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Trust in Ultima Thules: Social Capital and Renewable Energy Development in Iceland and Greenland *

© Aliaksei PATONIA, MPP, MSc
Email: aliaksei.patonia@oxfordenergy.org; zerbstalex@gmail.com
Oxford Institute for Energy Studies, Oxford, United Kingdom

Abstract. Iceland — an independent republic — and Greenland — an autonomous country within Denmark — represent two nations with similar geographical, economic, and historical backgrounds. Isolated from the continents, both are significantly affected by an adverse climate, making their economies dependent on trade and import. Nevertheless, despite their similarities, their national energy patterns differ substantially. Specifically, Iceland covers most of its energy mix with local renewables, whereas Greenland meets most of the energy demand with imported hydrocarbons. This paper investigates the reasons for Greenland lagging behind Iceland in terms of developing renewable energy resources. It hypothesises that, apart from the commonly-mentioned geographical, institutional, and cultural factors, the difference in social capital level has significantly contributed to the countries' divergent energy strategies. In this sense, Iceland's higher social capital stock stimulates its renewable power progress, whereas Greenland's lower social capital level hampers it. To examine this hypothesis, the article constructs a 'social capital tripod', which assumes specific geographical, institutional, and cultural factors to be linked to renewable energy development through social capital. The findings demonstrate that Greenland, being dependent on hydrocarbon import, has a significantly lower expected level of social capital than Iceland, which runs mostly on renewables, therefore generally aligning with the research hypothesis.
Keywords: *Iceland, Greenland, renewable energy, social capital, geography, institution, culture.*

Introduction

Iceland – an island country located at the juncture of the Arctic and Atlantic Oceans, with an area of about 103,000 km^2 and an approximate population of 335,000 – is considered Europe's least densely-populated country[1]. Similarly, placed in the same region between the Atlantic and Arctic Oceans, Greenland possesses an immense territory of 2,166,086 km^2 with about 56,500 inhabitants and thus is regarded as the most sparsely-populated country in the world[2]. With adverse climates and a significant percentage of their territories covered with glaciers, agricultural activities in both countries are limited, pushing most settlements closer to the coastline. As a result, the Icelandic Norse population historically developed fishing, while the Greenlandic Inuit one focused on marine mammal hunting, with both activities taking a significant share of their modern economies.

According to Kristjansdottir [1, Kristjansdottir H.], Greenland and Iceland's specific geographical features have affected their historical and economic development. In the opinion of Hart [2, Hart G.], remote location and adverse climate significantly contributed to isolation, preventing

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[1] Statistics Iceland. Mannfjöldaþróun 2018 [Population Development 2018]. URL: file://cfs/users/aip4/Documents/Downloads/download.pdf (accessed 17 July 2019).
[2] Statistics Greenland. Population. URL: http://www.stat.gl/dialog/topmain.asp?lang=en&subject=Population&sc=BE (accessed 06 July 2019).

countries and territories from being reached by goods and technologies. Thus, in the opinion of Kristjansdottir [1, Kristjansdottir H.], both nations used to be some of the least economically developed, with the mentioned traditional activities prevailing before a period of modernization after the Second World War (*WWII*) spurred economic and population growth. This period also corresponded with Iceland's obtainment of fully-fledged independence, moving from a Danish colony with limited home rule to a modern democratic republic[3]. Similarly, according to Gad [3, Gad U.], Greenland's shift towards independence from Denmark started in the early post-war period and led to the establishment of the national government (*Naalakkersuisut*). Hence, both countries have significant geographical, cultural, economic, and governmental similarities.

Despite these similarities, Iceland and Greenland's energy patterns are completely different. Currently, Iceland's energy mix is mostly comprised of locally-generated electricity and heat, with a small amount of hydrocarbons imported primarily for transportation purposes[4]. According to *Orkustofnun* [4, Orkustofnun], the National Energy Authority of Iceland, three quarters of the national electrical power is produced by Iceland's hydroelectric plants, leaving the remaining part to local geothermal stations. Greenland's energy mix, in contrast, relies mostly on imported oil and gas, since, in the opinion of Gad [3, Gad U.], the country's few hydropower and waste incineration plants are unable to meet local needs. Indeed, most of the country's total energy consumption consists of foreign hydrocarbons, leaving less than 20 percent to nationally-generated power[5]. Thus, despite significant similarities, Iceland and Greenland paradoxically demonstrate opposite renewable energy development trends.

Aim, objectives, and research hypothesis

As seen above, renewable energy development patterns in Iceland and Greenland differ significantly. Here, producing most of its power from renewables, Iceland represents an almost unique sustainable paragon. In contrast, generating some renewable energy with its small-scale hydroelectric plants, Greenland is still primarily dependent on imported hydrocarbons[6]. In this respect, the *aim* of this research is to investigate why, despite all the similarities, Greenland is not developing renewables as actively as Iceland.

Attempting to explain the reasons behind the divergence in the two countries' energy strategies by means of geographical, institutional, or cultural factors, traditional theories demonstrate significant shortcomings. This article thus views *social capital* as an alternative prerequisite for renewable energy development that might incorporate the advantages of the geography, institution, and culture paradigms. In particular, demonstrating the positive influence of substantial

[3] Witherall R. From Fish to Aluminium: Iceland Turns Attention to Energy Intensive Industries. *Aluminium Today*, 1998, vol. 10, iss. 5, pp. 1-32.
[4] Smiths C., Justinussen J., Bertelsen R. Human Capital Development and a Social License to Operate: Example from Arctic Energy Development in the Faroes Islands, Iceland and Greenland. *Arctic Energy*, 2016, 1 (1), pp. 122-131.
[5] Statistics Greenland. Greenland in figures 2018. URL: http://www.stat.gl/publ/en/GF/2017/pdf/Greenland%20in%20Figures%202017.pdf (accessed 21 August 2019).
[6] Taagholt J., Brooks K. Mineral Riches: A Route to Greenland's Independence. *Polar Record*, 2016, 52 (3), pp. 360-371.

social capital stock on renewable energy development described in the previous research, the paper assumes geographical, institutional, and cultural traits to be proxy indicators of social capital, and thus potential barometers of national renewable energy development. It thus *hypothesises* that low levels of social capital in Greenland and high levels in Iceland contribute to the limited renewable power progress in the former, and extensive power progress in the latter.

To examine this, the article's key *objective* is *to estimate the social capital stock in each of the countries and compare them*. However, generally describing social capital as a form of capital utilising social relations for the achievement of specific advantages, Inaba [5, Inaba Y.] acknowledges the breadth of this notion. Hence, to avoid ambiguity in accomplishing the research aim, the paper has a further *objective*: to *generate its definition by identifying its key components*. Presuming that specific geographical, institutional, and cultural features influence the components of social capital differently, the research strives to *examine which of these features can influence the defined social capital components and in what way.* Finally, *to measure the current magnitude of these proxy indicators*, the article also estimates social capital levels in Iceland and Greenland..

Outline

To achieve its aim, the research first reviews the key theoretical frameworks, attempting to explain the renewable energy disparity of Iceland and Greenland – i.e. the geography, institutions, and culture hypotheses. Having identified their key advantages, it then demonstrates the inability of any of them to fully clarify reasons for difference in energy development between the viewed countries. With such a conceptual gap, the research subsequently introduces the concept of social capital, arguing that it can become a junction between the geographical, institutional, and cultural approaches, on the one hand, and renewable energy progress, on the other, ultimately forming a 'social capital tripod'.

Due to the complexity of the notion of social capital, the study's next section discovers the key social capital components and incorporates them into the definition elaborated for this paper. Then, these components are aligned with the geographical, institutional, and cultural proxies so that the 'social capital matrix' is formed. This 'matrix' is then used to analyse Icelandic and Greenlandic social capital stock. Specifically, comparing the countries' geographical, institutional, and cultural indicators, the research estimates the ultimate social capital level in each. Subsequently, comparing the expected social capital levels in Iceland and Greenland, the research provides evidence to either support or refute the research hypothesis.

In the final part, the paper demonstrates the possibility for the 'social capital tripod' to be further utilised in the analysis of current and estimated future renewable energy trends, potentially explaining renewable energy development failure in areas suitable for its development. Apart from showing the advantages of the concept, the final part also defines its significant limitations and presents an alternative theory, attempting to explain the energy situation in Iceland and

Greenland. In conclusion, the research provides suggestions for further improvement of the 'tripod' approach.

Literature review

Classical theoretical frameworks. According to Acemoglu [6, Acemoglu D., p.27], 'the two main candidates to explain the fundamental causes of differences in prosperity between countries are geography and institutions'. Specifically, the institutions hypothesis' proponents ascribe societal success to the presence of 'good institutions that encourage investment in machinery, human capital, and better technology' [ibid, p.28]. Here, Acemoglu and Robinson [7, Acemoglu D. and Robinson J.] recall the Democratic Republic of Congo – a poor country with abundant natural resources, but malfunctioning institutions. Alternatively, supporters of the geography paradigm assume that 'not only can unfavourable geography cripple states; it can also slow the development and diffusion of technology' [8, Sachs Sachs J., p. 145]. To illustrate these tenets, the case of dry sub-Saharan Africa is mentioned by such researchers as Diamond[7]. Due to the existence of real-life examples supporting both frameworks, there is major 'ongoing debate in the growth empirics literature: the "institutions vs. geography" debate' [9, Kourtellos A., Stengos T., and Tan C., p.1].

To reconcile the theories, an alternative approach was introduced: developing the ideas of Weber on the Protestant ethic fostering economic progress, Shi et al [10, Shi S. et al, p. 281] highlighted *culture*'s importance for national development, suggesting, that 'commercial culture has a significantly positive impact on economic performance'. Trying to bridge the gaps of geographical and institutional approaches, this *cultural hypothesis* adds the element of personalisation, complementing the previous frameworks and presenting researchers with a third option for the analysis of national development. Since, according to Moe [11, Moe E., p. 1730], 'there is a strong and well-documented correlation between energy… and economic growth and development', energy development is usually examined against these theories. This paper thus investigates renewable energy progress in Iceland and Greenland with respect to these three frameworks.

Geography. When applied to the energy development of Greenland and Iceland, the geography hypothesis traditionally ascribes the success of Iceland's renewable energy strategy to its geographical uniqueness. Specifically, according to Kristjansdottir [1, Kristjansdottir H., p. 43], 'in most parts of Iceland it is possible to find geothermal resources', which makes this energy source suitable for use in many sectors: e.g. municipal heating, electricity generation, agriculture, and aquaculture. That is why this source currently provides about 66 percent of Iceland's primary energy supply[8]. In the opinion of Gudmundsson [12, Gudmundsson J., p.127], this is because 'Iceland is probably unique in its geothermal potential', as it is one of the most tectonically active places on the planet, located on the border of the North American and Eurasian tectonic plates.

[7] Diamond J. Guns, Germs, and Steel: *The Fates of Human Societies*. New York, W.W. Northon & Company, 1999.
[8] Arnorsson S., Axelsson G., Saemundsson K. Geothermal Systems in Iceland. *Jokull*, 2008, 58 (1), pp. 269-302.

In contrast, Greenland is entirely placed on the North American Plate and does not have equally powerful geothermal fields. As the research of Franco, Fettweis, and Erpicum [13, Franco B., Fettweis H., and Erpicum M.] shows, most Greenlandic springs generate water of low or medium temperature (below 60°C), hampering their industrial utilisation. Additionally, according to Stevens, Alley, and Parizek [14, Stevens N., Alley R., and Parizek B.], Greenland's full geothermal potential cannot be utilised, since most of its fields are currently covered by the Greenlandic ice sheet (about 80 percent of the island's territory). Thus, though Iceland and Greenland have similar locations, their physical geography differs significantly enough not to allow the latter to develop geothermal energy.

Despite representing arguments highlighting the uniqueness of Icelandic geothermal development, the traditional geography hypothesis does not explain why Greenland does not develop alternative green energy sources. In the opinion of Partl [15, Partl R., p. 544], 'the enormous mass of ice covering Greenland, combined with steep mountain gradients to the sea, makes hydropower a promising resource'. Specifically, the island's total hydropower capability is estimated at between 100 GW and 1 TW, 'not only satisfy[ing] the energy needs of Greenland itself, but… also allow[ing] for large-scale energy export'[9]. Thus, despite the lack of industrially exploitable geothermal fields, Greenland could potentially cover its energy demand with hydroelectric power, popular in the Nordic countries.

In fact, most of the electricity generated in Norway and Iceland comes from hydropower plants; indeed, estimate about 98 percent of Norwegian electricity is estimated to be generated by water[10]. Similarly, about 75.5 percent of Icelandic electricity is produced by the same means, leaving the remaining 24.5 percent to geothermal sources [4, Orkustofnun]. This covers most of the primary energy consumption in both countries[11]. In Greenland, however, about 80 percent of the consumed energy still comes from imported hydrocarbons[12]. Given the nation's extreme demand for its own energy sources, lack of conditions for geothermal development cannot explain failure to utilise geographical advantages favouring hydroelectric power. Thus, traditional tenets of the *geography hypothesis* do not reflect Greenland's complex energy situation.

Institutions. Proponents of the institutions hypothesis view Iceland's renewable energy success through the prism of coordinated national energy policy that integrated all the country's power producers and consumers into one system. Indeed, the development of all energy-related projects in Iceland is regulated by the governmentally-developed Master Plan for Hydro and Geothermal Energy Resources (Master Plan) introduced in 1999, 'modelled on the Norwegian Master

[9] La Roche. The Greenland Hydropower as a Source of Electrolytic Hydrogen. *International Journal of Hydrogen Energy*, 1977, 2 (4), pp. 405-411.
[10] Birkedal M., Bolkesjø T. Determinants of Regulated Hydropower Supply in Norway. *Energy Procedia*, 2016, 87 (1), pp. 11-18.
[11] Sovacool B. Contestation, Contingency, and Justice in the Nordic Low-Carbon Energy Transition. *Energy Policy*, 2017, 102 (1), pp. 569-582.
[12] Statistics Greenland. Greenland in figures 2018. URL: http://www.stat.gl/publ/en/GF/2017/pdf/Greenland%20in%20Figures%202017.pdf (accessed 21 August 2019).

Plan for Water Resources' and originally set up for preliminary evaluation of the impact of the suggested energy undertakings[13]. Incorporating all separate energy-producing and consuming entities into the unified grid controlled by the national transmission operator Landsnet, the Master Plan became the main document managing Icelandic national energy development[14].

In contrast to Iceland, Greenland's energy development strategy is defined by the '*Kingdom of Denmark Strategy for the Arctic 2011-2020*' (hereinafter 'Strategy') elaborated by the Danish Government for Denmark itself, Greenland, and the Faroe Islands[15]. Having identified the main areas of concern in the region, the Strategy section on Greenland mostly covers mineral exploration and extraction. In the opinion of Wilson [16, Wilson E.], this document generally repeated the provisions of the Mineral Strategy of Greenland 2004 later included in Greenland's oil and mineral strategy 2014–2018. According to the researcher, although these two documents were initiated and adopted by Naalakkersuisut, they focus solely on minerals and do not cover renewables [ibid].

Such an insufficient presence of the renewable energy question on the national agenda is described by proponents of the *institutions hypothesis* to be the direct consequence of the absence of Greenlandic statehood – i.e. dependence on Denmark. According to Lyck and Taagholt [17, Lyck L., Taagholt J., p. 59], this political reliance is greatly augmented by the economic one – 'capital inflow from Denmark' in the form of government support for the island's scattered settlements. In the opinion of the researchers, Naalakkersuisut may have failed to prioritise the development of national energy strategy due to lack of internal funding.

In addition to the lack of national energy development strategy, Greenland's state-controlled national grid does not connect all households to the state energy producers (e.g. the five existing hydroelectric power plants), offering half of the population the option to generate energy by incinerating waste or imported hydrocarbons[16]. Although this could potentially be explained by unfavourable geographic conditions, neither the geographic nor the institutions hypothesis explains why off-grid systems have not been actively developed in Greenland. In the opinion of Boute [18, Boute A., p. 1029], implementation of such energy solutions in isolated Arctic communities could 'reduce the economic, social and environmental cost of electricity supply'. Additionally, together with mineral endowment, this could augment Greenland's economic grounds for independence.

The Isle of Eigg in the Scottish Inner Hebrides vividly illustrates the success of an isolated island community that managed to cease energy dependence on imported hydrocarbons by investing in small-scale renewables. Although the island does not have any separate institutionally-supported energy development strategy, it meets all its demands, with solar, wind, and hydro-

[13] Thorhallsdottir T. Strategic Planning at the National Level: Evaluating and Ranking Energy Projects by Environmental Impact. *Environmental Impact Assessment Review*, 2007, 27 (6), p. 576.

[14] Orkustofnun. Master Plan for Hydro and Geothermal Energy Resources in Iceland. URL: http://www.nea.is/geothermal/master-plan/ (accessed 22 July 2019).

[15] Ministry of Foreign Affairs of Denmark. Kingdom of Denmark strategy for the Arctic 2011-2020. URL: http://um.dk/en/foreign-policy/the-arctic (accessed 21 July 2019).

[16] Nukissiorfiit. NukiFakta. URL: http://www.nukissiorfiit.gl/nukissiorfiit/?lang=da (accessed 18 September 2019).

power providing 'a reliable 24-h electricity supply to the islanders' [19, Chmiel Z., Bhattacharyya S., p. 578]. In Greenland, such small-scale solutions could be the most financially-feasible alternative[17].

Similarly to the Isle of Eigg, the fist renewable energy initiatives in Iceland were not started by the government. In fact, the first small-scale hydropower plant was built by a local entrepreneur about 20 years before the first governmental renewable energy project [1, Kristjansdottir H.]. Although Greenland's isolated communities may lack funds for such investments, they could have applied for financial support from the Danish block subsidy[18]. Hence, the *institutions hypothesis* and the absence of the national renewable energy strategy does not fully explain the country's situation.

Culture. The hypothesis attributing difference in energy development to culture mostly focuses on Greenlandic indigenous identity and consequent differences in traditional ways of living between the Icelandic Europeans and Greenlandic Inuit. Indeed, according to Corcoran et al [20, Corcoran P. et al, p. 106], 'the Inuit culture is the most pure hunting culture in existence'. Apart from reindeer, walrus, reindeer, seal, and narwhal hunting, fishing constitutes the biggest sector of the country's national economy[19]. In this respect, according to Mazza [21, Mazza , p. 319], energy development endangers 'the safety of both the existence of indigenous peoples and their right to preserve traditional cultures and differentiated economies'.

In contrast to Greenland, Iceland possesses a more diversified economy with more power-intensive industries. There, aluminium production was added to traditional fishing after WWII. In 2016 the Central Bank of Iceland stated that these two industries generated about half of the national income[20]. Additionally, most Icelanders are European descendants of Norse and Celts (about 96 percent), whereas most Greenlanders are indigenous Inuit (about 88 percent)[21]. This could determine the specifics of Greenland's development as a traditional society not requiring greater energy intensity, and not posing threat to their way of life. Alternatively, industrialised

Iceland would strive for energy-intensive production that does not endanger any industries.

Hansen et al, find mining, rather than renewable energy development, the major threat to traditional indigenous culture, as, due to its great scale and magnitude, it has caused 'dramatic changes to life and culture, not only at the local community level, but also to Greenland in general' [22, Hansen et al, p. 25]. Indeed, Greenland is extremely mineral-rich, with resources potentially

[17] NORDREGIO. Green Growth in Nordic Regions. URL: http://www.nordregio.se/Global/Green%20growth%20in%20Nordic%20regions%2050/NordicGreenGrowth-pages.pdf (accessed 18 October 2019).

[18] Smiths C., Justinussen J., Bertelsen R. Human Capital Development and a Social License to Operate: Example From Arctic Energy Development in the Faroes Islands, Iceland and Greenland. *Arctic Energy*, 2016, 1 (1), pp. 122-131.

[19] IIED. Energy and Minerals in Greenland. URL: http://pubs.iied.org/pdfs/ 16561IIED.pdf (accessed 19 January 2020).

[20] Central Bank of Iceland. Economy of Iceland. URL: https://www.cb.is/library/Skraarsafn---EN/Economy-of-Iceland/2016/Economy_of_Iceland_2016.pdf (accessed 19 December 2019).

[21] Statistics Iceland. Population by Sex, Municipality, Citizenship and Age: 1 January 1998-2017. URL: tp://px.hagstofa.is/pxen/pxweb/en/Ibuar/Ibuar__mannfjoldi__3_bakgrunnur__Rikisfang/MAN04208.px (accessed 06 December 2019) *and* Statistics Greenland. Greenland in figures 2018. URL: http://www.stat.gl/publ/en/GF/2017/pdf/Greenland%20in%20Figures%202017.pdf (accessed 21 August 2019).

extractable through open-pit mining[22]. As surface mining is an extremely large-scale undertaking, the currently existing small hydropower plants pose a significantly lower threat to the traditional indigenous way of life than the extractive activities affecting the region[23].

If Greenland finally initiates development of renewable energy projects, the threats and concerns for the indigenous communities, existing industries, and other stakeholders could be eliminated or minimised through strategic environmental assessment. Such a process is currently being implemented and regulated in Iceland by the Master Plan. For instance, after a thorough assessment process, Kárahnjúkar Hydropower Project was constructed in an area 'widely considered to be peripheral both geographically and economically' [23, Newson S., p. 162]. Since, the country has the lowest population density on the planet, most hydropower projects could have been constructed in isolated places, not threatening the indigenous way of living. As this has not been the case, the traditional tenets of the cultural hypothesis do not fully explain the situation.

Alternative approach: The social capital framework. As seen, although each of the traditional theories has some reasoned arguments in favour of its specifically-highlighted factors (geography, institutions or culture), none of them flawlessly explains Greenland's passive renewable energy development. Here, an alternative approach could potentially develop their advantages and integrate them into a single, more comprehensive framework. This paper argues that the theory of social capital could bridge these three paradigms, ultimately connecting them to the prospects of renewable energy development.

According to Hauberer, the social capital concept was first introduced in the nineteenth century and significantly developed in the 1980s by Bordieu and Coleman who first 'systematically' used it [24, Hauberer J., p. 35]. Generally described as 'resources embedded in relationships among actors', the concept represents a broad framework uniting personal motivation for cooperation and productive results of such interactions [ibid, p.50]. Though most papers on this topic relate it to the political dimension and investigate its effect on civil society and peoples' interactions with the government, several pieces of recent research align this notion with sustainability.

In their exploration of social capital's agricultural impact, McShane et al find it 'important for farming sustainability' [25, McShane C. et al, p. 154]. Later, investigating people's reaction towards pro-environmental policies of the government, Cilona finds social capital 'certainly an important element to develop and to support sustainable policies' [26, Cilona T., p. 219]. In addition, Nanetti and Holguin conclude that social capital 'facilitates the pursuit of sustainable development' [27, Nanetti R., Holguin C., p. 7]. Thus, assuming renewable energy to be part of broader sustainable development, high level of social capital could be aligned with greater prospects for renewable power progress. Since the geography, institutions, and cultural hypotheses per se fail to explain the current renewable energy situation in Iceland and Greenland, this article fills this conceptual

[22] IIED. Energy and Minerals in Greenland. URL: http://pubs.iied.org/pdfs/ 16561IIED.pdf (accessed 19 January 2020).
[23] Rasmussen R. Formal Economy, Renewable Resources and Structural Change in West Greenland. *Groupe d'Etudes Inuit et Circumpolaires (GETIC) et l'Association Inuksiutiit katimajiit inc.,* 2000, 24 (1), pp. 41-78.

gap by integrating these frameworks into the concept of social capital ultimately affecting renewable energy development.

Social capital: Literature gap and integration of geography, institutions, and culture. As described, this study combines the traditional theories related to renewable energy production through the social capital framework. Although separate papers represented above have already linked specific tenets of each to this form of capital, a comprehensive study aligning all three under one umbrella theory is lacking. That is why this research bridges this literature gap, forming the 'social capital tripod', which is subsequently aligned with renewable energy development by the already-established links described above (see Fig. 1).

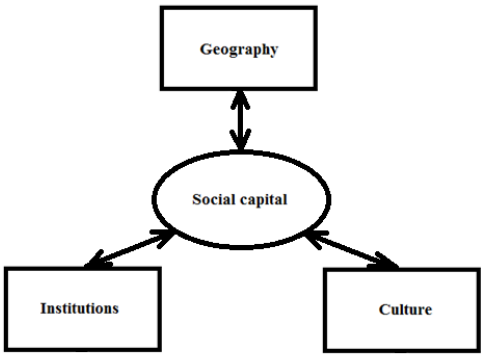

Fig. 1. Social capital tripod

Regarding the geography hypothesis, some conditions related to the *socio-geographical dimension* are assumed to significantly affect social capital. Specifically, Johnston, Karageorgis, and Light [28, Johnston M., Karageorgis S., Light I., p. 1479] highlight *population growth* as a 'powerful contributor to social capital'. Similarly, studying population decline in the Netherlands, Elshof and Bailey [29, Elshof H., Bailey A., p.73] suggest that 'it is likely that consequences of population decline impede on preconditions for social capital'. Thus, it could be implied that diverging population indicators have different effects on social capital in Iceland and Greenland.

In addition to population growth, some researchers mention *distance* and *discontiguity between settlements* as an alternative set of factors negatively influencing social capital stock. Indeed, as the results of the research conducted by Westlund, Rutten, and Boekema [30, Westlund H., Rutten R., Boekema F., p. 965] show, 'social capital diminishes continuously with distance'. That is why investment in infrastructure appears to be important because 'borders and barriers make distance discontiguous and… social capital is affected by these discontinuities' [ibid, p. 966]. It could thus be assumed that potentially more discontiguous Greenland has lower level of social capital than presumably better-connected Iceland.

Despite the shortcomings of the traditional tenets of the *institutions hypothesis*, this framework is also aligned with social capital through the effect of institutions on societal health and wellbeing. This is because violence and social capital have 'the opposite direction of associa-

tion'[24]. Specifically, according to Rosenfeld, Messner, and Baumer [31, Rosenfeld R., Messner S., Beumer, E., p. 283], the role of law enforcement agencies is important, as 'depleted social capital is associated with high levels of *homicide'*. Hence, if found, a higher number of homicides in Greenland in comparison to Iceland could potentially indicate its lower social capital level.

In addition to homicides, Recker and Moore [32, Recker N., Moore M., p. 78] also imply that countries with 'higher rates of social capital, diversity, and population density experience lower *suicide rates*'. In this connection, suicide rates are an important indicator of the inefficiency of governmental institutions potentially affected by 'reduced funding for mental health services and reduced donations to community charitable support organization'[25]. Thus, another indication of different levels of social capital in Iceland and Greenland could be their diverging suicide indicators.

Finally, the *cultural hypothesis* could potentially be connected to social capital and explain the differences in Icelandic and Greenlandic renewable energy patterns by means of two specific characteristics: *alcohol consumption* and *migration traits of the population*. In the first case, extreme *alcohol consumption* is 'strongly associated with reduced indicators of social capital'[26]. Here, cultural traits are mostly associated with the Inuit people traditionally having low alcohol tolerance, usually leading to 'sharply increasing levels' of consumption[27]. At the same time, social capital is 'positively associated with the probability of regular, but not binge drinking'[28]. Thus, if Greenland's alcohol consumption is significantly higher than Iceland's, this could indicate lower Greenlandic social capital. Alternatively, medium-level consumption would potentially be associated with its high stock.

With regard to the *migration traits*, Spina [33, Spina N., p.1] finds out-migration 'a threat to social capital in sending communities'. In this respect, traditional nomadic and semi-nomadic communities are assumed to have lower levels of social capital due to seasonal population movements[29]. Thus, identifying nomadic traits within Greenland and Iceland could provide information for evaluating their respective social capital levels, with the one possessing stronger nomadic traits having presumably lower social capital stock and vice versa.

Social capital: Definitions and main components. Although the notion of social capital has become popular in recent decades, it is still a broad concept, with different researchers understanding its main traits differently. Hence, Lin, Fu, and Hsung assume that 'without a clear concep-

[24] Dinesen C. et al. Violence and Social Capital in Post-Conflict Guatemala. *Pan American Journal of Public Health*, 2013, 34 (3), p. 162.
[25] Hawton K., Haw C. Economic Recession and Suicide: The Association is Clear but Government Response May Limit Its Extent. *British Medical Journal*, 2013, 347 (79), p. 9.
[26] Theall K. Social Capital and the Neighbourhood Alcohol Environment. *Health and Place*, 2009, 15 (1), p. 323.
[27] Aage H. Alcohol in Greenland 1951-2010: Consumption, Mortality, Prices. *International Journal of Circumpolar Health*, 2012, 71 (1), p. 2.
[28] Koutra K. Social Capital and Regular Alcohol Use and Binge Drinking in Adolescence: a Cross-Sectional Study in Greece. *Drugs-Education Prevention and Policy*, 2014, 21 (4), p. 299.
[29] Petersen R. *Settlements, Kinship and Hunting Grounds in Traditional Greenland: a Comparative Study of Local Experiences from Upernavik and Ammassalik*. Copenhagen, Danish Polar Center, 2003.

tualization, social capital may soon become a catch-all term broadly used in reference to anything that is "social"' [24, Hauberer J., p. 34]. In order not to be misled, this paper conducts a comparative analysis of the most-used definitions of social capital in academic literature, then identifying the main components of this concept and presenting an alternative definition, used in this paper.

The six analysed definitions of social capital were chosen according to the popularity of research papers where they were mentioned in the three 'most patronised scholarly databases by respondents' – i.e. ScienceDirect, Scopus, and Google Scholar[30]. The selection was also based on the highest indicators of the authors' research impact indices: h-Index, i10-Index, and FWCI Index – the three most popular[31]. The combination of these criteria could be shown as follows (see *Table 1*):

Table 1

Definitions of social capital and respective authors

Authors	Definition	Number of citations per database as of 1st of August 2019			Author-level research impact indices		
		ScienceDirect[32]	Scopus[33]	Google Scholar[34]	h-Index[34]	i10-Index[34]	FWCI index[33]
Bourdieu [34, Bordieu P., p.248]	'The aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition'	309	127	38617	249	645	n.a.
Coleman [35, Coleman J., p. S98]	'A variety of different entities, with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors'. 'Social capital inheres in the structure of relations between actors and among actors'.	0	n.a.	39022	72	143	n.a.
Lin [36, Lin N., p. 19]	'Investment in social relations with expected returns in the marketplace'	76	n.a.	8961	54	87	n.a.
Portes [37, Portes A., pp. 6-7]	'The ability of actors to secure benefits by virtue of membership in social networks or other social structures' (p. 6). 'Accumulation of obligations from others according to the norm of reciprocity' (p. 7).	0	4391	13735	113	315	51.32
Putnam [38, Putnam R., p. 19]	'Connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them'	n.a.	n.a.	16676	80	183	n.a.
Woolcock [39, Woolcock M., p. 153]	'The information, trust, and norms of reciprocity inhering in one's social networks'	39	1801	5894	43	81	136.75

[30] Ahenkorah-Marfo M. Domain Analytic Approach to the Use of Academic Databases by Graduate Students. *International Information and Library Review*, 2017, 49 (1), pp. 1-10.

[31] Bertoli-Barsotti L., Lando T. A Theoretical Model of the Relationship between the H-Index and Other Simple Citation Indicators. *Scientometrics*, 2017, 111 (3), pp. 1415-1448.

[32] ScienceDirect. Peer-reviewed Journals, Articles and Book Chapters. URL: http://www.sciencedirect.com/ (accessed 01 August 2019).

[33] Scopus. Authors and papers. URL: https://www.scopus.com/freelookup/form/author.uri (accessed 01 August 2019).

[34] Google Scholar. Citations. URL: https://scholar.google.com/intl/en/scholar/citations.html (accessed 01 August 2019).

As seen, the most popular definition of social capital, which highlights *networks* and *relationships* (underlined), was proposed by Bourdieu [34, Bordieu P., p. 248]. While repeating the importance of social networks, the second most popular definition, suggested by Portes [37, Portes A., pp. 6–7], added social structures and reciprocity. In addition to mentioning reciprocity, relations, social structures and networks, definitions by Coleman [35, Coleman J., p. S98], Putnam [38, Putnam R., p. 19], and Woolcock [39, Woolcock M., p. 153] integrated the component of trust (trustworthiness). Finally, the most recent one generated by Lin [36, Lin N., p. 19] also underlined the importance of social relations. Hence, although the viewed definitions mention the same factors, none of them incorporates all five components of social capital. Filling this gap and integrating all of them will reach one of the *research objectives* and give us the following picture (see *Fig. 2*).

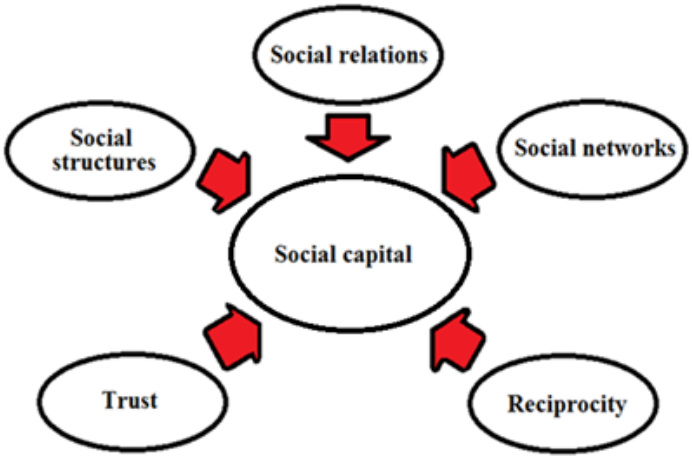

Fig. 2. Components of social capital.

According to Coleman [35, Coleman J., p. S98], it should also be noted that 'social capital is *productive*, making possible the achievement of certain ends that in its absence would not be possible'. Hence, combining the components of this notion with this characteristic, another *research objective* could be reached by producing the following definition of social capital: *social capital* is a productive form of capital comprised of social structures, connections, relations, and networks based on trust and reciprocity. As this definition integrates the most important parts of the concept, it is used for the purposes of this research.

Social capital: Geography, institutions, culture and their effect on the main components.

As seen in part II.2.A, the 'social capital tripod' aligns social capital with the two specific indicators of each of the traditional theories – i.e. population growth rate and distance/ discontiguity for geography, number of homicides and suicides for institutions, alcohol consumption and nomadic traits for culture. Part II.2.B, in its turn, described the social capital itself comprising five key elements: social relations, networks, structures, trust, and reciprocity. Hence, it could be assumed that, depending on the level and degree of each indicator, each respective social capital component will be affected in a specific way. Here, implementation of the 'traffic light' colour code, where 'green' indicates positive changes in social capital components, 'red' stands for the negative

ones, and 'yellow' for the ones of potential probability of changes, provides the following picture of the effects on social capital (see Table 2):

Table 2

'Social capital matrix': Major influence of indicators on main components

Factors	Indicators	Level / degree	Social relations	Social networks	Social structures	Reciprocity	Trust	General impact on social capital
Geography	*Population growth rate*	High	Bigger number of stimuli for developing social relations	Greater opportunity for networking	More favourable conditions for solidifying social structures	Possibility for reciprocity to be hampered	Potentially adverse effect on trust in case of high population growth	Moderately positive
		Low	Smaller number of stimuli for developing social relations	Lower opportunity for networking	Less favourable conditions for solidifying social structures	Possibility for reciprocity to be spurred	Potentially positive effect on trust (if population growth is low)	Moderately negative
	Distance, discontiguity/ communication between settlements	Big / bad	Unfavourable conditions for interaction	Low possibility for networking	Greater barriers for establishing and developing solid social structures	Unfavourable conditions for achieving significant level of reciprocity	Less favourable conditions for establishing trust	Significantly negative
		Small / good	Favourable conditions for interaction	High possibility for networking	Greater potential for developing solid social structures	Favourable conditions for achieving significant level of reciprocity	Favourable conditions for establishing trust	Significantly positive
Institutions	*Number of homicides*	Big	Adverse conditions for establishing and developing social relations	Potentially less favourable conditions for networking	Potentially less favourable conditions for forming social structures	Low level of reciprocity	Low level of trust	Moderately negative
		Small	Favourable conditions for establishing and developing social relations	Potentially more favourable conditions for networking	Development of comprehensive social structures is potentially encouraged	High level of reciprocity	High level of trust	Moderately positive
	Number of suicides	Big	Low level of social relations/interaction	Less favourable conditions for networking	Unfavourable conditions for creating and developing strong social structures	Low level of reciprocity accompanies big number of suicides	Low level of trust within community/ society	Significantly negative
		Small	Potentially higher level of social relations/interaction	Potentially more favourable conditions for networking	Favourable conditions for developing strong social structures	Small number of suicides accompanies high level of reciprocity	Greater level of trust within community/society	Moderately positive
Culture	*Alcohol consumption per capita*	High / low	Extremely high consumption and total abstinence deteriorates productive social relations	High and extremely low consumption hampers productive networking	Less favourable conditions for social structures with high alcohol consumption and total abstinence	Extremely heavy and low alcohol consumption creates less favourable conditions for reciprocity	Risky and no alcohol consumption is associated with lower trust level	Significantly negative if extremely high and low consumption and binge drinking
		Moderate	Moderate consumption encourages social relations	Moderate consumption stimulates networking	Moderate consumption facilitates social structures	Moderate social alcohol consumption encourages reciprocity	Moderate alcohol consumption fosters trust-binding	Significantly positive in case of medium consumption

	Nomadic/ semi-nomadic cultural traits	Yes	Adverse effect on developing social relations outside community	Limited conditions for social networking	Barriers for creating solid social structures	Unfavourable conditions for reciprocity outside community	Unfavourable effect on trust towards strangers associated with distance and lack of direct interaction	Significantly negative
		No	Greater potential chance to develop relations outside community	Greater conditions for social networking	Potential absence of barriers for solidification of social structures	Greater chance to ensure and develop reciprocity outside community	Potential lack of barriers for trust development	Moderately positive

As seen from the 'matrix', a *high population growth rate* has '*moderately positive*' impact on social capital, whereas *low population growth* rate predominantly *hampers its development*. This is due to the fact that, population growth spurs interactions between people, ultimately forcing them to create binding social structures, networks, and relationships [35]. However, the effect of this factor on trust and reciprocity is not absolutely clear, since 'population growth has the potential to destabilize both racial and national orders' and thus can hamper both factors [36]. Nevertheless, despite having some presumably negative effect on social capital, *population growth* is still considered '*moderately positive'* for its development (three 'green' cells and two 'yellow' ones).

In contrast to the mentioned population factor, *distance between settlements* and *infrastructural discontiguity inversely relate* to the *social capital stock*. Indeed, high level of these factors is associated with impeded networking, hampered relations, and lower trust [37]. Similarly, social structures and reciprocity are easier established with lower distance and greater contiguity. Thus, greater distance between settlements and discontiguity are associated with lower social capital levels, and vice versa (see the respective 'green' and 'red' cells) [38].

With respect to institutional factors, the number of *homicides* is '*moderately negatively*' associated with social capital in the case of a *large* number, and '*moderately positively'* if the number is *small* (three 'red' and two 'yellow' versus three 'green' and two 'yellow' cells). In Greenland, reciprocity, trust, and social relations either suffer or benefit most from the high or low murder incidence, respectively [39]. However, as the case of Iceland demonstrates, networking and social structures may not produce any significant differences in the case of increased homicides [40].

In the opinion of some researchers, a large number of suicides in such Nordic countries as e.g. Finland signifies low level of personal reliance on governmental institutions and social struc-

[35] Jacobs-Crisioni C., Koomen E. Population Growth, Accessibility Spillovers and Persistent Borders: Historical Growth in West-European Municipalities, *Journal of Transport Geography*, 2017, 62 (1), pp. 80-91.
[36] Abascal M. Us & Them: Black-white Relations in the Wake of Hispanic Population Growth'. *American Sociological Review*, 2015, 80 (4), p. 791.
[37] Kang L., Jiang Q., Tan C. Remarkable Advocates: An investigation of Geographic Distance and Social Capital for Crowdfunding'. *Information and Management*, 2017, 54 (3), pp. 336-348.
[38] Bogino-Larrambebere M. Non-Motherhood: Between Distance and Reciprocity in Kinship Relationship. *Quaderns de l'Institut Catala d'Antropologia*, 2016, 21 (2), pp. 60-76.
[39] Christensen M. et al. Homicide in Greenland 1985-2010. *Forensic Science, Medicine, Pathology*, 2016, 12/1, pp. 40-49.
[40] Baumer E., Wright R., Gunnlaugsson H. Crime, Shame, and Recidivism. *The British Journal of Criminology*, 2002, 42 (1), pp. 40-59.

tures, and low level of trust and reciprocity [41]. Others, however, fail to prove that low suicide rate has a significantly positive impact on networking and solidification of social structures, while proving this for the high suicide rate [42]. Thus, while being associated with an *absolutely negative effect on social capital* in the case of a *high number* (five 'red' cells), a *low number of suicides* is '*moderately positive'* for social capital stock (three 'green' and two 'yellow' cells).

Analysing alcohol traits in nine different countries, Nelson and McNall conclude that both extremely high and low alcohol consumption prevent social structures from being formed, trust from being solidified, and networks from being established [43]. Moderate alcohol consumption, in their opinion, however, fosters all these parameters. Similarly, a case study of US schools demonstrates that relations and reciprocity are strengthened with moderate alcohol consumption, weakening with extremely high and low consumption [44]. Thus, *extremely high and low alcohol indicators* are associated with *low social capital*, whereas *medium* ones with *high social capital*.

Finally, studying the nomadic culture of the Bajo people in the Philippines, Highfield demonstrates that migratory cultural traits generally prevent social relations from being established and developed [45]. In the opinion of the author, these features also hamper networking and reciprocity. However, absence of migratory traits may not always foster trust-building and the development of social structures. Thus, the presence of *nomadic traits in a culture* is *'significantly' negatively* associated with *social capital* (five 'red' cells), whereas *absence* of them is '*moderately positively'* affiliated with it (three 'green' and two 'yellow' cells).

As demonstrated, all five social capital components are differently influenced by each specific geographical, institutional, and cultural factor. Specifically, depending on the magnitude of these factors, the effect on each is either '*significantly* positive/negative' (all the cells are 'green'/'red') or '*moderately* positive/negative' (most cells are 'green'/'red'). Integrating and presenting the all in a single matrix not only bridged the mentioned conceptual and literature gap, but also met the *research objective* of examining how specific factors effect particular social capital components, providing an effective analytical tool to be deployed in this research (see *Part III*).

Methodology, analysis, and limitations

The research *method* of the current study presupposes the use of the *'social capital matrix'* (see *Part II.2.C*) comparing six forms of indicators in both countries – i.e. with two for each of the

[41] Titelman D. et al. Suicide Mortality Trends in the Nordic Countries 1980-2009. *Nordic Journal of Psychiatry*, 2013, 67 (6), pp. 414-423.
[42] Bae J. et al. Current Interventions, Strategies, And Networking Of Adolescent Suicide. *Journal of Korean Medical Association*, 2013, 56 (2), pp. 100-110.
[43] Nelson J., McNall A. Alcohol Prices, Taxes, and Alcohol-Related Harms: a Critical Review of Natural Experiments in Alcohol Policy for Nine Countries. *Healthy Policy*, 2016, 120 (3), pp. 264–272.
[44] Long E., Barrett T., Lockart G. Network-Behaviour Dynamics of Adolescent Friendships, Alcohol Use, and Physical Activity. *Health Psychology*, 2017, 36 (6), pp. 577–586.
[45] Highfield R. Marine Nomad. *New Scientist*, 2011, 211 (2820), pp. 24–25.

integrated frameworks: the geography, institutions, and culture hypotheses. Here, population growth, homicide, suicide, and alcohol consumption rates are the quantitative indicators used, whereas connectivity/discontiguity and nomadic/semi-nomadic cultural traits represent the qualitative ones. The major sources of quantitative information for the research are national statistical databases – *Statistics Iceland* for Iceland and *Statistics Greenland* with its subdivision *Statbank Greenland* for Greenland – and the datasets of international organisations – the World Bank, Organisation for Economic Cooperation and Development (OECD), and United Nations Office on Drugs and Crime (UNODC). Similarly, the qualitative data are obtained primarily from the reports of international intergovernmental forums and national and regional scientific bodies: the Arctic Council, Circumarctic Ragnifer Monitoring and Assessment Network (CARMA), Iceland Road and Coastal Administration (IRCA). Finally, the analysis of both types of data is augmented with in-depth studies of specific topics conducted by such researchers as Aage[46] and Mortensen[47].

As discussed, the six qualitative and quantitative proxy indicators are analysed against the 'social capital matrix'. There, depending on the level or presence of specific factors, their general influence on social capital is determined. For instance, in the case where Greenland appears to have a high suicide rate, the general impact of this factor will be defined as '*significantly negative*' (see the right-hand column of *Table 2*). Similarly, if Iceland's population growth is high, the overall estimated effect on the country's social capital is '*moderately positive'*.

Having obtained all the results, the paper summarises them, identifying the expected level of social capital in Iceland and Greenland by the prevailing type of effect on social capital stock – i.e. greater number of either 'moderate' or 'significant' impacts for the country. For example, if the number of 'moderately positive' effects in Iceland exceeds the number of 'significantly positive', the country's final estimated social capital level will be 'moderately high'. Alternatively, if the indicators demonstrating 'significantly negative' impact on Greenland's social capital outnumber those with 'moderately negative' effect, the overall social capital level will be estimated as 'significantly low'.

Although the matrix demonstration facilitates analysis of the expected social capital levels in Greenland and Iceland, it is based on a specifically-tailored definition of social capital and its respective components (see *Part V.1.B*). This potential definitional bias adds to the limitations imposed by the study timeframe. Here, further research should increase the reliability of its results over time. Finally, and most importantly, while revealing indirect links between the geographical, institutional, and cultural indicators and social capital stock, the analysis and framework per se do not demonstrate causality or correlation between the proxy indicators and the ultimate social capital level. This is the case because of the non-statistical nature of the study, owing primarily to

[46] Aage H. Alcohol in Greenland 1951-2010: Consumption, Mortality, Prices. *International Journal of Circumpolar Health*, 2012, 71 (1), p. 2.
[47] Mortensen B. Exploiting Hydropower in Greenland: Climate, Security of Supply, Environmental Risks and Energy-Intensive Industries. *The Yearbook of Polar Law*, 2015, 6 (1), pp. 36-62.

time constraints. Statistical analysis conducted in further research could thus potentially augment the significance of the current paper and its approach.

Findings and analysis

Geography. As described in Parts II and III, this section demonstrates the findings regarding proxy indicators of social capital related to the 'tripod' concept. By doing this, it meets the research objective of measuring their current magnitude. Section IV.1, specifically, focuses on the two features related to the geographical conditions: population growth and distance/discontiguity between settlements. Having demonstrated the difference between the two countries, this section elaborates potential prerequisites for such divergence. The paper then analyses their presumed impact on overall social capital levels in Iceland and Greenland.

Population growth. For the past three decades, Iceland has exhibited a relatively steady population growth rate, whereas Greenland's has fluctuated only slightly, not showing extreme dynamics[48]. Within the studied period, however, despite the overall difference in general trend in favour of Iceland, this country's population experienced a dramatic decline in 2008-2009, coinciding with relative Greenlandic growth (see *Fig. 3*). Such decline in Iceland's population growth could be explained as a result of the global financial crisis and 'collapse of the Icelandic banking system in 2008'[49]. Specifically, this dramatic effect on the country's economy and society could owe to the high degree of the internationalisation of the Icelandic economy. Additionally, Sigujonsson and Mixa note banking to be 'among the structural factors' within Icelandic society, highlighting its significant economic contribution[50].

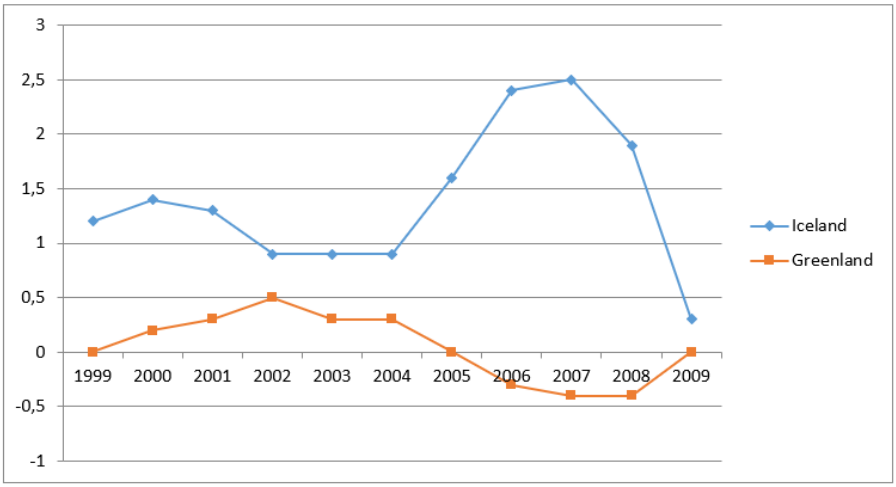

Fig. 3. Population growth rate in Iceland and Greenland (1999–2009).

[48] World Bank. Population Growth (annual %). URL: http://data.worldbank.org/indicator/SP.POP.GROW (accessed 17 December 2019).
[49] Ingimundarson. A Crisis of Affluence: The Politics of an Economic Breakdown in Iceland. *Irish Studies in International Affairs*, 2010, 21 (1), p. 57.
[50] Sigujonsson T., Mixa M. Learning from the 'Worst Behaved': Iceland's Financial Crisis and the Nordic Comparison. *Thunderbird International Business Review*, 2011, 53 (2), p. 222.

Indeed, even in 2016 — eight years after the crisis — the Central Bank of Iceland, assumed the level of the banking sector in the entire economy to be close to 13 percent [51]. Thus, 'when the Icelandic banking system collapsed in October 2008, it spelled the end of a six-year economic boom'[52]. The population decline of 2008-2009 is thus mostly assumed to be the result of this economic turmoil rather than a specific social policy.

At the same time, as the cases of Finland, Iceland, and Greece show, most indicators of population health and growth in all three countries 'continued improving after the Great Recession started' [53]. In Greenland, however, despite some temporary shifts towards slow population growth, the situation never changed dramatically. One of the most important factors influencing this was that 'infant mortality rates remain[ed] high as compared with those among populations in the neighbouring regions' [54]. Here, it means that Greenlandic population cannot increase due to the almost unchanging number of people of reproductive age. In this respect, the economic factors happen to be of secondary importance. Thus, the short-term population increases, are fostered by professional migration, as 'lacking a skilled workforce in Greenland, the government invited professionals from Denmark to contribute to the modernization process' [55].

That Greenland experienced some population growth despite the global financial crisis, in turn, could be explained through low international exposure of the country's economy, in general, and slow development of its financial sector, in particular. Indeed, according to the Naalakkersuisut, all services (including banking) constitute just below ten percent of Greenlandic economy [56]. The effect of any financial turmoil in principle is therefore unlikely to affect the country's population.

In summary, the population growth rate patterns between 1999 and 2009 confirm the general population dynamics in both countries. Specifically, population in Iceland keeps *growing*, while Greenland is relatively stable, with periods of *very slow growth and decline* changing each other. Using the 'social capital matrix', it could thus be assumed that extremely low population growth rate in *Greenland* and high population growth rate in *Iceland* signify '*moderately' low* social capital stock in the former (three 'red' cells and two 'yellow' cells in *Table 2*) and '*moderately' high* stock in the latter (three 'green' and two 'yellow' cells in *Table 2*).

Distance between settlements, discontiguity and communication. Greenland's unique geographical conditions with natural barriers in the form of fjords, mountains, and most of the terri-

[51] Central Bank of Iceland. Economy of Iceland. URL: https://www.cb.is/library/Skraarsafn---EN/Economy-of-Iceland/2016/ Economy_of_Iceland_2016.pdf (accessed 19 December 2019).
[52] Ingimundarson. A crisis of affluence: The politics of an economic breakdown in Iceland. *Irish Studies in International Affairs*, 2010, 21 (1), p. 60.
[53] Tapia-Granados J., Rodriguez J. Health, Economic Crisis, and Austerity: a Comparison of Greece, Finland, and Iceland. *Health Policy*, 2015, 119 (7), p. 941.
[54] Friborg J. et al. A Population-Based Registry Study of Infant Mortality in the Arctic: Greenland and Denmark, 1973-1997. *American Journal of Public Health*, 2004, 94 (3), p. 452.
[55] Hamilton L., Rasmussen R. Population, Sex Ratios and Development in Greenland. *Arctic*, 2010, 63 (1), p. 49.
[56] Naalakkersuisut. Economy and Industry in Greenland. URL: http://naalakkersuisut.gl/en/About-government-of-greenland/About-Greenland/Economy-and-Industry-in-Greenland (accessed 19 January 2020).

tory covered with ice limit transportation to boats and dog sleds, completely excluding railways and roads between towns [3, Gad U.]. Developing infrastructure 'in such a discontiguous structure would necessitate vast capital expenditure and enormous technical difficulties' [40, Carruth S., p. 71]. As a result, urban and regional infrastructure development there represents the 'repetition of many small infrastructures rather than a continuous, extendable armature' [ibid, p. 68]. Due to the almost complete impossibility of reaching most of the destinations by land, then, connectivity between the settlements is low and endangered in adverse weather.

Apart from discontiguity and consequently low connectivity, distance between Greenlandic settlements dramatically affects communication as, in most cases, it is greater than in other countries. Indeed, some of the smaller settlements have accessibility radii of 50 km, while the bigger ones could be reached only by travelling some 100-150 km (see *Fig. 4*):

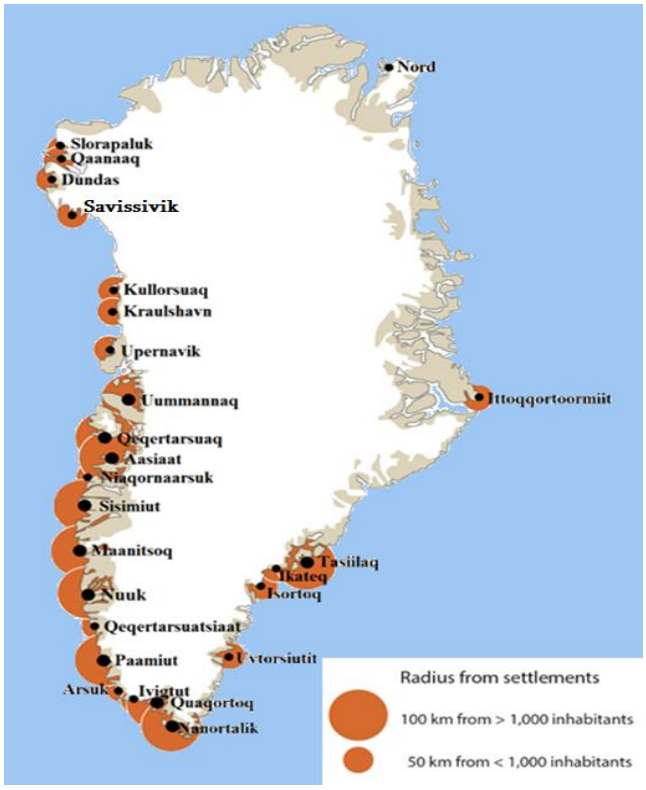

Fig. 4. Greenland's main settlements and approximate distance between them [57].

As seen, although water transport can facilitate movement between Greenlandic settlements, the distance between them is still considerable. In addition, natural factors such as icebergs may also hamper transportation along the coast, pushing the vessels towards the sea, thereby increasing 'the risk of being caught in bad weather' [58]. Discontiguity and long distance thus both inhibit Greenlandic communication.

In the opinion of Kristjansdottir [1, Kristjansdottir H.], Iceland, in contrast, represents a country with quite similar natural challenges (e.g. fjords and mountains), but milder climatic con-

[57] Arctic Council. Arctic Biodiversity Assessment: Status and trends in Arctic biodiversity. URL: http://arcticlcc.org/ assets/resources/ABA2013Science.pdf (accessed 16 July 2017).
[58] Hamilton L., Rasmussen R. Population, Sex Ratios and Development in Greenland. *Arctic*, 2010, vol. 63, no. 1, p. 49.

ditions: leaving most of the territory in the subarctic zone, the Arctic Circle only passes through the Island of Grimsey. With about ten percent of the terrain covered with glaciers, the country's technical and engineering problems related to infrastructure construction are assumed by the researcher not to be of the same magnitude as those of Greenland. On the other hand, 'a challenging terrain, and unpredictable weather has made road infrastructure improvements a key component in regional development strategies'[59]. Given the complete absence of railroads, the country possesses an *extensive road network* substantially supported by governmental investments[60]. Hence, currently, most Icelandic settlements are linked by either primary or local access roads, significantly *increasing connectivity* between the cities, towns, and villages (see *Fig.5*):

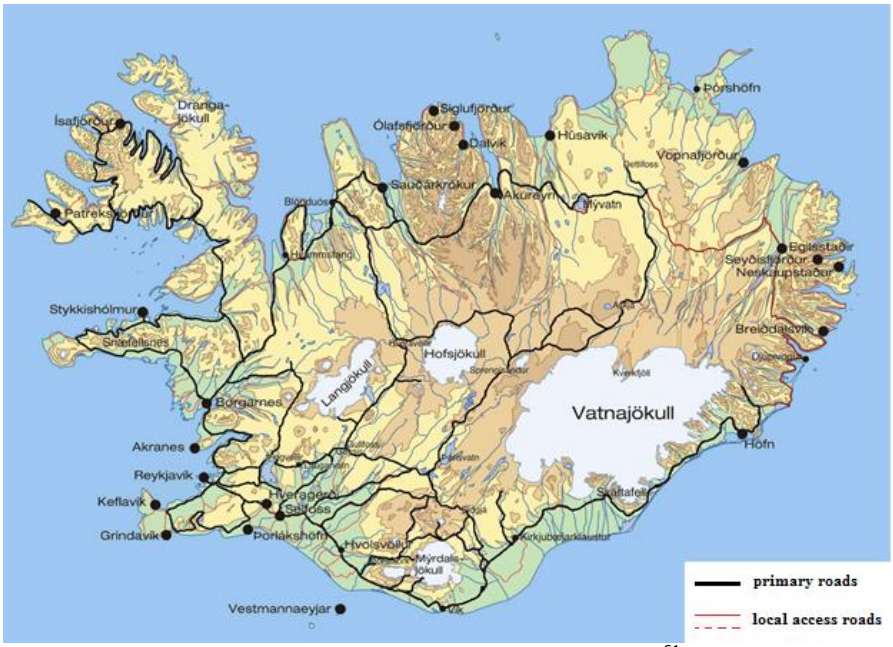

Fig. 5. Iceland's main settlements and roads [61].

Apart from low discontiguity, the greatest distance between two separate settlements in Iceland is 922 km (between Ísafjörður and Höfn), with the average being about 300 km. Although the second set of numbers looks similar to the ones in Greenland, the main difference is that, due to the well-developed road network, most towns and villages could be reached within a few hours, with lower risk associated with potentially adverse weather conditions. In contrast, the biggest distances between settlements in Greenland are measured in thousands of kilometres, with almost no available transportation. Connectivity between Icelandic settlements is thus far better than in Greenland, ultimately improving communication between citizens.

To summarise, the official data confirm the assumption that the complicated geographical pattern of Greenland increases discontiguity of its landscape, creating greater challenges for its transportation and infrastructural development, exacerbated by extremely large distances be-

[59] Bjarnason T. The Effects of Road Infrastructure Improvement on Work Travel in Northern Iceland. *Journal of Transport Geography*, 2014, 41 (1), 2014, p. 229.
[60] Karlsson V. Interregional Migration and Transportation Improvements in Iceland. *International Regional Science Review*, 2015, 38 (3), pp. 292-315.
[61] IRCA. The Road System. URL: http://www.road.is/vefur2.nsf/Files/RoadSystem2017/$file/vegakerfid2017-enska.pdf (дата обращения 16.01.2020).

tween settlements and lack of infrastructure. In contrast, multiple roads, smaller distances, and less discontiguous terrain in Iceland significantly improve connectivity in that country. Thus, viewing these indicators through the social capital matrix would demonstrate that, applicably to *Greenland*, they have a '*significantly negative*' influence on *social capital* (five 'red' cells in *Table 2*), whereas, in the case of *Iceland*, they demonstrate a '*significantly positive*' one (five 'green' cells in *Table 2*).

Institutions. As in the previous section, this one views two quantitative indicators of the success of governmental institutions in Iceland and Greenland: homicide rate and suicide rate. In addition to the graphical representation of the statistical data, this part explains potential disparity causes. Finally, the implications of this divergence on Iceland and Greenland's social capital are provided.

Homicide rate. Regarding the homicide rate, Iceland's situation differs dramatically from that of Greenland, boasting one of the planet's lowest crime rates – stemming from 'communitarian social organization, a reliance on shaming, plus a healthy dose of social exclusion that reinforces both the strength of communitarian ties and the effect of shaming'[62]. In practice this appears to positively affect the homicide incidence: according to the UNODC, the number of homicides per 100,000 inhabitants within the researched decade was extremely low, with 2003, 2006, and 2008 registering no cases [63].

Greenland's overall criminal statistics, in contrast, are notorious, demonstrating one of the highest murder rates globally. Indeed, despite slight decrease in recent decades, its homicide rate is 'markedly higher compared to… Denmark and northern Europe'[64]. Graphically, juxtaposition of homicide rate statistics within the researched timeframe proves this disparity (see *Fig. 6*):

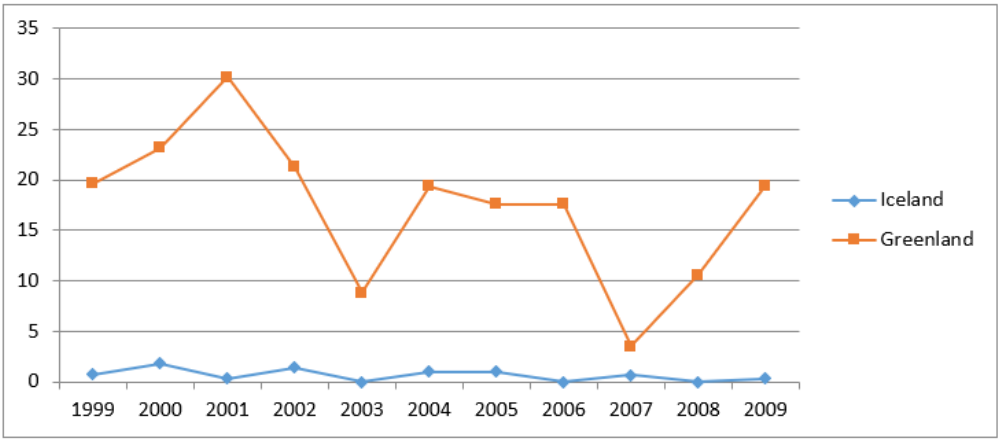

Fig. 6. Homicides per 100,000 inhabitants in Iceland and Greenland (1999–2009) [65].

Here, although there were some decreases in the number of homicides in Greenland in 2003 and 2007, the general pattern of the country's murder rate is markedly different from that of

[62] Baumer E., Wright R., Gunnlaugsson H. Crime, Shame, and Recidivism. *The British Journal of Criminology*, 2002, 42 (1), pp. 54.
[63] UNODC. Homicide Counts and Rates. URL: https://data.unodc.org/#state:0 (accessed 06 February 2020).
[64] Christensen M. et al. Homicide in Greenland 1985-2010. *Forensic Science, Medicine, and Pathology*, 2016, 12/1,p.40.
[65] Ibid.

Iceland. Such difference could potentially be explained by specifics of Greenland's law enforcement system, making the country 'the only place in the world where one does not punish people for anything'[66]. In this sense, 'there is no penal code, only a criminal code', and 'there are no prisons, only institutions', so that the system presupposes that perpetrators 'are "helped" rather than punished' [67]. Hence, this perception of the penitentiary system is an exception, rather than the rule.

In Iceland, in contrast, 'prison or punishment has never been seen as care, welfare or treatment' [68]. In this sense, Iceland's five prisons resemble those in other Nordic countries. However, being guided by the idea that 'small institutions function better in many aspects than large ones', all the penitentiary institutions in the country are very small (up to 87 prisoners), with the total number of places being 138 for the whole island [69].

Although Lappi-Seppälä claims the biggest achievement of prison reforms in most of the Nordic countries to be 'fewer offenders under supervised control, lower levels of fear and punitive demands, less serious violence, and fewer property offenses', homicide statistics generally demonstrate insignificant success of these policies in Greenland [70]. Iceland, however, could be taken as an example of effective undertakings in this respect. Since, according to Baumer et al, homicide indicators mostly relate to institutional factors and well-functioning national social programmes, the current trends are assumed to last for the foreseeable future, unless dramatic reforms change the law enforcement systems in both countries [71]. As, in the social capital matrix, a high number of murders is considered '*moderately negative*' for the *social capital* stock, *Greenland*'s level of social capital is *low* (three 'red' and two 'yellow' cells in *Table 2*). However, *Iceland*'s social capital stock should thus be *high* because of the low homicide rate, considered to '*moderately positively*' impact this feature (three 'green' and two 'yellow' cells in *Table 2*).

Suicide rate. As with homicides, the two countries' suicide patterns differ. In particular, Greenland's suicide rate appears to be one of the highest in the world, with the incidence dramatically increasing among the Inuit. This is particularly alarming, as they form the core of Greenlandic society[72]. Specifically, suicides are a major public health problem in the countryside. That is why

[66] Lauritsen A. Greenland's Open Institution – Imprisonment in a Land without Prisons. *Journal of Scandinavian Studies in Criminology and Crime Prevention*, 2012, 13 (1), p. 47.
[67] ibid, p. 48.
[68] Baldursson E. Prisoners, Prisons and Punishment in Small Societies'. *Journal of Scandinavian Studies in Criminology and Crime Prevention*, 2000, 1 (9), p. 9.
[69] ibid, p. 7.
[70] Lappi-Seppälä T. Penal Policies in the Nordic Countries 1960-2010. *Journal of Scandinavian Studies in Criminology and Crime Prevention*, 2012, 13 (1), pp. 85.
[71] Baumer E., Wright R., Gunnlaugsson H. Crime, Shame, and Recidivism. *The British Journal of Criminology*, 2002, 42 (1), pp. 40-59.
[72] Statistics Greenland. Greenland in figures 2018. URL: http://www.stat.gl/publ/en/GF/2017/pdf/Greenland%20in%20Figures%202017.pdf (accessed 21 August 2019).

researchers draw a parallel between such a special geographically-driven suicide pattern and its instigators[73].

Geographically, most traditional Greenlandic communities happen to be located in small settlements rather than bigger towns, potentially explaining the geographical disparity between the suicide rate increase in urban areas and the countryside [74]. Indeed, in the opinion of the researchers, since modernisation of Greenland began in the 1950s, most of the indigenous communities were affected by the transition from traditional subsistence activities (mostly hunting) to the employment-based market economy. In this respect, in the comparative case study of the indigenous population of Alaska and Greenland, Bjerregaard and Larsen demonstrate that in both countries significantly higher suicide rates are registered among the unemployed population which traditionally engage in subsistence hunting and fishing [75]. Thus, in the opinion of the researchers, such a dramatic shift towards modernisation could spur suicidal thoughts among the indigenous population, which is not adapting well to the conditions of the modern world.

In Iceland, given the total absence of indigenous communities, the situation is more promising. In particular, during the period 1980–2009, 'Iceland had the lowest suicide rates for all ages' in the Nordic countries [76]. Although this group of states is usually considered to be at high suicide risk, in the global list of countries by suicides, Iceland takes a medium position, with an average number of suicides per 100,000 inhabitants [77]. In the opinion of Lester, this owes primarily to the 1980s alcohol laws, allowing the consumption of strong beer. Following the argument of the author, authorized procurement of medium-strong alcohols rather than spirits provided adequate psychological relaxation for the Icelandic population [78].

In Greenland, after the absolute consumption peak in the 1970–1980s, similar alcohol-related law reforms were introduced, leading to a significant decrease in pure alcohol consumption [79]. However, this indicator remains higher than in many Nordic countries, and is mostly associated with heavy rather than social drinking [80]. According to Bjerregaard and Lynge, such disparity is an important contributor to an increased likelihood of suicide [81]. Indeed, comparing the suicide rates in Greenland and Iceland gives the following picture (see *Fig. 7*):

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[73] Bjerregaard P., Lynge I. Suicide: A Challenge in Modern Greenland. *Archives of Suicide Research*, 2006, 10 (2), c. 209-220.
[74] ibid.
[75] Bjerregaard P., Larsen C. Time Trend by Region of Suicides and Suicidal thoughts Among Greenland Inuit. *International Journal of Circumpolar Health*, 2015, 74 (1), pp. 1-8.
[76] Titelman D. et al. Suicide Mortality Trends in the Nordic Countries 1980-2009. *Nordic Journal of Psychiatry*, 2013, 67 (6), pp. 418.
[77] OECD. Suicides. URL: https://data.oecd.org/healthstat/suicide-rates.htm (accessed 07 March 2020).
[78] Lester D. Effect of Changing Alcohol Laws in Iceland on Suicide Rates. *Psychological Reports*, 1999, 84 (3), pp. 1158-1159.
[79] Bjerregaard P. Development of a Public Health Programme in Greenland. *Scandinavian Journal of Public Health*, 2005, 33 (4), pp. 241–242.
[80] ibid.
[81] Bjerregaard P., Lynge I. Suicide: A Challenge in Modern Greenland. *Archives of Suicide Research*, 2006, 10 (2), pp. 209-220.

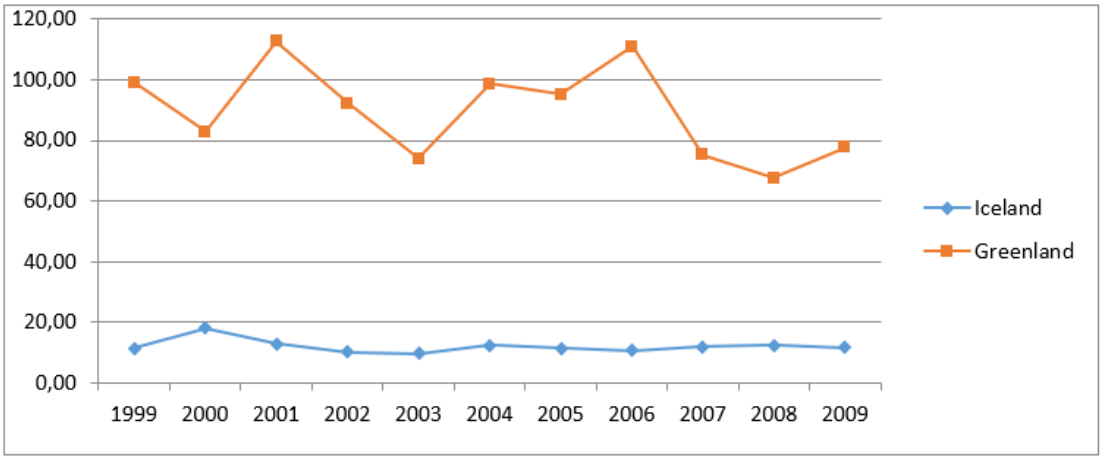

Fig. 7. Suicides per 100,000 inhabitants in Iceland and Greenland (1999–2009) [82].

As seen in *Fig. 7*, within the studied period (1999-2009) *Greenland*'s *suicide rate* appears to be several times *higher* than Iceland's. According to the social capital matrix, such conditions have a marked *negative* influence on the country's *social capital* (five 'red' cells). *Iceland*, in turn, has a relatively low *suicide rate*, which should have a *'moderately positive'* impact on its *social capital stock* (three 'green' and two 'yellow' cells).

Culture. This part focuses on Iceland and Greenland's cultural features, taking alcohol consumption per 100,000 inhabitants and presence of nomadic/semi-nomadic features as key indicators. Apart from graphically demonstrating the difference between the countries, it provides suggestions of their presumable cause. Finally, it reveals how these disparities supposedly create differences in the countries' social capital stock.

Alcohol consumption. Greenland's alcohol consumption is higher than in many Nordic countries. However, the current consumption rate is significantly lower than three decades ago, when it was two times higher than that of Denmark [83]. Such decline can signify the success of an efficient legislative and economic policy introduced by the government and alcohol prices raised far above the Danish ones primarily through taxation. Since in the foreseeable future this fiscal approach of Naalakkersuisut is not expected to change dramatically, Greenlandic alcohol consumption decline will likely continue[84].

Alternatively, in the case of Iceland, alcohol consumption rose slightly since the 1970-1980s, when overall prices for spirits were lowered[85]. The short-term increase, however, almost stabilised in the studied period (see Fig. 8). Although Fig 8. demonstrates a declining trend in Greenland and a rising trend in Iceland, the real effects of these patterns are not comparable, as the Icelandic increase is driven mostly by increasing adolescent alcohol consumption of soft alcohols, not the case

[82] OECD. Suicides. URL: https://data.oecd.org/healthstat/suicide-rates.htm (accessed 07 March 2020).
[83] Aage H. Alcohol in Greenland 1951–2010: Consumption, Mortality, Prices. *International Journal of Circumpolar Health*, 2012, 71 (1), p. 2.
[84] Bjerregaard P. Development of a Public Health Programme in Greenland. *Scandinavian Journal of Public Health*, 2005, 33 (4), pp. 241-242.
[85] Jonsson R., Kristjansson S. Alcohol Policy and Public Opinion in Iceland, 1989-2012. *Nordic Studies on Alcohol and Drugs*, 2013, 30 (6), pp. 539-549.

in Greenland[86]. Greenlandic teenage alcohol abuse is a serious problem, especially concerning the Inuit population. Evidence shows that this is primarily related to the usually lower alcohol tolerance threshold, lower education indicators and high unemployment [87]. Thus, although the average alcohol consumption in Greenland is decreasing due to high taxes, the teenage one is not falling [88].

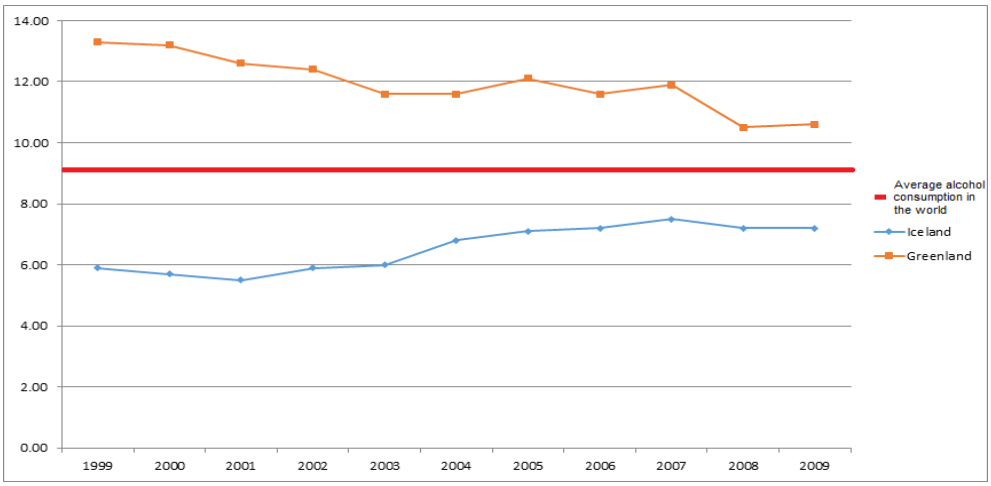

Fig. 8. Alcohol consumption per capita (litres of pure alcohol/year) in Iceland and Greenland (1999–2009) [89].

Avoiding a situation similar to the one in Greenland was one of the drivers for increasing Iceland's legal drinking age from 18 to 20 [90]. In contrast, Greenlanders can purchase beer and cider from age 16, and strong alcohol from 18 [91]. Though both countries' alcohol prices are high, Greenland does not exercise a monopoly approach regarding alcohol sales within the country, as despite a state monopoly on alcohol import by the state-controlled KNI A/S, spirits and beer can be purchased in regular supermarkets [92]. Additionally, large volumes of home-brewed alcohol minimise the effect of extremely high-priced alcohol in shops and bars [93]. Thus, relative alcohol accessibility could explain the contrast between Iceland and Greenland within the same timeframe (see *Fig. 8*).

As described above, Iceland's alcohol industry is orchestrated by ATVR – the state-controlled monopoly that operates the Vínbúð chain – the only specialised stores where strong

[86] Asgeirsdottir T., McGeary K. Alcohol and Labour Supply: The Case of Iceland. *European Journal of Health Economics*, 2009, 10 (4), pp. 455-465.
[87] Aage H. Alcohol in Greenland 1951-2010: Consumption, Mortality, Prices. *International Journal of Circumpolar Health*, 2012, 71 (1), p. 2.
[88] Bjerregaard P. Development of a Public Health Programme in Greenland. *Scandinavian Journal of Public Health*, 2005, 33 (4), c. 241-242.
[89] OECD. Alcohol Consumption. URL: https://data.oecd.org/healthrisk/alcohol-consumption.htm (accessed 08 March 2020).
[90] Ibid.
[91] Aage H. Alcohol in Greenland 1951-2010: Consumption, Mortality, Prices. *International Journal of Circumpolar Health*, 2012, 71 (1), p. 2.
[92] Bjerregaard P. Development of a Public Health Programme in Greenland. *Scandinavian Journal of Public Health*, 2005, 33 (4), pp. 241-242.
[93] Aage H. Alcohol in Greenland 1951-2010: Consumption, Mortality, Prices. *International Journal of Circumpolar Health*, 2012, 71 (1), p. 2.

beverages can be purchased [94]. That is why, although most of the Nordic countries have binge drinking tendencies, Iceland mitigates this by lowering alcohol accessibility [95]. Since, binge drinking still appears to be a big problem in Greenland, this could contribute to the overall alcohol consumption pattern represented in Fig. 8. Thus, analysing this indicator in the countries through the prism of the 'social capital matrix', it could be said that *Greenland* possesses a *low* level of *social capital* associated with *high alcohol consumption* (five 'red' cells). In contrast, *Iceland*, whose *alcohol consumption* approaches the *average* global rate, likely has *high social capital stock* (five 'green' cells).

Nomadic and semi-nomadic traits. Regarding nomadic traits of national culture, Greenland and Iceland represent two different responses to global modernisation. In particular, despite the Danish attempt to make Greenlandic society follow the rules of a market economy and integrate into the employment-based production system, a large proportion of the population still engages in traditional subsistence activities [96]. In the opinion of Gad [3, Gad U.], given the lack of well-developed industries and high unemployment, with some support of fishing, traditional hunting appears to be their natural substitution inherited ancestrally. In this respect, Greenland's lower overall education level could also be considered as an unemployment-fostering factor stimulating further engagement with traditional activities [97].

In addition to the absence of large-scale industries and unemployment, Carruth [40, Carruth S.] highlights discontiguity and small size of most Greenlandic settlements as catalysts for hunting. Indeed, Corcoran et al [20, Corcoran P. et al, p. 106] calling the Inuit culture the 'most pure hunting culture', states that, geographically, non-urban areas predominantly comprise the indigenous population in contrast to e.g. Nuuk, with a large number of Danish expatriates. Indeed, 'when we speak of a traditional settlement in the Greenlandic hunting society, we mean a winter settlement that was occupied from August/September until April/May' [98]. In that sense, a great deal of the populations of small towns have semi-nomadic traits, migrating with or towards the population of their respective hunted animals [99].

Apart from traditional small-scale fishing along the coast of the major settlements, Greenlanders mostly hunt seals, narwhals, Atlantic walruses, and reindeer [100]. The traditional way of hunting entails, then, not only relocation to summer hunting facilities, but also chasing prey for

[94] Arnarsson A., Kristofersson G., Bjarnason T. Adolescent Alcohol and Cannabis Use in Iceland 1995-2015. *Drug and Alcohol Review*, 2017, 1 (1), pp. 1-9.
[95] Osterberg E., Karlsson T. Trends in Alcohol Consumption and Violence in the Nordic Countries 1960-2000. *Contemporary Drug Problems*, 2011, 38 (2), pp. 311-330.
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[100] Hendriksen K., Jørgensen U. Hunting and Fishing Settlements in Upernavik District of Northern Greenland Challenged by Climate, Centralization, and Globalization. *Polar Geography*, 2015, 38 (2), pp. 123-145.

dozens of kilometres along the coast or over the open terrain [20, Corcoran P. et al]. Thus, graphical representation of the summer distribution of key hunted animals gives a general perception of the Inuit population's presumable seasonal migration traits to adjacent settlements (see *Fig. 9*):

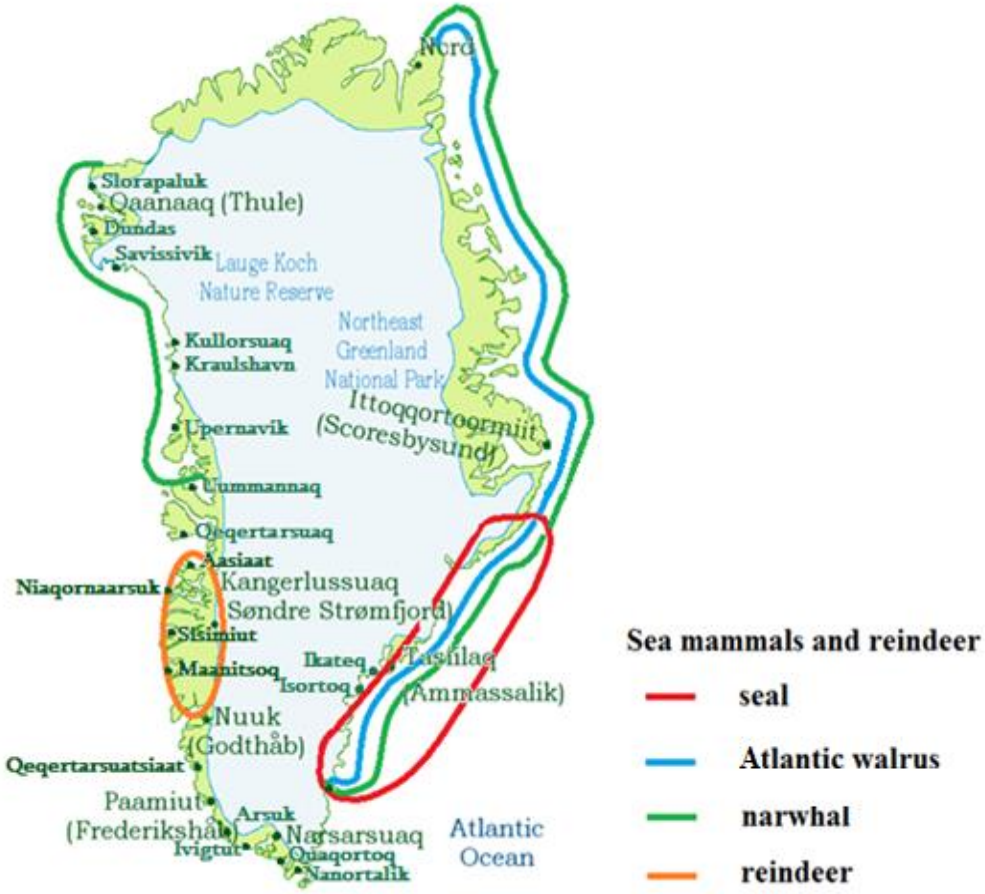

Fig. 9. Main summer distribution of the key hunted marine mammals and reindeer in Greenland (June – August) [101].

Although not all Greenlandic Inuit live seasonal semi-nomadic lives, this traditional cultural feature is still very strong [102]. In contrast to that, Iceland – a country with no indigenous population – represents a successfully modernised society with no significant hunting tradition [103]. Aside from the absence of the traditional subsistence communities, a substantial shift from fishing to aluminium production decreased overall need for seasonal mobility [104]. In particular, increasing employment in remote areas by means of industrial relocation (e.g. aluminium smelter in Reyðarfjörður) with the accompanying infrastructural development (e.g. establishment of such regional universities as, e.g. the University of Akureyri), significantly decreased urban migration

[101] CARMA. Circumpolar Distribution. URL: https://carma.caff.is/carma-interactive-map/circumpolar-distribution (accessed 17 January 2020), WWF. Seals in Greenland. URL: http://awsassets.wwfdk.panda.org/downloads/seals_in_greenland__wwf_report __dec_2013.pdf (accessed 17 March 2020) and WWF. Mapping the Changing Arctic landscape. URL: http://wwfarcticmaps.org/ (accessed 17 March 2020).

[102] Hendriksen K., Jørgensen U. Hunting and Fishing Settlements in Upernavik District of Northern Greenland Challenged by Climate, Centralization, and Globalization. *Polar Geography*, 2015, 38 (2), pp. 123-145.

[103] Witherall R. From Fish to Aluminium: Iceland Turns Attention to Energy Intensive Industries. *Aluminium Today*, 1998, 10 (5), pp. 1-32.

[104] Karlsson V. Interregional Migration and Transportation Improvements in Iceland. *International Regional Science Review*, 2015, 38 (3), pp. 292-315.

within the country [105]. As a result, during the ten-year period 1998–2008, population growth was observed in all the regions with the exception of two sparsely-populated ones in the North-West.

In summary, analysing the situation against the social capital matrix yields the following results. Specifically, substantial strength of the hunting traditions and a semi-nomadic way of living in Greenland has a '*significantly negative*' effect on social capital (five 'red' cells in *Table 2*). On the other hand, absence of indigenous nomads and relatively low migration tendencies in Iceland have a '*moderately positive*' impact on social capital (three 'green' and two 'yellow' cells in *Table 2*). Thus, it could be assumed that *Greenlandic social capital* should be *low*, and *Icelandic*, *high*.

Summary

As demonstrated, Greenland and Iceland have different conditions for developing social capital. In particular, all of Greenland's associated indicators either moderately or strongly affect social capital in a negative manner. In contrast, Iceland's indicators are strongly or moderately affiliated with social capital. However, since the magnitude of the combination of factors is different in each case, the social capital stocks in Greenland and Iceland are diverging (see *Table 3*):

Table 3

Summary of the main indicators of social capital, their nominal effect on it, and its expected overall level in Iceland and Greenland

Factors	Indicators	Country			
		Iceland		Greenland	
		Indicator's level	Nominal effect on social capital	Indicator's level	Nominal effect on social capital
Geography	*Population growth rate*	High	'Moderately positive'	Low	'Moderately negative'
	Distance between settlements and discontiguity	Low distance/ low discontiguity, good connectivity	'Significantly positive'	High distance/ high discontiguity, bad connectivity	'Significantly negative'
Institutions	*Number of homicides*	Small	'Moderately positive'	High	'Moderately negative'
	Number of suicides	Small	'Moderately positive'	High	'Significantly negative'
Culture	*Alcohol consumption per capita*	Moderate	'Significantly positive'	High	'Significantly negative'
	Nomadic/ semi-nomadic traits	No	'Moderately positive'	Yes	'Significantly negative'
Expected overall level of social capital		'Moderately' high		'Significantly' low	

Here, Iceland's expected level of social capital is 'moderately high' due to the greater presence of specific factors having a 'moderately positive' effect on its stock – i.e. high population growth rate, small number of homicides/suicides, and absence of nomadic cultural traits. On the other hand, the predicted overall social capital level in Greenland is 'significantly low' due to the prevalence of the indicators having 'strongly negative' effect on it: the country is characterised by large distances between its settlements, accompanied by bad connectivity and high discontiguity. Additionally, with a significant proportion of its population following a semi-nomadic lifestyle,

[105] Bjarnason T., Edvardsson I. University Pathways of Urban and Rural Migration in Iceland. *Journal of Rural Studies*, 2017, 54 (1), pp. 244-254.

Greenland experiences high alcohol consumption and suicide incidence. Thus, although Iceland's presumed social capital level is not extremely positive, it potentially provides a better background for developing renewables than Greenland, where estimated social capital is negative at its utmost.

As demonstrated, the *findings* generally *support the research hypothesis*, linking higher estimated Icelandic social capital stock with the country's advanced renewable energy development, and connecting the predicted lower level of social capital to the inhibition of Greenlandic green power progress. The research *aim* is thus achieved, with the supporting evidence explaining the countries' diverging energy patterns in the face of geographical, cultural, and economic similarities. However, the paper's non-statistical nature leaves the findings their demonstrative role, rather than proving direct causation correlation between the 'tripod' components and social capital level. Thus, further research should be augmented with statistical analysis.

Apart from analysing the energy industry's current situation, the 'tripod' concept could be used for planning scenarios of future renewable energy development. For instance, Greenland's currently decreasing alcohol consumption and rising population could potentially be augmented by governmental reform of law enforcement and other governmental institutions, aiming to lower suicide and homicide rates [106]. Additionally, with the increased urbanisation and infrastructural development arising from technological advances and overall climatic tendencies (thawing glaciers), the interconnections between the communities would be strengthened [107]. As the 'social capital tripod' shows, if such significant processes take place, all three pillars (geographical, institutional, and cultural) will be strengthened, leading to increased social capital stock and creating favourable conditions for implementation of renewable energy initiatives.

Reconciliation of the main frameworks explaining overall economic growth and renewable energy development (i.e. the geographical, institutional, and cultural hypotheses) appears to be one of the main benefits of the 'social capital tripod'. Although the idea of a similar amalgamation of the geography and institutions hypotheses was represented before and the concepts of binding culture to geography and institutions to culture were further supported, none of the approaches united all three. Here, the current approach integrates the key ideas of each, allowing for the augmentation of their main advantages, rather than contrasting their key deficiencies. This unified approach bridges the literature gap while explaining and predicting renewable energy scenarios.

Another advantage of applying the 'tripod' is its relative simplicity of measuring its indicators. Specifically, as seen, all the data obtained for analysis are of secondary nature – i.e. no primary data gathering took place. Although this may be regarded as a potential shortcoming, obtaining primary information by means of interviews and surveys is also associated with time shortages, sample size and interviewee biases. Indeed, measuring social capital by interviewing focus-groups on their trust towards their neighbours or their government, etc. – i.e. some of the most common

[106] Frantzsen E. Indefinitely Sentenced to Denmark – The Return to Greenland. *Journal of Scandinavian Studies in Criminology and Crime Prevention*, 2012, 13 (1), pp. 57-68.
[107] Hendriksen K., Jørgensen U. Hunting and Fishing Settlements in Upernavik District of Northern Greenland Challenged by Climate, Centralization, and Globalization. *Polar Geography*, 2015, 38 (2), pp. 123-145.

ways to evaluate social capital – may potentially be negatively perceived by the participants. This, in turn, will either distort the information or reduce the sample size so that the results could not be applied to the whole region or country: using secondary data avoids these disadvantages.

Although the 'tripod', in general, and the 'social capital matrix', in particular, make it easier to estimate expected levels of social capital in a country by means of viewing specific geographical, institutional, and cultural features and tendencies, this approach may potentially be criticised as too generic. Even if the 'social capital matrix' demonstrates that the presumable effect of each factor on social capital has its special magnitude (e.g. population growth has 'moderate' impact, whereas discontiguity has 'significant' one), the exact level of social capital in a country or region cannot be measured by this tool. Although potentially useful for strategic planning, then, its applicability for the numerical risk and cost and benefit analyses in its current form are limited.

To address this shortcoming, many researchers suggest utilisation of a universal social capital index rather than a broad holistic matrix. However, although some scholars introduced a nation-wide survey-based social capital index for each territorial unit, the variables used (e.g. political participation, group membership, voter turnout, etc.) were heavily criticised for not being applicable to all countries (e.g. China, where low political participation is still associated with generally high social capital). This ambiguity concerning the social capital measurement could owe primarily to its uncertain definition. Thus, although this study attempted to produce an integrated definition of this notion by incorporating the key features mentioned by the six most cited researchers of the issue, insights from other authors could highlight alternative traits. In this sense, the method implemented to generate the definition of social capital is personally biased.

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