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

© 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.*

Discussion

In spite of the fact that the demonstrated advantages of the 'social capital tripod' could make it a useful tool for analysing current energy strategies and potential future renewable energy prospects, the concept was shown to possess significant limitations. That is why, this part demonstrates an alternative approach, potentially equally capable of explaining Greenland and Iceland's energy situation. Additionally, it identifies further research direction for potential improvement of the 'tripod'.

Alternative explanation: 'Resource curse' and industry specifics.

Although the concept presented above may potentially be utilised for analysing current and predicting future energy trends, alternative theoretical approaches could contribute to understanding the renewable power status quo in Iceland and Greenland. For instance, the 'resource curse' framework suggested by Auty [41, Auty R., p. 1] demonstrates that 'resource-rich countries fail to benefit from a favourable endowment' actually performing 'worse than less well-endowed countries'. Extending this theory Sovacool et al [42, Sovacool B. et al, p 180] assume that 'countries with an abundance of minerals or hydrocarbons can exhibit… deteriorating environmental

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quality'. Adding to this tenet, in her case study of Europe's energy industries, Menegaki [43, Menegaki A] demonstrates that the 'resource curse' is not associated with renewable energy sources, while the relationship between the development of extractive industries and inhibited economic growth still remains strong. Thus, in the opinion of Mansson [44, Mansson, p. 1], 'resource curse'-prone countries are less likely to develop renewable energy, as 'renewable resources… are more difficult to control', and nations rich in minerals and hydrocarbons are more likely to be affected by rent-seeking and authoritarianism.

Although authoritarianism is not characteristic of Denmark, according to Paldam [45, Paldam M.], rent-seeking is a unique feature of the Greenlandic model, which owes primarily to the annual financial grant from Denmark and extractive industry. Thus, the country is succumbing to the 'resource curse', as mineral mining and oil production are encouraged, even assumed by the Naalakkersuisut to form the basis of the nation's future economy [1]. In this respect, production industries are currently not prioritised [2]. Since, according to Liu and Ang [46, Liu N. and Ang B.], in most cases extractive sectors are significantly less energy-intensive than production ones, focusing on minerals and oil does not give Greenland sufficient incentive to develop its energy industry. Combined with the 'resource curse', this hampers impetus for renewable energy progress. Graphical illustration of these tenets could be accomplished through identification of current renewable energy projects and representation of mineral exploration and exploitation areas (see Fig. 10).

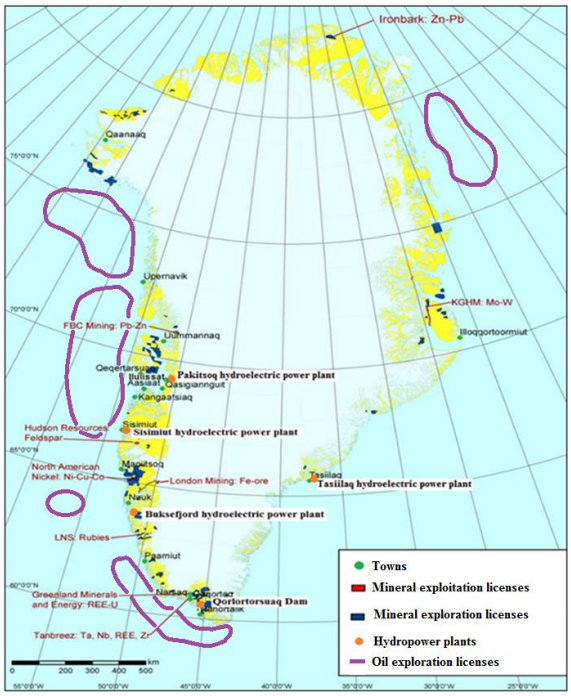

Fig. 10. Mineral exploration and exploitation licences and hydroelectric power plants in Greenland [3].

[1] IIED. Energy and minerals in Greenland. URL: http://pubs.iied.org/pdfs/16561IIED.pdf (accessed 19 January 2020).
[2] 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).
[3] Author's adaptation from GEUS. Greenland geological data. URL: http://data.geus.dk/map2/geogreen/#Z=5&N=7778710&E=980648 (accessed: 21 February 2020) and Mortensen B.O.G. Exploiting hydropower in Green-

As shown, only three of five currently existing hydroelectric power plants are located close to oil/mineral exploration areas (Buksefjord, Sisimiut, and Qorlortorsuaq). This is likely to signify that their purpose is to provide electricity to local settlements rather than exploration industries [4]. Although they cover Greenland's biggest towns, about 20,000 people in the country still lack stable renewable electricity supplies and most of the electricity for all sectors of Greenland's economy (fishing and mining) is thus produced from imported fossil fuels [5].

In contrast to Greenland, according to Kristjansdottir [1, Kristjansdottir H.], Iceland has no significant extractive industrial prospects. Alternatively, in the opinion of the author, modernisation of the country after WWII by means of building the aluminium production industry created additional need for stable energy supplies. Since aluminium smelting is extremely energy-intensive, these industry development plans could be viewed as some of the greatest instigators for the large-scale utilisation of Icelandic hydropower potential [6]. Indeed, in 2015, about 65 percent of the total electricity produced in the country was consumed by currently-operating smelters [7]. In this respect, Kárahnjukar and Andakílsárvirkjun hydropower plants could be mentioned as built specifically in the vicinity of the Fjarðaál and Grundartangi aluminium smelting plants for the consequent energy supplies [8]. Here, according to Kristjansdottir [1, Kristjansdottir H.], the Kárahnjukar power plant appears the country's biggest energy-production project, located closest to its nation's biggest industrial energy consumer — the Fjarðaál aluminium smelter.

As seen, large-scale renewable energy production in Iceland was greatly associated with industrial modernisation and shift towards aluminium smelting. As a result, in 2015 the country covered 87 percent of its total energy demand with locally-produced green electricity and heat, leaving only 13 percent to imported petrol and diesel for transportation purposes [9]. In this sense, absence of any extractive activities with the accompanying success of developing renewable energy sources in Iceland greatly contrasts with mineral-exploiting Greenland importing most of its energy, providing significant support to the 'resource curse' theory.

On the other hand, mineral and hydrocarbon endowments — i.e. the core of the 'resource curse' theory — are assumed by Auty [41, Auty R.] to be an integral part of any nation's geographical conditions, leading to greater probability of resource-rich countries to experience this problem. Orihuela [47, Orihuela J.], in turn, mentions weak governmental institutions among factors contributing to the adverse effect of favourable geographical conditions. Following the argument of Al

land: Climate, security of supply, environmental risks and energy-intensive industries. *The Yearbook of Polar Law*, 2015, 6 (1), pp. 36-62.

[4] Bawa H. Clean sustainable energy for Greenland. *Circle*, 2015, 3 (1), pp. 22-23.

[5] ibid.

[6] Witherall R. From fish to aluminium: Iceland turns attention to energy intensive industries. *Aluminium Today*, 1998, vol. 10, iss. 5, pp. 1-32.

[7] ibid.

[8] Skulason J.B. & Hayter R. Industrial location as a bargain: Iceland and the aluminium multinationals 1962-1992. *Human Geography*, 1998, 80 (1), pp. 29-48.

[9] Orkustofnun. Power intensive industries. URL: http://www.nea.is/hydro-power/power-intensive-industries/ (accessed 23 March 2020).

Sabah [48, Al Sabah M.], cultural factors (e.g. management traditions, innovation responsiveness, etc.) are also assumed to be capable of either impeding the 'resource curse' or facilitating it. Since each of the cited authors mentions a particular component of the 'social capital tripod', the concept of the 'resource curse' can potentially be integrated into it, either augmenting the understanding of the influence of separate components of the framework, or forming the 'social capital quadripod' (with the main 'industry type' becoming the fourth component). Fully-fledged development of this concept, however, needs further research.

Potential improvement: Interdependency of components

Although the current paper represents the 'social capital tripod' as indirectly integrating geographical, institutional, and cultural factors through the concept of social capital, these components may also be directly linked to each other. In this case, the 'social capital tripod' could be graphically represented as follows (see Fig. 11):

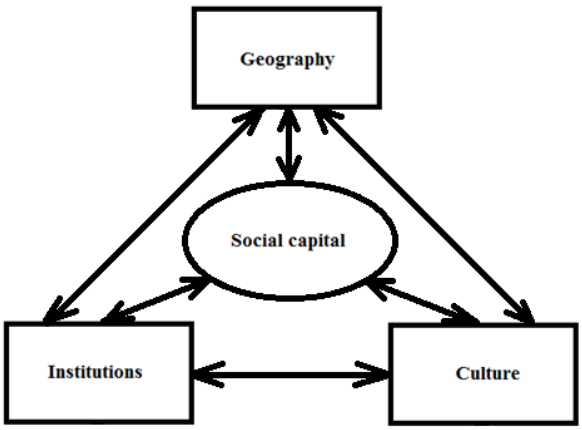

Fig. 11. 'Social capital tripod': Direct links between the components.

Here, in addition to the secondary links (arrows leading to social capital), there are direct bonds between the components (arrows connecting institutions with culture and geography). Alongside hypothetical assumptions of the existence of these ties, there is some evidence in the literature supporting that supposition.

In the opinion of Hart [2, Hart G.], 'geography has a major role to play in developing… political economy, culture and power'. Sachs [8, Sachs J., p. 148] adds to this, arguing that geographical conditions and climate are associated with culture, as 'geography… affects the profitability of various kinds of economic activities'. In this sense, in the opinion of the author, some types of culture developed mainly due to a specific form of subsistence economy that was most effective in those geographical conditions. With respect to climatically extreme Greenland, in the opinion of Caufield [49, Caufield R.], whale and seal hunting were the main activities that helped the Inuit to survive for 4000 years. In contrast to this, according to Grad [50, Grad I.], the milder climate of subarctic Iceland with less intense ice coverage allowed the Norse settlers to replicate the sheep farming

economies of Norway, etc. Thus, as shown, geography and culture being connected to each other affect long-term economic development.

When it comes to the energy development, the geography-culture link could also be used to illustrate the non-renewable preferences of Greenland and the renewable ones of Iceland. In particular, according to Sachs [8, Sachs J., p. 150], geography and culture 'shape the flow of technology'. In this respect, according to Caufield [49, Caufield R.], with the introduction of motorboats for whaling and fishing in the 1920s, this type of transport has become dominant in Greenland's economy, gas oil being the most popular fuel. In the opinion of Buijs [51, Buijs C.], as no significant technological advances have been made regarding marine and land vehicles for Arctic conditions, Greenland's situation will most likely not change, as boats and snowmobiles propelled by hydrocarbons appear most reliable. In contrast, according to Discoll et al [52, Discoll P. et al, p. 637], Iceland's current industrial and energy specifics possess significant 'possibilities for a shift towards a more sustainable mobility paradigm'. In the opinion of the authors, this owes primarily to the country's more favourable geographical conditions and greater share of land transport, potentially facilitating replacing combustion cars with electric ones.

Similarly, such researchers as e.g. Castells [cited in 2, Hart G., p. 816] connect culture to institutions, assuming that 'cultures manifest themselves fundamentally through their embeddedness in institutions'. In this respect, organizations and institutions usually reflect a nation's cultural specifics. However, in the opinion of Gad [3, Gad U.], Greenlandic institutions were established by the colonial Danish power, irrespective of local culture. According to Orvik [53, Orvik N., p. 67], the Inuit therefore regard implementation of the western institutional model as a menace, threatening their 'endeavour to preserve their own values and culture'. Thus, following the researcher's argument, the country's modernisation, orchestrated by the central Danish government, did not reflect the cultural aspirations of most Greenlanders. In contrast, Icelandic institutions of classical western type were introduced by Icelanders themselves; thus, all socio-economic modernisation had the overall consent of the majority of Icelanders [10].

Such conditions hampered Greenland's renewable energy development, also potentially relating to the dichotomy between the traditional Inuit culture and modern institutions established by the Danish colonial power [11]. Here, the authors assume renewable energy to be part of the general modernisation policy, negatively perceived by the Inuit population. On the other hand, Iceland's large-scale renewable development plan initiated by the country's government was welcomed by its citizens interested in getting greater economic and financial opportunities, as the institutions responsible for the change consulted the local population, obtaining consent [12]. Thus,

[10] Witherall R. From fish to aluminium: Iceland turns attention to energy intensive industries. *Aluminium Today*, 1998, vol. 10, iss. 5, pp. 1-32.
[11] Langgård K., Pedersen K. Modernization and heritage: How to combine the two in Inuit societies, Nuuk, Atuagkat, 2013.
[12] Skulason J.B., Hayter R. Industrial location as a bargain: Iceland and the aluminium multinationals 1962-1992. *Human Geography*, 1998, 80 (1), pp. 29-48.

the interconnection of culture and institutions can either go in line or conflict with each other, ultimately influencing renewable energy development.

Finally, similarly to illustrating the direct connection of culture to institutions and geography, scholars find a link between the last two factors. In particular, Engerman et al [54, Engerman S., p. 87] while studying geography, institutions, and subsequent development of South and North America, assume that natural factor endowments of the former, and agricultural production opportunities of the latter, fostered the establishment and evolution of two specific types of institutions in these regions: 'extractive and inclusive'. Specifically, following the authors' argument, mineral exploitation in South America created greater opportunities for the 'extractive institutions with power in the hands of a small elite' not interested in production-related economic progress [ibid, p. 96]. Alternatively, vast territories suitable for farming in North America created preconditions for inclusive institutions because of fewer opportunities for elitist rule, as profit-generation was available to a greater number of people. In this respect, Acemoglu and Robinson [7, Acemoglu D. and Robinson J., p. 89] mention that such institutions 'foster economic activity', creating a platform for further modernisation, whereas extractive ones hamper it.

Such a comparison of the geographical features and subsequent institutional development of South and North America could potentially be projected to Greenland and Iceland. Indeed, with challenging climatic conditions and the territory suitable for neither agriculture, nor significant production of goods, Greenland's institutions appear to be close to the ones of extractive type: according to Goldbach [55, Goldbach I.], low general education level concentrates power in the hands of a small elite, linking national prosperity to mining and oil production. In contrast, Iceland's geographical conditions allowing for both agriculture and large-scale industrial activities are augmented by the inclusive institutions — i.e. a government focusing on large-scale industrial and energy development plans including strategic environmental assessment and incorporating citizens' opinions [13]. Additionally, Iceland's government constantly stimulates an already high level of education by building additional regional universities [14]. Thus, insignificant renewable energy development in Greenland, and an extensive renewable energy development in Iceland, could potentially be linked with their extractive and inclusive types of institutions, owing to their geographical specifics.

In summary, in addition to being linked to each other through social capital, the core parts of the 'social capital tripod', as shown above, could presumably have direct links to each other. Although this may significantly augment the concept suggested by this paper, further research still needs to be conducted into this relationship. Additionally, alternative theories explaining the status quo in Iceland and Greenland could reveal significant limitations of the represented framework.

[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] Bjarnason T., Edvardsson I. University pathways of urban and rural migration in Iceland. *Journal of Rural Studies*, 2017, 54 (1), pp. 244-254.

Thus, both the nature of the relationship between the components and the overall concept need additional research.

Further limitations

Though this article did not intend to provide statistical evidence to highlight the direct relationship between social capital and renewable energy development in the two jurisdictions, further exploration of this assumed link from this perspective is needed to give the hypothesis a sound quantitative proof. In this connection, the predominantly qualitative nature of the paper represents the main shortcoming of this study. That is why the next step in developing research on this topic would be the application of econometric (statistical) analysis that could support this body of knowledge with a more vivid and reliable set of evidence.

Apart from applying non-quantitative approach towards the investigation of social capital's impact on the progress of renewables, the paper uses 'conventional' (i.e. western-borne) conceptualisation of the phenomenon of social capital. This, in its turn, could pose significant limitations on the results of the investigation and thus needs further and more detailed exploration. In particular, while mentioning some of the most prominent studies on the topic developed by Bordieu, Coleman, Lin, Portes, Putnam, etc., the article did not apply alternative views on the phenomenon of social capital. In particular, in contrast to the most popular approaches tying social capital mostly to networks, relationships, social structures and trust, such researchers as e.g. Ready [56, Ready E., p. 3] have quite an unconventional view looking at social capital through the prism of 'resource flow'. Here, in the context of indigenous population, food sharing could be viewed 'as a form of social capital that provides access to resources in a network' [ibid].

Though Ready [ibid] focused primarily on the indigenous population of the North American Arctic and its harvesting culture, similar assumptions about the importance of food sharing for the indigenous communities in other geographical regions were made by other scholars. For instance, while exploring the traditional settlements of Greenland's Upernavik district, Hendriksen and Jørgensen referred to the 'old tradition of "meat gifts"' [57, Hendriksen K. and Jørgensen U., p. 137]. According to the authors, in those indigenous communities 'if someone catches a whale, walrus, or polar bear, it is shared in the smaller settlement according to traditional rules for distribution, and if someone cannot hunt due to illness, age or mental state, the rest of the settlement makes sure that the family has fresh seal or other meat' [ibid]. Hence, following the argument of Ready, paying specific attention to the food sharing practices in such traditional communities could potentially indicate that the level of social capital present in them is high. This, in its turn, could challenge the findings of the current article that demonstrates low overall level of social capital in Greenland.

At the same time, since Hendriksen and Jørgensen's paper (unlike the one of Ready) is qualitative by its nature [ibid], proving the significance of the 'food sharing' argument in Greenland could further benefit from quantitative support just like the current article. In addition, the

limited geographic scope of the authors' research — i.e. focus on one Greenlandic district — may question whether the social capital level in Upernavik could reflect the one in the whole country. Nevertheless, exploring the concept of social capital from the perspectives of 'resource flows', 'food sharing' and other alternative approaches towards social capital is likely to bring new insights to the argument posed by this piece of research. In this sense, the specific attention that this paper gives to the 'conventional' social capital conceptualisations should be viewed as its significant limitation.

Conclusion

This study explored the reasons behind Iceland and Greenland's divergent renewable energy patterns. Taking into consideration the countries' significant geographical, historical, and economic similarities, the research aimed to find out why the latter is currently not promoting renewable power implementation as actively as the former. To do so, the paper focused on the three main theoretical concepts, attributing the energy development difference between these nations to geographical, institutional, or cultural factors. However, despite providing important insights into potential contributors to the energy pattern disparity, the traditional geography, institution, and culture paradigms were demonstrated to be unable to completely pinpoint the exact reason for Greenland lagging behind Iceland. This research thus hypothesised that low social capital hampered renewable energy development in Greenland, whereas high social capital fostered that of Iceland.

To support this hypothesis with sound arguments, one of the research objectives was to estimate social capital stock in both countries. For this purpose, it argued in favour of creating a 'social capital tripod', linking each of the three frameworks to this notion and demonstrating positive association of social capital with renewable energy development described in the previous research. As the notion of social capital appears to be broadly interpreted, another objective was to identify its components and create a comprehensive definition for use in this paper. This was done through extraction of the key social capital features (trust, reciprocity, social structures, relations, and networks) mentioned in the six most cited academic definitions of social capital and their subsequent integration.

Similarly, the six specific geographical, institutional, and cultural features were revealed to directly impact social capital level: population growth rate, distance and discontiguity/connectivity between settlements (for geography); homicide and suicide rate (for institutions); alcohol consumption rate and nomadic/semi-nomadic traits (for culture). By binding these six social capital proxies to its five components, the research constructed the 'social capital matrix' that was implemented for assessment of the estimated social capital level in Iceland and Greenland in 1999–2009, considered one of the most significant decades for Nordic renewable energy progress.

Having analysed qualitative and quantitative geographical, institutional, and social factors in Greenland and Iceland through the 'matrix', the research reached its objective of measuring the

proxy indicators' level in each country. Specifically, in the researched period, most of the Greenlandic features — i.e. high discontiguity and low connectivity, high number of suicides and alcohol consumption, and strong nomadic traits — had 'significantly negative' impacts on social capital, with the remaining — low population growth and high homicide rate — being 'moderately negative'. In contrast, four out of six Icelandic features were associated with 'moderately positive' effect (high population growth, no nomadic traits, low homicide and suicide rates), with only two being 'significantly positive' (low distance/discontiguity and moderate alcohol consumption).

Since none of the indicators in Iceland was paralleled with negative social capital, and none of the Greenlandic factors related to the positive one, analysis of their status in each country revealed that the expected overall Icelandic social capital level is 'moderately' high, while that of Greenland is 'significantly' low. The identified difference in the two countries' social capital stock generally *aligns* with the research *hypothesis*. Hence, the research *aim* of exploring the reason for the countries' dichotomy has been approached. Indeed, Iceland's advanced renewable energy development could be paralleled with its higher level of social capital, whereas Greenland's lack of renewable power enthusiasm could owe to the revealed low level of social capital.

Although the findings parallel the diverging levels of social capital with similarly diverging renewable energy patterns, due to its non-calculative nature, the suggested 'tripod' concept does not demonstrate statistical proof that other potential variables did not contribute to the countries' current renewable energy state. In this sense, further improvement would include integration of correlation and causality analyses, as well as elaboration of a specific social capital index for exact measurement of its level. On the other hand, its relative simplicity, not requiring problematic primary data collection, could turn the 'tripod' into a helpful mechanism for decision-making and analysis. Hence, by evaluating geographical, institutional, and cultural features of countries and regions, one can possibly predict the probability of success, or explain the reasons behind the failure of renewable energy development in high-potential regions.

In parallel with the promotion of the social capital concept as an explanation of the Greenlandic paradox, the paper mentions the 'resource curse' theory as an alternative approach, potentially capable of illustrating the cause of this disparity from a different view. Then, explaining unwillingness to develop renewable energy through the presence of significant mineral deposits, the research connects it to the buildout of non-energy-intensive extractive industries. In contrast, active renewable energy development is paralleled with the boost of power-intensive aluminium production. Although these arguments seem reasonable, the research shows that the 'resource curse' concept can potentially be integrated into the 'social capital tripod', either through strengthening the already-existent components, or by adding an additional one in a form of 'industry specifics', so that the 'social capital quadripod' is formed.

Next, apart from additional exploration of potential incorporation of the 'resource curse' theory into the 'tripod' structure, the study suggested steps for further theoretical improvement of the existing model. Specifically, alongside the indirect connection of the geographical, institu-

tional, and cultural factors to each other by means of social capital, the paper provided some evidence of literature supporting the idea of their direct links. Although establishment of such bonds between the proxy indicators needs further research, the potential new version of the concept will not undermine their connections to its social capital core.

Finally, having recognised the non-quantitative nature of the article among the key traits limiting the reliability of its argument, the paper welcomes further exploration of this topic with statistical methods. In addition, though this piece of research viewed the social capital phenomenon solely through the prism of its most popular conceptualisations, less conventional theories attributing this notion in indigenous communities to 'food sharing' and 'resource flows' were recognized as important elements of the theory that were not addressed. In this connection, introduction of such new and 'less conventional' approaches towards social capital would additionally augment this body of knowledge.

In summary, alongside providing insights into the causes of renewable energy development failure within the circumstances favourable for its progress, by integrating geographical, institutional, and social factors into one system, the paper demonstrates the tri-partite essence of sustainability that connects social, environmental, and economic pillars. In this sense, having illustrated the variety of effects that specific proxy indicators have on social capital and, consequently, on renewable energy and sustainability, the research provides additional evidence of the multifaceted nature of sustainable development. Most importantly, the paper illustrates social capital as a significant prerequisite for the success of renewable energy development.

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