Progressive Party's cabinet minister responsible for education and sports and was regarded a necessity just like the schools. The original plan was to design a building in the style of the traditional farmhouse in Iceland where each of the three houses served a special purpose. The pools were to be located side by side: a children's pool, one with freezing cold salt water to train fishermen, and, of course, a forum for the athletes' tournaments. In a matter of years, the construction of Sundhöllin was seen as one of the most impressive symbols of the nation's self-respect. The building incorporated the ideal of Iceland as a country peopled with proud individuals who joined forces to improve living conditions.

The local pool as a gathering place

In the early sixties, a pool visit's emphasis shifted somewhat from the clear-cut functional intentions to a more varied and pleasurable purpose. The pool was to be a place that satisfied expectations and to some extent the singular longings of an increasingly affluent population, a fact that was literally cemented in the pool's architecture.

Despite the widespread discourse about the ambivalent relationship between the public and the private in modern society, it is remarkable how swiftly an outdoor pool became an important institution. Giddens' (1984) concept of 'structuration' might be helpful here, or the assumption that all human action is performed within the context of

pre-existing social structures that are governed by a set of norms, distinct from those of other social structures.

The hot-tub culture described along these lines is simultaneously a recent phenomenon that has acquired rules, which have been 'normalised' and generally accepted all over the country. In a sense, the pools have taken on the functional role of community centres, and this partly compensates for the lack of dynamic aspects of street life in the otherwise sprawl-dominated structure of Reykjavík.

Schoolchildren have been universally obliged to learn to swim since the early 1940s, earlier in some districts. The training had a wider purpose than learning survival skills and rescue methods. According to the present standard curriculum, the training is to be adapted to the children's needs and capabilities, from the age of six, when they start, to 13, when they graduate (Rastrick 2008). Learning to swim is only a part of the game and could better be described as disciplined fun. Emphasis is on developing and synchronising the child's senses and motor skills, but probably the most important factor is the general social aspect of their cognitive development—learning to respect each other and behave in a responsible and playful manner and hinder stigmatisation (Goffman 1963).

To a certain degree, all the above-mentioned functions became integrated into the 'softer' ideology of the Nordic welfare state. The shift from the pressing necessity of an overall improvement and the more 'vitalistic' understanding of health was now regarded as a common responsibility to improve the quality of life in a more relaxed manner; as such, joint effort and cooperation is required.

The changed perception of the pool and its social role can, for instance, be discerned from how the media reported on the opening of a new swimming pool in June 1968. Emphasis on relaxation and wellness shadows all other purpose of the pool:

> *Nothing is as wholesome as swimming in the clear water and then let the sunrays dry you off. As we sit down on the heated edge of the pool we comprehend all the possibilities it has to offer. Athletics get the chance to compete against foreign nations on legal swimming lanes, teenagers get a 50 m long lane to play in and seniors receive five hot tubs to have their discussions in. There were 6 year olds learning to swim and they succeeded in keeping afloat, assisted with water wings, splashes of water all over the place, the enthusiasm splendid (Vísir 1968, p. 3).*

In recent decades, the swimming pool has become a central gathering place for large sections of the Icelandic community. Some attend the pool on daily bases, while others will visit more irregularly. A distinctive feature of the current pool culture in Iceland evolves around the hot tubs. At every public swimming pool in the country, one will find at least a couple, and often several, outdoor hot water tubs of differing temperatures each being large enough to fit several people. In the early hours of the morning, these tubs might be packed with people from all walks of life engaged in conversation or quietly enjoying the relaxation in the hot water.

The point is that public bathing, always culturally embedded, is and has been a pleasurable social activity, interesting to study and unnecessary to mystify. It is good clean fun. This is a central point in understanding the unrestrained behaviour of the pool attendance in Iceland. A visit to the pool and the hot tubs has, in a way, simply become a

significant meeting point or the public space necessary in the urban landscape where the threat of isolation is always present (Jónsson 2010).

The city as a place "where strangers are likely to meet" is the well-known definition by Richard Sennet (1977, p. 16). Public places in which people feel comfortable conducting routine social interactions with acquaintances as well as unfamiliar persons are crucial for every community. To maintain such comfort requires a certain level of distance or proximity. Here the metaphor of the 'bubble' is appropriate, and each and everyone has a personal space which the individual, an acquaintance or a complete stranger, has to respect. Sennet sees this as one of the most important characteristics of urbanisation. For Henri Lefebvre (2004), the 'rhythm of everyday life' manifests itself in the neighbourhood where 'locatedness' or repetition and place converge. Edward T. Hall (1973) has defined the 'proxemics' of intimate space as the closest 'bubble' of space surrounding a person and he maintains that the sphere is culturally embedded. Entry into this space is acceptable only for the closest of friends and intimates. He defines social and consultative spaces as the spaces in which people feel comfortable conducting routine social interactions with acquaintances as well as strangers.

The rules are subtle and vary from one culture to another. In the case of the Icelandic public pools, visitors quickly become aware of these rules, sublime or tacit as they may be. Dramaturgical theory maintains that there is a social urgency behind this, insofar as the 'actors' are concerned with matters of self-presentation and the emergence of a team impression. The curiously impersonal intimacy of the pool is a clear manifestation of the above traits of modernity. People are constantly shifting roles in a decidedly or in a conditionally restrained manner. Role-playing is a crucial part of the pool-goers' everyday communal living.

Aquatic customs are a wide-ranging subject and even when narrowed down to bathing, the varieties are almost endless. The Icelandic code of conduct involves minimal touching. You do not greet each other with a handshake; a nod is sufficient; hot-tub conversations are general and impersonal, even between regular visitors.

Breaching the rules makes them visible and encourages conformity (e.g. Garfinkel 1984). The pool culture in Iceland has a faint resemblance of naturism; despite the fact that public nudity is forbidden at the actual poolside, the relaxed manner characterising behaviour in a public space is evident. The experience of nakedness and the absence of the gaze of others in the showers is one of the most common comments by foreign visitors to the Icelandic pool facilities.

Concluding remarks

The culture of public bathing has become an important feature of everyday life in Iceland. Each and every village, and neighbourhood in the bigger towns, has a pool with a character of its own, reflecting the time of construction and the changing architectural trends, functionality as well as meaning, over the years. The structural criterion for this emerging everyday culture phenomenon is the successful exploitation of geothermal resources. The quest to manage geothermal power in a doable manner can be seen as a problem of transcribing on-the-spot problem solving into instrumental engineering. Being successfully able to develop appropriate technology in meeting the local challenges of harnessing the geothermal resources was essential. However, the institutional

emergence of the swimming pool had also to go hand-in-hand with the nation's socialisation. In a matter of decades, schooling and other forms of socialisation have led to the population's familiarity with the pool environment facilitating enjoyment and mental and spiritual enhancement on multiple levels with people seeking comfort and physical enhancement. The natural fear of the cold in the harsh Icelandic climate was replaced in the swimming pool permitting for everyday improvement of bodily condition and playfulness with the contrasting tensions of heat and cold. The swimming pool combines being in a public place where strangers meet and a neighbourhood centre where locals routinely gather—a place that incorporates comfort, pleasure and social interaction that to an extent is tolerant in regard to age, gender and bodily appearance.

Geothermal utilisation in its initial stages could be considered labour intensive and requiring a set of craft-based skills that are difficult to disseminate by codification. With the energy crisis and the general agreement that oil is a finite source, it has increasingly become accepted that productivity per se, generating more in less time, is no longer the most significant objective. The issue now is to retain and improve the good life attained by the industrial revolution by finding smarter ways to fulfil needs.

Authors' contributions

ÖDJ laid the foundational theoretical and empirical groundwork presented in the article as to the interactive dimensions of technological, socio-cultural, fiscal and political aspects of the harnessing of geothermal sources. ÓR contributed with specific historico-social analysis and wrote the manuscript with extensive contributions from ÖDJ. Both authors edited the final manuscript. Both authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests.

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