KÖZIGAZGATÁSI ÉS INFOKOMMUNIKÁCIÓS JOGI PHD TANULMÁNYOK

PHD STUDIES IN ADMINISTRATIVE AND ICT LAW

2026/I.

VII. évfolyam - Volume 7

KÖZIGAZGATÁSI ÉS INFOKOMMUNIKÁCIÓS JOGI PHD TANULMÁNYOK

2026. évi I. SZÁM
VII. ÉVFOLYAM

HU – (e)ISSN: 2732-0731

Kiadó: Tudatosan a Környezetünkért Egyesület
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PHD STUDIES IN ADMINISTRATIVE AND ICT LAW

ISSUE III, 2026
VOLUME VII

HU – (e)ISSN: 2732-0731

Publisher: Tudatosan a Környezetünkért Egyesület (Consciously for Our Environment Association)

Responsible for publishing: Dr. habil. Balázs Hohmann Ph.D., President of the Association

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ELŐSZÓ

Folyóiratunk legújabb száma a közigazgatási és infokommunikációs jog olyan aktuális kérdéseit állítja középpontba, amelyek egyszerre kapcsolódnak a digitális átalakulás, a fenntarthatóság, az energetikai infrastruktúra és a digitális vagyon jogi kezelésének kihívásaihoz. A tanulmányok az indonéz klímavédelmi törekvésekben megjelenő női részvétel kérdésétől a helyi jogalkotás digitalizációján és annak magyarországi felhasználási lehetőségein át a Fekete-tengerhez kapcsolódó, zöldenergia-projekt jogi és infrastrukturális vonatkozásaiig, valamint a kriptovaluták és kriptotárca-profilok öröklésének problémaköréig széles spektrumban vizsgálják a kortárs szabályozási dilemmákat.

A lapszám különös értékét adja, hogy szerzőink a jogi elemzést nem elszigetelt dogmatikai kérdésként, hanem társadalmi, technológiai és intézményi összefüggéseiben közelítik meg. A klímapolitikai részvétel reprezentációs kérdései, az önkormányzati normák digitalizációja, a stratégiai jelentőségű energetikai fejlesztések jogi keretei, továbbá a digitális vagyonelemek halál esetére történő rendezésének kihívásai egyaránt azt mutatják, hogy a közigazgatási és infokommunikációs jog területén a szabályozásnak mind gyakrabban kell reagálnia határokon átnyúló, technológiailag összetett és társadalmilag érzékeny jelenségekre.

A Kiadó nevében ezúton is köszönöm Szerzőink igyekezetét, a Szerkesztőbizottság tagjainak és a lektoroknak a felkérések elfogadását és áldozatos munkájukat. Külön köszönet illeti a Dél-dunántúli Regionális Könyvtár és Tudásközpont munkatársait, akik sokoldalú szakmai és technikai támogatásukkal továbbra is nélkülözhetetlen segítséget nyújtanak folyóiratunk megjelentetéséhez.

Jó szakmai „merítkezést” kívánok minden Olvasónak!

Dr. Hohmann Balázs
főszerkesztő

FOREWORD

The latest issue of our journal focuses on timely questions of administrative and infocommunication law that are closely connected to the challenges of digital transformation, sustainability, energy infrastructure, and the legal treatment of digital assets. The studies examine a broad spectrum of contemporary regulatory dilemmas, ranging from women's representation in climate change efforts in Indonesia, through the digitalisation of local legislation and its potential use cases in Hungary, to the legal and infrastructural aspects of a mysterious green energy project connected to the Black Sea, as well as the inheritance of cryptocurrencies and cryptowallet profiles.

The particular value of this issue lies in the fact that our Authors approach legal analysis not as an isolated doctrinal exercise, but in its broader social, technological, and institutional contexts. Questions of representation in climate policy participation, the digitalisation of municipal norms, the legal framework of strategically significant energy developments, and the challenges of arranging digital assets in the event of death all demonstrate that regulation in the field of administrative and infocommunication law must increasingly respond to cross-border, technologically complex, and socially sensitive phenomena.

On behalf of the Publisher, I would like to thank our Authors for their dedication, and the members of the Editorial Board and the reviewers for accepting our invitations and for their invaluable work. Special thanks are due to the colleagues of the South Transdanubian Regional Library and Knowledge Centre, whose support is indispensable for the publication of our journal.

I wish all readers a good professional "immersion"!

Dr. Balázs Hohmann
Editor-in-Chief

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WOMEN'S REPRESENTATION IN CLIMATE CHANGE EFFORTS IN INDONESIA

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DOI: 10.47272/KIKPhD.2026.1.1

ABSTRACT
Climate change is an intertwined issue with implications on the enjoyment of human rights and social justice. Female members in Indonesia are more vulnerable due to their linkage with certain industries and sectors which are exposed to climate change. This article explores the issues of legal politics associated with representation of women in climate change policies in Indonesia, as well as provides suggestions regarding the policy framework to secure representation of women in a transformative way. This research is conducted on a doctrinal approach to the problem based on legislation and conceptual frameworks, as well as best practices of other developing countries. According to the results of the analysis of literature sources, there are no doubts about the strong commitment of Indonesia to its constitution and other international instruments. However, at the same time, there is evidence that the process of formulating climate change policy in Indonesia is gender-neutral and sectoral. Thus, a gender transformative adaptation policy paradigm becomes crucial for the success of climate change and sustainability policy.

KEYWORDS
Climate change; women's representation; legal politics; climate justice; sustainable development.

ARTICLE HISTORY
SUBMITTED 15 Febr 2026 | REVISED 1 March 2026 | ACCEPTED 5 March 2026

I. Introduction

The climate change today has been regarded as the multi-faceted problem which goes beyond ecological impacts but influences other spheres including economic, political, social, and even the sphere of human rights.[1] Climate change does not impact all people equally but rather operates through already existing social differences. Women's communities in such developing countries as Indonesia are especially vulnerable in terms of climate change consequences.[2] It can be happened since women's socioeconomic and cultural activities rely on those sectors of economy most affected by the climate crisis, including farming, fishing, foresting, healthcare and natural resources management.[3]

To solve the climate crisis, the world community has introduced the sustainable development goals (SDGs) in 2015 when climate change mitigation was recognized as a strategy inseparable from gender equality. In the context of SDGs, climate change is viewed not only as an environmental issue, but as a question of climate justice which implies integrative solutions from the point of human rights.[4] Women, who have been considered as victims of climate change, can act as powerful agents for climate adaptation and mitigation since they possess significant experience and knowledge. Recent changes include major transformations regarding the engagement of women in tackling climate change issues in Indonesia at the normative level. In this respect, for example, the Indonesian government has addressed the matter of women's participation in dealing with climate change through several policies and strategies. In particular, one can consider the plan and strategy called "National Action Plan on Gender and Climate Change (RAN-GPI)" 2024-2030, as it is based on international commitments such as the Nationally Determined Contributions (NDCs) and SDGs.[5] In particular, the policy states that the involvement of women in climate change initiatives should be increased through equal access to the benefits of such interventions in certain key areas, amongst other approaches.

1 Colin Hickey, 'Climate Justice and Informal Representation' (2022) 36(2) Ethics & International Affairs 179.

2 Riskey Oktavian and Tasya Avrielia, 'Ekofeminisme dan Kontribusi Perempuan dalam Transformasi Iklim pada Forum G20 di Indonesia' (2024) 10(2) Jurnal Sosial dan Politik 186.

3 Hikmatul Akbar and others, *Jejak Perempuan dalam Upaya Mitigasi Lingkungan Global* (LPPM UPN 'Veteran' Yogyakarta Press 2022).

4 Wassim Benayed and others, 'Does the Energy Transition Pay Off? The Impact of Renewable Energy Adoption and SDG Integration in MENA Firms' (2026) Management & Sustainability: An Arab Review (advance online publication) https://doi.org/10.1108/MSAR-10-2025-0422

5 Akbar and others (n 3).

However, the normative reinforcement has yet to turn into substantive representation in practice. In terms of its national and global aspects, women begin to participate in the forums where climate decision-making processes occur, even in international diplomacy involving the G20, W20, and C20.[6] Nonetheless, in regard to the regional and village levels where there is an effect of climate change, the representation of women is still quite low. The number of women leaders at the village level is around 5.5% and the process of climate change planning and decision-making processes is still done by men.[7] This situation shows the gap between the policy at the center and the implementation at the grassroots level. On the other hand, many sectoral policies do start to give certain numbers for the representation of women, such as at least 30% participation in female facilitators in social forestry,[8] and at least 30% women's involvement in Destana.[9] Without proper institutional mechanism, however, the above-mentioned method is prone to produce representation which is symbolic, administrative, and unequal towards women as the subject of decision making.

There are several factors which are structural and policy-based that inhibit the involvement of women in the process of taking actions for the climate. These factors include deep-rooted patriarchal norms regarding gender roles, gender stereotypes, lack of sex-disaggregated data, as well as the adoption of technocratic and paternalistic policies in climate policy-making.[10] Hence, women become viewed as passive receivers of empowerment interventions and as the representatives of marginalised communities rather than independent actors with the capacity of initiating and driving change.[11] Women's participation in natural resource governance and climate policy making processes is therefore still very limited.[12] The empirical evidence shows however that women are important players in environmental protection and combating climate change issues. The example from Indonesia shows how ecofeminism works and how women fight to protect their

6 Andi Misbahul Pratiwi and others, 'Memahami Kerentanan, Mendorong Kepemimpinan, dan Mengupayakan Keadilan: Analisis Kebijakan Feminis terhadap Rencana Aksi Adaptasi Iklim Jawa Tengah dan Kabupaten Demak' (2025) 29(3) Jurnal Perempuan 221.

7 Kementerian Pemberdayaan Perempuan dan Perlindungan Anak (KP3A), *Rencana Aksi Nasional Gender dan Perubahan Iklim (RAN-GPI) 2024–2030* (KemenPPPA 2024).

8 Akbar and others (n 3).

9 KP3A (n 7).

10 Andi Misbahul Pratiwi, Katie McQuaid and Robert M Vanderbeck, 'Gender, Vulnerability, and Power in Indonesia's Climate Policies' (2026) Climate Policy (advance online publication) https://doi.org/10.1080/14693062.2026.2645652

11 KP3A (n 7); Akbar and others (n 3).

12 ibid.

rights. Women in Kendeng are involved in protecting themselves from the extraction of water by opposing the extractive practice and fighting for food security through the use of indigenous systems of knowledge.[13]

From this perspective, women's empowerment in climate change policies in Indonesia goes beyond mere numerical representation. There should be a paradigm shift in the legal political sphere from the gender-neutral model to the affirmative model in order to achieve substantive women's participation in the entire process of formulating, deciding, implementing, and evaluating climate change policies.[14] Within this context, this paper analyzes the political orientation of women's representation in climate change policies in Indonesia, as well as its necessary policy designs to guarantee substantive women's representation as the basis of climate justice and sustainable development.

II. Methodology

In this study, the doctrinal legal research methodology will be employed. It involves the study of law as a written norm, to examine the legal provisions, principles, and doctrines that regulate the participation of women in the climate change policy formulation process in Indonesia. This evaluation will be done using both the statute and conceptual approaches, where international and national laws and regulations related to the topic, such as the Constitution of 1945, climate change, and human rights international treaties, national laws, and regulations, among others, will be reviewed The legal sources that will be utilized include both primary and secondary legal sources. Primary legal sources comprise international agreements, legislation, and policies on climate change and gender mainstreaming. Secondary legal sources consist of scientific literature, opinions of experts, and legal doctrines on gender justice, climate justice, and legal politics. The entire set of legal sources will undergo qualitative analysis through descriptive-analytical analysis methodology in order to determine the direction of legal politics, reveal normative gaps and weaknesses, and provide necessary legal policy designs to achieve substantive women's representation in climate change mitigation and adaptation in Indonesia.

13 Pratiwi and others (n 6).

14 Georgina Waylen, 'Enhancing the Substantive Representation of Women: Lessons from Transitions to Democracy' (2008) 61(3) Parliamentary Affairs 518.

III. The Legal Politics of Women's Representation in Climate Change Policy in Indonesia

The politics of law concerning the inclusion of women in climate change policies in Indonesia is at an important transitional period, which means the move from a gender-neutral policy to a gender-responsive policy, even up to initiating the nature-gender paradigm shift.[15] It is evident that there is an understanding that gender-blind climate policies will never address the existing inequality that women face due to access to resources, the power to make decisions, and the effects of climate change on them.[16] In the latter paradigm, climate justice involves not only successful results but also processes of achieving sustainability through human rights, gender equality, and empowerment of women.[17]

In terms of philosophy and ideology, increasing the presence of women in climate change policies is founded on the value of Pancasila, specifically on the Fifth Principle of Pancasila which obligates all Indonesian people to have social justice. The idea of social justice requires that any public policy, whether it pertains to environmental or climate change policies, considers the inequalities faced by certain people in reality and ensures equitable allocation of development opportunities.[18] The philosophic foundation gained legal recognition from Articles 28H paragraph (1) and 28I paragraph (2) of the Constitution of the Republic of Indonesia which states that each person is entitled to an adequate and healthy environment and prohibits discrimination in any form. These articles not only encompass the neutrality of the state, but they also allow for affirmative action in order to protect and actively involve vulnerable groups such as women in climate policies.[19]

The constitutional requirement was then reduced in Law No. 32 of 2009 on Environmental Protection and Management, amended by Law No. 6 of 2023. It states that public participation is one of the principles of environmental management as stated in Article 70 where there will be equal rights and opportunities for the public to participate actively. Nevertheless, the provision regarding public participation remains procedural and is gender-neutral without any norms ensuring female participation in the policy process of climate change

15 KP3A (n 7).

16 Daniel Stockemer, 'Women's Descriptive Representation in Developed and Developing Countries' (2015) 36(4) International Political Science Review 393.

17 Pragya Nagpal and Shashank Tomar, 'Impact of Women Participation in Climate Change/Environmental Protection' (2022) 5(4) International Journal of Law Management & Humanities 138.

18 Pratiwi and others (n 6).

19 Akbar and others (n 3).

formulation, decision-making, and implementation. The existence of this condition means that environmental law politics in Indonesia are only about procedural participation, not substantive participation.

In international politics, the politics of law related to women participation in issues of climate change received more legitimacy with the help of The United Nations Framework Convention on Climate Change (UNFCCC) regime and cross-regime approach such as The Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), Beijing Declaration and Platform for Action, and Paris Agreement signed in 2015.[20] In particular, Paris Agreement notes that it is crucial to improve capacity and increase adaptation to climate change effects. With regard to the norms, it implies that needs of the most vulnerable groups must be taken into account, namely women. In particular, it is worth noting that Paris Agreement has no legal consequences, yet the commitments under NDCs possess much political and moral significance.

As Indonesia is a signatory to the UNFCCC, Paris Agreement, and CEDAW that Indonesia ratifies through Law Number 7 Year 1984, Indonesia has a legal responsibility to ensure that its policies relating to climate change adhere to the principle of eliminating discrimination against women. This commitment is then translated in Indonesia into various policy instruments such as Presidential Instruction Number 9 Year 2000 on Gender Mainstreaming as the starting point for mainstreaming gender perspectives in development sectors; ratification of the Paris Agreement in Law Number 16 Year 2016; and Presidential Regulation Number 98 Year 2021 which regulates the mechanism of implementing carbon economic value by endorsing the principle of gender equality in the formulation of national climate resilience targets. The latest efforts can be seen in the National Action Plan on Gender and Climate Change (RAN-GPI) 2024-2030 which serves as a strategic instrument to facilitate full participation and benefit for women in climate change actions at the national and regional levels.

On the other hand, in practice, there are still major barriers to women's participation in climate change policy decision-making processes. First of all, the process of formulating policies on all levels remains dominated by males.[21] In consultation sessions, technical organizations, and the hierarchical organization of power, there is still an overwhelming number of men.[22] The first and foremost

20 KP3A (n 7).
21 Akbar and others (n 3).
22 ibid.

barrier to implementation is related to the local government level as the primary sphere where actions to mitigate and adapt to climate change occur. At this level, the decision-making process is not yet completed within an organizational framework which is not fully capable, meaning that women are marginalized despite bearing considerable social and ecological responsibilities.[23]

The state has actually set a number of positive goals in some sectors to ensure greater inclusion of women. But the use of sector-based administrative goals without the backing of an effective institutional mechanism may simply ensure that women remain on paper and that there is no transformation in the power dynamics in decision-making about climate policy.[24] Without any effective institutional mechanisms, proper monitoring, and adequate resources, the goal may remain confined to the administrative process. Moreover, the framing of the policy in the regional context still tends to look at women as vulnerable sections in times of disasters requiring empowerment rather than agents of change who can take initiative using their adaptation knowledge and leadership skills.[25]

Efforts have been made to close this gap by incorporating some strategies into the legal climate change policy in Indonesia. One of these strategies is the use of the Gender-Responsive Planning and Budgeting approach, even using a double budget tagging strategy at the ministries or organizations involved to ensure the existence of particular funding related to the participation of women.[26] Moreover, there is the implementation of the quota strategy in education, training, and strategic placement in relation to green technology and climate change innovation, as well as the improvement of gender-disaggregated data as a basis for policymaking.[27]

Indonesian politics regarding women's inclusion within climate policies have finally embraced a more gender-responsive strategy, yet it is currently undergoing a process of transition. In the future, the problem that will face Indonesian law does not lie within the lack of normative commitment, but rather in ensuring that women's participation becomes substantial and transformative rather than merely symbolic. It is essential that such changes occur since otherwise, it would render any

23 Sally White and others, 'Voting against Women: Political Patriarchy, Islam, and Representation in Indonesia' (2024) 20(2) Politics & Gender 391.

24 Rowena Maguire and Bridget Lewis, 'Women, Human Rights and the Global Climate Regime' (2018) 9(1) Journal of Human Rights and the Environment 51.

25 Lucy McAllister, Amanda Magee and Benjamin Hale, 'Women, E-Waste, and Technological Solutions to Climate Change' (2014) 16(1) Health and Human Rights 166.

26 KP3A (n 7).

27 Maguire and Lewis (n 24).

attempts at strengthening the regulation ineffective in attaining climate justice and sustainability.

IV. Implementation, Challenges, and the Impact of Non-Inclusive Climate Change Policies on Women

The implementation of policies relating to climate change in Indonesia remains problematic due to structural and cultural issues. Normatively speaking, Indonesia has been able to develop a relatively progressive policy approach by ratifying several international laws and integrating them in the Nationally Determined Contributions. However, in reality, there is a gap between the goals of such policies and their implementation. The lack of inclusion of these policies has an effect on making women more vulnerable in different facets of life.

Based on the empirical evidence, national GHG emissions continue to be increasing significantly. In 2019, national GHG emissions in Indonesia were found to increase at an annual average rate of 4.32%.[28] Forest sector contributed the highest share with 50%, followed by the energy sector 34%, wastes sector 7%, agricultural and plantation 6%, and industrial process and product use (IPPU) sectors which include household 3%.[29] The aggregate rise in GHG emissions has proved that Indonesia is indeed dealing with the climate emergency which arises due to the sustainability of its development model based on the exploitation of its natural resources and fossil fuels.

This is well illustrated by the size of the country's contribution to emissions on a global scale. For instance, Indonesia was responsible for producing approximately 1.24 Gt of CO_2e in 2022, representing an estimated 2.3% share in total emissions across the globe, thus making it one of the ten countries that emit the most greenhouse gases in the world.[30] The two-sided nature in which the country finds itself is due to the relevance of Indonesia in global climate governance while at the same time being subjected to greater attention from the world.

[28] Lulu Kurniarahma, Lorentino Togar Laut and Panji Kusuma Prasetyanto, 'Analisis Faktor-Faktor Yang Mempengaruhi Emisi CO2 di Indonesia' (2020) 2(2) Journal of Economic 369.

[29] Pusat Data dan Teknologi Informasi Energi dan Sumber Daya Mineral, Kementerian Energi dan Sumber Daya Mineral, *Inventarisasi Emisi GRK Bidang Energi* (Kementerian ESDM 2020) 29 <https://www.esdm.go.id/assets/media/content/content-inventarisasi-emisi-gas-rumah-kaca-sektor-energi-tahun-2020.pdf> accessed 27 October 2025.

[30] Indonesia Environment Energy Center, 'Indonesia Sumbang 2,3% Global Emisi Global' (2024) <https://environment-indonesia.com/indonesia-sumbang-23-emisi-global-lebih-tinggi-dari-jepang-hingga-industri-penyumbang-emisi-tertinggi/> accessed 27 October 2025.

Regarding the process of implementation, the major hindrances in this aspect emerge in connection with certain specific factors. In the first place, regional strategies for climate change mitigation and adaptation remain based on a technocratic approach, which fails to recognize the significance of women's knowledge and experience gained in addressing such an issue.[31] The representatives of this gender group continue to be considered passive subjects of the program implementation and training process, whereas in fact they constitute active subjects of knowledge and climate management experience.

The second challenge lies in the implementation of these policies, which is limited due to the lack of disaggregated data based on gender, age, and disability.[32] The lack of such data prevents the development of evidence-based policies that are able to address women's needs. Consequently, women's needs in the impacted industries like agriculture, fishing, and healthcare sectors are neglected when planning, budgeting, and assessing the impact of climate change policies. The third barrier pertains to the existing patriarchal culture that hampers women's involvement in critical decision-making processes concerning the use of natural resources.[33] For instance, the social forestry practice entails administrative procedures whereby permits must be made in the name of male household members.

Fourthly, insufficient coordination among ministries and institutions, as well as central and regional governments, contributes to the fragmented nature of climate policies.[34] This is further compounded by the low capacity of development planning structures in incorporating gender considerations in an effective manner in climate change policies. Gender mainstreaming ends up being confined to policy documents rather than being integrated into decision-making processes and policy implementation at the grassroots level.

The lack of inclusivity in climate change policies has implications for women at different levels.[35] Legally, the marginalization of women in representation is likely to place Indonesia in a situation where it fails to meet its international responsibilities under the Paris Agreement and CEDAW, which Indonesia has already ratified under Law Number 7 of 1984. Furthermore, the absence of gender

31 Akbar and others (n 3).
32 ibid.
33 ibid.
34 ibid.
35 Johannes Kruse, 'Women's Representation in the UN Climate Change Negotiations: A Quantitative Analysis of State Delegations, 1995–2011' (2014) 14(4) International Environmental Agreements: Politics, Law and Economics 349.

considerations in policies that have a gendered dimension may amount to discrimination and exclusion from meaningful participation in public affairs under Article 28I of the Constitution and Article 65 paragraph (2) of the Environmental Protection and Management Law, thereby undermining the legitimacy of the state.

In any case, from the socio-economic angle, the consequences of such changes are more pronounced when analyzed within industries. In the case of agriculture, the Food and Agriculture Organization (FAO) states that women make up the bulk of those employed in this sector in Indonesia, occupying between 40-50% of this group.[36] Moreover, this sector is one of the most susceptible to climate change owing to changes in temperature and precipitation patterns. According to the World Bank, climate change will cause a 9% decrease in the agricultural output by 2030.[37] The effect on health of mothers and their offspring, who are particularly dependent on women, is that the latter will face increased vulnerability to diseases as a result of poor nutrition and food insecurity.

Vulnerabilities that are similar in nature have been identified in the fisheries sector. According to BRIN, there is an expected decrease in fishery production by up to 30% in several coastal regions caused by global warming and ecological degradation.[38] On average, about 42% of workers in the fisheries sector are women.[39] Apart from the threat posed to household earnings, the reduction in production levels leads to women in coastal regions seeking alternative means of earning a living, especially when faced with scarce financial resources and lack of skills.

Within the health industry, climate change presents itself with a multidimensional effect which has a greater impact on women. Several studies indicate the rise in prevalence of vector borne diseases like dengue fever and malaria,

[36] Mella Syaftiani, 'FAO Luncurkan Kampanye Untuk Akhiri Bias Gender dalam Pertanian di Afrika' (Kajian Organisasi Internasional, 9 April 2020) <https://koinupn.wixsite.com/home/post/fao-luncurkan-kampanye-untuk-akhiri-bias-gender-dalam-pertanian-di-afrika> accessed 8 November 2025.

[37] World Bank Group, *Country Climate and Development Report* (World Bank 2023) <https://openknowledge.worldbank.org/entities/publication/c6b1d872-f487-4579-be3a-3cb6ba55dffa> accessed 8 November 2025.

[38] Ibnu Budiman, Dita Wisudyawati and Affifah Azzahra, 'Penyebab dan Dampak Ekologis Dari Susut Hasil Produksi Ikan di Indonesia' in Khairul Amri, Husain Latuconsina and Riesti Triyanti (eds), *Pengelolaan Sumber Daya Perikanan Laut Berkelanjutan* (Penerbit BRIN 2023) 95.

[39] WRI Indonesia, '3 Alasan Kenapa Perempuan Nelayan Memainkan Peran Penting untuk Pemulihan Ekonomi yang Inklusif' (WRI Indonesia, 20 November 2020) <https://wri-indonesia.org/id/wawasan/3-alasan-kenapa-perempuan-nelayan-memainkan-peran-penting-untuk-pemulihan-ekonomi-yang> accessed 9 November 2025.

air borne diseases like ISPA and pneumonia as well as water borne diseases and nutritional deficiency disorders. This was further worsened by the realization that women are at a greater health risk compared to men ranging between 15-20%.[40] These include health risks related to pregnancy, childbirth as well as newborns. Aside from the physical effects, the climate crisis also brings about stress and psychological disorders due to financial instability within the household.

Moreover, climate policies with inclusivity also lead to an increase in violence against women, a vicious circle of household debts, reduction in the availability of education for girls, and inequity in the tenure rights system.[41] This indicates that climate change policies that lack proper consideration for women's representation can exacerbate the current existing disparities. Therefore, it can be stated that if there is no transformation of symbolic women's representation into substantive women's representation within the policies on climate change in Indonesia, such climate policies not only stand the chance of failing to deliver on their intended purposes, but they will also contribute to further exclusion of marginalized communities. It can be argued from an ecofeminist and sustainable development perspective that ecological sustainability cannot be achieved without social justice.

V. Comparative Learning from Developing Countries

The comparative experience of several developing nations, particularly those in the Global South, indicates that gender considerations are not only about gender equality but are important elements in making climate change policies and interventions successful. Through their experience, it is clear that when women are made central actors rather than merely passive recipients, climate policies can become more sustainable and effective. Therefore, through this analysis, it is evident that there is a concrete foundation that gender-sensitive climate change laws can correlate directly to improved environmental policy outcomes.[42]

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40 UNICEF, *Data dan Informasi Dampak Perubahan Iklim Sektor Kesehatan Berbasis Bukti di Indonesia* (UNICEF 2023) <https://www.unicef.org/indonesia/media/17191/file/Data%20dan%20Informasi%20Dampak%20Perubahan%20Iklim%20Sektor%20Kesehatan%20Berbasis%20Bukti%20di%20Indonesia.pdf > accessed 24 October 2025.

41 Bushra Mushtaq, 'Analysing the Productive Mechanism of Human Capital in Pakistan: New Insights from Women's Empowerment' (2026) Asia Pacific Journal of Innovation and Entrepreneurship (advance online publication) https://doi.org/10.1108/APJIE-02-2024-0018

42 Hongseok Lee, 'Does Increasing Racial Minority Representation Contribute to Overall Organizational Performance? The Role of Organizational Mission and Diversity Climate' (2019) 49(4) The American Review of Public Administration 454.

In the same vein, some developing nations have resorted to structural methods through affirmative action to enhance the participation of women, particularly as a consequence of post-conflict reconstruction and the democratic process. For instance, a 30% mandatory gender quota was established by the 2003 Constitution of Rwanda, which then became the nation boasting of one of the highest levels of female political representation.[43] With the substantial number of women in parliament, it was possible to formulate strategic policy changes such as granting of equal land ownership rights and promoting the utilization of renewable energy sources in rural areas.[44] Similarly, in Afghanistan and Iraq, constitutional mechanisms were enacted requiring at least 25% female parliamentary representation within the democratization processes of those nations.[45] On the other hand, while no strict constitutional requirement exists for gender parity in political representation in the Philippines and Uzbekistan, their substantial delegation of women representatives to the United Nations Framework Convention on Climate Change (COP) talks clearly indicated an understanding of the fact that climate change diplomacy needs to consider gender perspectives for credibility.[46]

Empowerment through land and natural resource rights is another key lesson that will help climate resilience. Despite the fact that women in Nigeria carry out about 70-80 percent of agricultural labor in rural areas, their official land ownership is less than 20 percent.[47] Empowering women by allocating land has been found to promote sustainable agricultural systems, improve welfare, and adapt to climate change in many ways. Evidence from both Cameroon and Nepal indicates that giving women rights to officially control community lands as members of community forest groups leads to more forest cover and economic stability within communities.[48] Indeed, women-run forest businesses have become the main contributors to community economy as well as conservation in Nepal. Women in India have shown their ability to rehabilitate land and bring prosperity in a practical

43 Melanie M Hughes, 'Armed Conflict, International Linkages, and Women's Parliamentary Representation in Developing Nations' (2009) 56(1) Social Problems 174.

44 John Högström, 'Women's Representation in National Politics in the World's Democratic Countries: A Research Note' (2012) 33(3) Journal of Women, Politics & Policy 263.

45 Yvonne Galligan, 'Bringing Women In: Global Strategies for Gender Parity in Political Representation' in Julie Ballington and Azza Karam (eds), *Gender Quotas in Politics* (Routledge/International IDEA 2005).

46 Kruse (n 35).

47 Cate Baskin, *Empowering Women's Land Rights as a Pathway to Climate Justice* (Policy Brief, Oxfam International 2018).

48 Nagpal and Tomar (n 17).

manner by leasing some critical lands and rehabilitating about 700 ha of degraded land using sustainable farming in just three years.[49]

Apart from these formal policies, the substantial role played by women has also been highlighted in the form of grassroots movements and innovations. The Green Belt Movement in Kenya spearheaded by Wangari Maathai not only managed to plant millions of trees in order to combat deforestation and soil erosion but also provided economic empowerment to women at the household level.[50] Energia's campaigns in several African nations have indicated that when women participate in designing and implementing renewable energy sources, the output is consistent with the needs of society, such as efficiency and saving domestic effort.[51] Women-run cooperatives in Malawi using solar-powered greenhouses are capable of producing high-value agricultural produce all year round.[52]

The second lesson that can be drawn involves attempts at integrating gender in national climate policy formulation. As a highly climate-vulnerable nation, Bangladesh produced a Gender and Climate Change Action Plan that takes into account the increased labor burden of women because of male migration and provides for gender-based evacuation measures during disasters.[53] Mauritania has been involving women in decision making concerning food security and sustainability under pressure from climate issues.[54] Uganda and Tanzania are currently in the process of formulating their CRV strategies by incorporating gender-disaggregated data at all levels of governance, thereby identifying vulnerabilities among women regarding food security and household economics.

However, experience gained in other developing countries such as Latin American countries, including Panama, Colombia, and Brazil, shows that problems of gender inequality have been mostly left unresolved.[55] Women in Latin America still have to bear the responsibility of invisible work in climate cooperation, where they perform social mediation, conflict resolution among community members, and networking, which are very important for the successful implementation of any

49 ibid.
50 ibid.
51 Akbar and others (n 3).
52 Shinu Vig, 'Climate Change and Mental Health of Women in Developing Countries' (2025) 178(6) Climatic Change 118.
53 KP3A (n 7).
54 Ryan Jeremiah D Quan, 'Securing Women's Rights amid the Changing Climate' (2015) 60 Ateneo Law Journal 98.
55 Gabriela Alonso Yáñez and Lily House-Peters, 'Identifying the (Gendered) Elephants in the Room: Women's Invisible Work within Transdisciplinary Climate Change and Sustainability Efforts' (2017) 87 Geoforum 1.

sustainable development programs. Invisible work is never officially recognized or remunerated even though it plays an extremely crucial role in climate policy.[56]

On the whole, cross-cultural studies from developing nations illustrate the extent to which the effectiveness of climate change laws is contingent on changing the status of women from passive sufferers to active agents of change. The evidence from the international sphere suggests that providing women equal access to land ownership, technology, resources, and decision-making roles ensures adaptability, sustainability, and equity in climate policies. This empirical evidence provides an adequate comparative foundation for Indonesia to move beyond the normative and administrative aspects of climate change law and focus on women as strategic actors.

VI. Policy Design Needed to Accommodate Women's Representation in Climate Change Efforts

Designing climate change policies in the way that recognizes women's representation within Indonesia is not enough when it is still done under the premise of a gender-neutral perspective. This gender-neutral perspective is highly vulnerable since the presence of structural inequality will result in the replication of substantive injustice.[57] The way out of this dilemma would be to direct climate policies towards the *gender transformative adaptation* perspective.[58] The idea behind it lies not only in increasing women's participation in numbers but also in addressing changes in structures that prevent women from being active agents in climate decisions.

First, policy design should focus on increasing the ability of women in leadership.[59] This requires changing women's status from being just an object or a victim to becoming a subject and agent of change which is only possible with the introduction of affirmative policies that support women's leadership. Introduction of the quota system for women in order to participate in decision-making at the international, national, and local levels is one way to address structural underrepresentation. It should not be treated as the end of the story but merely as a means to achieve women's agency. Thus, climate policies should be complemented with capacity building measures such as women leadership training and negotiation skill training as well as expertise on green technologies, agronomy, and climate risks. Moreover, women led CSOs must be acknowledged as policy makers who have

56 ibid.
57 Akbar and others (n 3).
58 Pratiwi and others (n 6).
59 ibid.

legitimate grounds for their inclusion in planning, implementing, and evaluating climate actions at national and regional levels.[60]

Second, gender representation has to be institutionally incorporated through integration into the development planning and budgeting process.[61] Gender mainstreaming into climate change policy cannot just exist as a standalone sectoral document but must be aligned with major planning documents. The integration should be reinforced by performance indicators that assess women's involvement and contribution to the policies in relation to climate change policies. In terms of budgeting, Gender Responsive Planning and Budgeting (PPRG) must be implemented using the double budget tagging scheme to ensure that the budget for climate change actions indeed benefits women.[62]

Third, gender transformation policies can only be effective where there is a good database disaggregated by gender, age, and disability.[63] In the absence of a database that can break down these details, climate policy stands a chance of not being able to identify the specific vulnerabilities and needs of women. Thus, it is imperative for policy formulation to include the requirement that disaggregated data be provided for all strategic sectors concerning climate change. These sectors include agriculture, energy, forestry, marine, and health among others. In addition to this, it goes without saying that intersectionality should not be taken lightly in understanding the link between gender and other factors such as poverty, place, and class. This is because without it, gender-sensitive policies would still be subject to generalization.

Fourth, climate policy designs should be highly involved in addressing the problems that arise from the changes in the tenurial rights and the use of natural resources.[64] Studies have revealed that the lack of representation of women with regards to tenure rights to land, forests, and water bodies is one of the major barriers to adaptation to climate change in developing countries. It is therefore clear that reforming tenure rights plays a pivotal role in ensuring that there is development of gender-sensitive climate change policy. Climate policy designs must ensure that the rights of women to fishery lands and areas are recognized in order for them to own resources and get support during adaptation to climate change, climate insurance,

60 ibid.
61 Akbar and others (n 3); KP3A (n 7).
62 ibid.
63 ibid.
64 KP3A (n 7).

and funding. Lastly, innovations for low carbon technologies should be encouraged among other vulnerable people like women.

The fifth point that needs to be considered when designing a climate change policy is the necessity for an effective mechanism of institutions and monitoring systems to guarantee its consistency and accountability of implementation.[65] It is necessary to create a national secretariat or working group that will be responsible for the implementation of the RAN-GPI, as well as addressing the problem of fragmentation of power among ministries and levels of government. In addition, the results of the monitoring of gender mainstreaming in climate policy must be included in the National Registration System for Climate Change Control (SRN). This will make it possible to monitor the process of women's participation in a consistent manner. Moreover, for a climate change policy to have a strong binding effect, it should be supported by legislative instruments, namely at the level of the presidential regulation.

In effect, designs of climate change policies that take into account women's representation require a paradigmatic shift from administration to transformation. Not only do gender-inclusive climate policies align with the requirements of social justice and human rights; they are also empirically required for the successful implementation of climate change policies. Without changes in policy design that target the issue of structure, the inclusion of women's representation may remain only symbolic, with no contribution to achieving national climate change goals.

VII. Conclusion

Climate change is a structure which must necessarily be considered in the context of human rights and social justice. Talking about the consequences of climate change in Indonesia, one can see that climate change is not neutral on the grounds of society and gender aspects and poses a threat to women. Hence, it needs to be noted that the involvement of women in the climate change problem must be approached from the point of view of the duties established by the Constitution of Indonesia in Article 28.

Based on the findings presented in this study, despite having developed a relatively progressive legal framework through the political climate change law and gender mainstreaming, Indonesia's implementation of such remains largely declarative, sectoral, and gender-neutral. This disparity between the recognition of

[65] ibid.

norms and implementation of policies leads to women being represented symbolically without any guarantee of their effective involvement in decision-making, control of resources, and sharing of climate action benefits. Not only will this situation generate gender inequality, but it will also hinder the efficacy of climate change policies since Indonesia continues to experience higher levels of emissions and socio-economic vulnerability among women in critical sectors.

From these observations, this paper makes an appeal for a political turn in the policy and law of climate change in order to ensure transformational gender policy designs. The representation of women will have to be maintained in the following ways: affirmative policies; institutionalization in planning and budgeting processes; generation of data based on intersectionality; reforms in tenurial rights and resource access; and the empowerment of institutions with accountability mechanisms. With such an effort, the country will not only comply with its constitutional and international obligations but also develop more efficient climate change policies.

STATEMENTS

Disclosure statement
No potential conflict of interest was reported by the authors.

Funding
The authors received no financial support for the research, authorship, or publication of this article.

Data deposition and availability
There is no data set associated with the study. No data deposition was required for this study.

Use of Artificial Intelligence
The authors did not use any artificial intelligence–based system in the preparation of this article.

Author contributions (CRediT)

Wulan Fritriana: Conceptualization; Methodology; Investigation; Formal analysis; Resources; Data curation; Writing – Original Draft; Writing – Review & Editing.

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CABLE IN THE BLACK SEA WATER, OR A MYSTERIOUS GREEN ENERGY PROJECT

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DOI: 10.47272/KIKPhD.2026.1.2

ABSTRACT
Hungary, Romania, Georgia and Azerbaijan are planning to build a 1150 km long seabed electricity cable under the Black Sea, to transport renewable energy from the South Caucasus region into the European Union and mostly to the Hungarian electricity market. Apart from the political, economical, and technical/engineering risks and challanges to the project, EU legal barriers also pose huge problems to this enterprise. This article tries to walk the reader around the multi-angle problematics of a very complex construction project at the periphery of the European Union.

KEYWORDS
High voltage undersea electricity cable, renewable energy export, OTC contract, cross border capacity reservation

ARTICLE HISTORY
SUBMITTED 10 Oct 2025 | REVISED 10 March 2026 | ACCEPTED 12 March 2026

I. Introduction

Based on the data of the International Energy Agency and the plans of the European Union, it is clear that the demand for electricity in the world, including in Europe, will drastically increase. Even today, electricity is the secondary source of energy that is an indispensable condition for the functioning of modern societies. The war in Ukraine is a frustrating demonstration of this.

In order to meet the growing demand for electricity, intensive source-side developments will be necessary throughout Europe. However, the Hungarian energy policy debates of recent years have sunk into the classic nuclear-coal-gas technological triangle. Renewable energy sources actually belonge to the „politically tolerated" category from the point of view of the classic Hungarian energy industry. It follows from all of this that little domestic attention has been paid to the technologies and project development opportunities that help the integration of renewable energy sources into the network. Accordingly, there are hardly any publications in the domestic literature that deal with the issues of high-voltage direct current transmission1, even though various high-voltage direct current project ideas have appeared in the peripheral regions of Europe, which aim to bring renewable-based electricity produced far away to Europe (eg. from North Africa).

Thats why, the professional public was surprised to learn that on December 17, 2022, in Bucharest, that "Hungary has committed itself with its partners to a unique investment in the world, we are preparing to build the world's longest undersea electricity line," as announced by its Prime Minister, and then, based on news from the domestic press, he signed the agreement on an electricity network transporting electricity from Azerbaijan to Hungary via Georgia and Romania. The exact content of the agreement cannot be identified based on the Hungarian news reports, but based on the available international sources, it is worth interpreting the project for the Hungarian energy industry as well.

The content of the project is believed to be precisely defined by Jeyhun Bayramov, Minister of Foreign Affairs of the Republic of Azerbaijan, who will refer to the investment under the title "Azerbaijan-Georgia-Romania-Hungary Black Sea Submarine Cable Project" at the meeting of the foreign ministers of the European Union's Eastern Partnership on December 12, 2022. The exact nature of the signed contract can be identified on the basis of the twitter post of Olivér Várhelyi, the commissioner responsible for neighborhood and enlargement policy of the European Union, i.e. a "Memorandum of Understanding - MoU" was signed.

Regarding the financial support of the project, it is worth recalling the words of President Mrs. Von der Leyen, according to which ".I am very much looking forward to the results of the currently ongoing feasibility study. We will be

[1] Aladár Kimpián, 'Nagyteljesítményű villamosenergia-átvitel nagy egyenfeszültségen' [High-Power Electricity Transmission at High Direct Voltage] (presentation delivered at the Energetikai Szakkollégium, Budapest, 27 March 2014) <https://www.eszk.org/attachments/l192/ea/HVDC_eloadas.pdf> accessed 31 March 2026

ready to support you. Because now we have the opportunity to financially support projects of common interest with neighboring countries...".

In February 2025, a joint company called Green Energy Corridor Power Company (GECO) was established in Bucharest by Azerbaijan, Georgia, Romania, and Hungary, with the goal to oversee the research and design phase of the Black Sea Submarine Cable Project[2]. The project has also been included in the ENTSO-E Ten-Year Network Development Plan (TYNDP) 2024–2034. It has been submitted to the European Commission to obtain "Project of Common Interest" (PCI) status — which would unlock funding and regulatory support.[3]

The fragmented public availability of information concerning the project also raises a broader issue of administrative and regulatory transparency.[4] In the case of large-scale, cross-border infrastructure projects involving public authorities, public undertakings and potential EU-level financial or regulatory support, transparency is not merely a matter of communication policy, but a condition of legal accountability, public scrutiny and informed professional debate.

II. International legal background of seabed cables

The regulation of undersea (submarine) cables, including their laying, maintenance, and protection, is governed primarily by international law, adopted in the XIX.th century but more notably a decade later the United Nations Convention on the Law of the Sea (UNCLOS).[5] Additionally, several other legal instruments, treaties, and conventions provide complementary or supporting frameworks.

The legal regulation of undersea cables became necessary after the continental expansion of wired telegraph and telephone lines, when the two shores of the Atlantic Ocean were first connected.[6]

The world's first telecommunication undersea cable was the Transatlantic Telegraph Cable, laid in 1858. Its official name was Transatlantic Telegraph Cable, it came into service in 1858, and connected Valentia Island, Ireland with Heart's Content, Newfoundland, Canada and than the USA on land. It use, as telephone came only later, communication started Morse code signal cables. The first

[2] 'Joint venture established to manage Black Sea submarine cable project' (*Renewables.az*, 3 Februay 2025) <https://renewables.az/en/news/joint-venture-established-to-manage-black-sea-submarine-cable-project?utm_source=chatgpt.com> accessed 31 March 2026

[3] www.renewables.az accessed 31 March 2026

[4] See Balázs Hohmann, *Az átláthatóság értelmezése és követelményrendszere a közigazgatási hatósági eljárások tükrében* [The Interpretation and Requirements of Transparency in Administrative Authority Proceedings] (Novissima 2022).

[5] Richard Barnes, 'The Continuing Vitality of UNCLOS' in Jill Barrett and Richard Barnes (eds), *Law of the Sea: UNCLOS as a Living Treaty* (BIICL 2016) 459.

[6] S Jayakumar, 'UNCLOS: Two Decades On' in Myron H Nordquist, John Norton Moore and Kuen-Chen Fu (eds), *Recent Developments in the Law of the Sea and China* (Brill Nijhoff 2005) 11. https://doi.org/10.1163/9789047417378_007

successful message was sent on August 16, 1858, from Queen Victoria (UK) to President James Buchanan (USA). However, the cable failed after only about three weeks of operation due to electrical problems. A more durable **cable** was successfully laid in 1866, again connecting Ireland and Newfoundland, and it remained operational far longer.

The first international legal instrument, to regulate undersea cables in international waters was the International Convention for the Protection of Submarine Telegraph Cables – signed in Paris, 14th March 1884.
The Convention regulated the most important topics of undersea cables. That is the laying of them, security distances, responsibility for them, and criminal law responsibility for breaking or damaging the cables.

Just for curiosity, Austria-Hungary was one of the signatory states of the Convention, and it was signed by the Emperor of Austria Hungary, I. Franz Josef. The Hungarian signature of this technical novelty international instrument was put on paper contrary to the fact, that the Monarchy did not operate any undersea cables, as not being a colonial power. The only undersea cable system, that the Monarchy was connected to directly was the Adriatic cable network in Trieste and German, Italian and Ottoman lines. That is how the Empire communicated with the world.

Article I of the Convention defines the geographical scope of application of the Convention which is the non-territorial waters of the sea (12 nautical miles) and the subject is telegraph cables which end on the shores of the contracting parties.

Article II defines as „a punishable offence to break or injure a submarine cable, wilfully or by culpable negligence, in such manner as might interrupt or obstruct telegraphic communication, either wholly or partially". It is interesting to observe – having seen recent cable cutting incidents on the Baltic Sea by Russian affiliated vessels during the Ukrainian/Russain war – that only wilful and culpable wrongdoings are sanctioned. So the Convention does accept, that by accident, or by self saving, such damages may occur on the sea.

The convention provides for the case when the owner of a cable during laying or repairing his own cable brakes or injures another cable, obliging the wrongdoer to bear the costs of reparation. (Art. IV.)

Other sea vessels, when they see a cable laying vessel, should stay a way at least one nautical mile from that vessel, the same goes for the fishing nets and fishing boats.

Article VIII. of the Convention provides for the rules on the criminal procedures to be taken in the case of infraction. The main guiding rule is the rule of the flag of the ship, if that does not help in defining the jurisdiction, the nationality of the crew prevails. The procedure of proof was also very liberal under the Convention, allowing all legislation of the country of the court. Proceedings were expected to be finished as soon as possible. The contracting parties also undertook

to make the braking or damaging of the telegraph cables to be punishable crime in their respective national law (at least by fine or imprisonment or both)

It is interesting to remark, that the Convention did cover war. In case of belligerent states, it was not expected to respect its provisions. „Article XV It is understood that the stipulations of the present Convention do not in any way restrict the freedom of action of belligerents."

The UNCLOS convention, nearly a century later, further developed the principles worked out by the telegraph cable convention.

Its Article 21, which regulates laws and regulations of the coastal State, on territorial waters, says: *„The coastal State may adopt laws and regulations, in conformity with the provisions of this Convention and other rules of international law, relating to innocent passage through the territorial sea, in respect of all or any of the following: (a) the safety of navigation and the regulation of maritime traffic; (b) the protection of navigational aids and facilities and other facilities or installations; (c) the protection of cables and pipelines"*

Article 51 deals with existing agreements, traditional fishing rights and existing submarine cables and it says: *„2. An archipelagic State shall respect existing submarine cables laid by other States and passing through its waters without making a landfall. An archipelagic State shall permit the maintenance and replacement of such cables upon receiving due notice of their location and the intention to repair or replace them"* The Baltic Sea is one of the mostly cabled seas in the world. Telecommunication, electricity and even natural gas pipelines cross it. Reparaing or replacing them was a non issue during peace time for the coastal states, but events gone an unexpected way with the sabotage of Nordstream 1 and Nordstream 2, the two Russian gas pipelines, as well as the cutting of a dozen of telecommunication and electricity cables, by the so called „shadow fleet", using ship anchors.[7]

The route of any undersea cables is determined by consent of the Coastal State, as says Article 58 and Article 79 of the UNCLOS, through the Exclusive Economic Zone and the continental shelf, there are only safety conditions that shall be met. Coastal states are not entitled to block pipeline or cable projects on that ground. It is now appropriate to examine the content of Article 79:

Submarine cables and pipelines on the continental shelf

1. „All States are entitled to lay submarine cables and pipelines on the continental shelf, in accordance with the provisions of this article.

2. Subject to its right to take reasonable measures for the exploration of the continental shelf, the exploitation of its natural resources and the prevention, reduction and control of pollution from pipelines, the coastal State may not impede the laying or maintenance of such cables or pipelines.

3. The delineation of the course for the laying of such pipelines on the continental shelf is subject to the consent of the coastal State.

[7] Bill Whitaker, 'Concerns about possible Russian sabotage persist amid rash of cable cuts in the Baltic Sea' (*CBS News*, 28 September 2025) <https://www.cbsnews.com/news/concerns-about-possible-russian-sabotage-baltic-sea-cable-cuts-60-minutes-transcript/> accessed 31 March 2026

4. Nothing in this Part affects the right of the coastal State to establish conditions for cables or pipelines entering its territory or territorial sea, or its jurisdiction over cables and pipelines constructed or used in connection with the exploration of its continental shelf or exploitation of its resources or the operations of artificial islands, installations and structures under its jurisdiction.
5. When laying submarine cables or pipelines, States shall have due regard to cables or pipelines already in position. In particular, possibilities of repairing existing cables or pipelines shall not be prejudiced."

One of the most contemporary example of laying a large scale undersea pipeline was the construction of the Nordstream 2 pipeline, where the course of the pipeline pair had to be modified by the investor multiple time, due to concerns of the effected coastal states.[8]

Article 112 deals with the right of States to lay submarine cables and pipelines and declares that „ 1. All States are entitled to lay submarine cables and pipelines on the bed of the high seas beyond the continental shelf. 2. Article 79, paragraph 5, applies to such cables and pipelines. „ That concerns the high seas over the continental shelfs, where only safety reasons rule over the economic ones.

Article 113 is an alread known rule from the Telegraph Cable Convention, making it obligatory for member states to have rules in their respective internal legal system to sanction wilful or culpable negligence breaking or damaging cables and pipelines. *„ Breaking or injury of a submarine cable or pipeline Every State shall adopt the laws and regulations necessary to provide that the breaking or injury by a ship flying its flag or by a person subject to its jurisdiction of a submarine cable beneath the high seas done wilfully or through culpable negligence, in such a manner as to be liable to interrupt or obstruct telegraphic or telephonic communications, and similarly the breaking or injury of a submarine pipeline or high-voltage power cable, shall be a punishable offence. This provision shall apply also to conduct calculated or likely to result in such breaking or injury. However, it shall not apply to any break or injury caused by persons who acted merely with the legitimate object of saving their lives or their ships, after having taken all necessary precautions to avoid such break or injury."*

Though that rule for basic responsibility for damaging or breaking cables and pipelines is extended by Article 114 of the UNCLOS to owners of existing undersea infrastructure, by saying that *„Breaking or injury by owners of a submarine cable or pipeline of another submarine cable or pipeline Every State shall adopt the laws and regulations necessary to provide that, if persons subject to its jurisdiction who are the owners of a submarine cable or pipeline beneath the high seas, in laying or repairing that cable or pipeline, cause a break in or injury to another cable or pipeline, they shall bear the cost of the repairs."*

On other relevant legal instrument is the ITU instruments with their technical standards. International Telecommunication Union (ITU) although not a

[8] Martin Russell, 'The Nord Stream 2 pipeline: Economic, environmental and geopolitical issues' (*European Parliamentary Research Service Briefing*, July 2021) <https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/690705/EPRS_BRI(2021)690705_EN.pdf> accessed 31 March 2026

legal regulatory body for laying cables, ITU governs technical standards and coordination for global telecommunications infrastructure, and collaborates with UN bodies on spectrum allocation and interference protection.

III. The project

The basic idea of the planned project is to connect the Georgian and Romanian electricity systems with an undersea cable. This would make it possible to connect the energy systems of the South Caucasus and the energy systems of continental Europe, which would improve the security of supply of the Georgian electricity system. When planning the project, they started from the basic situation that the Georgian electricity system is based to a significant level on hydropower plants, the production of which is highly dependent on the rainfall conditions of the region, but at the same time, the country already has a strong network connection with all the countries of the region, or it can be further strengthened. Therefore, any available domestic surpluses, as well as renewable-based electricity produced in the region and not used locally, could be exported to the European Union.

To implement the idea, JSC Georgian State Electrosystem (GSE) and Transelectrica started a joint study. The Georgians also received support from the World Bank for the preparation of a foundational study, and the construction of a 1,000 MW submarine cable was also included in the Georgian 10-year network development plan. The ENTSO-E network development plan prepared in 2022 also includes the Georgian-Romanian cable project.

Following further support from the World Bank and an international tender, Georgia signed a contract with the Italian energy consulting firm CESI SpA, which began the development of a feasibility study. According to the contract worth nearly 2.5 million euros, the preparation of the feasibility study began on May 11, 2022 and will last 18 months. According to a Georgian statement, "as part of the study, GSE is actively cooperating with the Romanian transmission system operator Transelectrica. The Ministry of Economy and Sustainable Development of Georgia conducts regular consultations on the project with the competent ministries of Romania, Armenia and Azerbaijan, as well as with GSE - the energy companies of the mentioned countries".

VI. The technical content

As planned, in the transmission project, a 500 kV dual-system transmission line will be built on the Georgian side between the existing 500 kV Jvari and the new 500 kV Anaklia substations (seaside). In the future, a two-pole 500 kV direct current submarine cable would be built between Anaklia and Constanta (Constanta Nord or Medgidia Sud). For this purpose, the construction of a 500/500 kV AC/DC converter station with an installed capacity of 2x500 MW is planned at the Anaklia substation. A DC/AC station of similar capacity is also required at the Romanian connection point. According to the first estimates, the total length of the submarine

cable would be 1,100 kilometers, which would also include a 95 km land section. Therefore, the project does not involve further internal Romanian network development or Hungarian transmission network is also not involved in the project. At least such ideas cannot be identified from the network development plan of ENTSO-E.

Among the ENTSO-E planning data, it is stated that the CAPEX cost of the investment is 2118.85 M€, while the OPEX cost is 9.42 M€/year, which also includes the cost of network loss. These costs - based on the values - are probably due to the conversion of the World Bank cost estimate from that time in €. Since European inflation has been quite high since then and the €/USD exchange rate is approx. 10% deterioration also occurred, so it is likely that we are not much wrong if approx. We calculate with 20% higher costs. Based on all of this, in the case of an investment that is just starting, with a 25-year time span, a 10% internal rate of return, a construction period lasting 4 years, assuming 90% capacity utilization and without EU support, the transmission fee on the busbar of the Constanta Nord substation is about €56/MWh for delivered electricity.

If we add to this the LCOE cost of the renewable energy sources mentioned in the political statements, the Romanian transmission tariff and the costs of the Romanian-Hungarian border crossing, then electricity could arrive on the Hungarian electricity market at a price of approximately €110-140/MWh (due to the risks, presumably around the upper limit of the band may be the actual price), but not in large quantities either. Whether this calculated price is too much or too little cannot be said yet. For example, compared to the current Hungarian spot market prices, this is a smaller value, but this price level is approximately in the order of magnitude of the German "base load" product price for delivery in 2026. In any case, it is obvious that this cost level can no longer be called favorable compared to other local production technologies. In addition, the possibility of long-term delivery to Hungary is highly limited, since the end of the cable will be in the Constanta Nord substation.

And yet, we did not mention the expected phyisical and market losses of the infrastructure. We know that the North Sea Link (UK–Norway, 720 km, ±525 kV HVDC) reports losses of approximately 4% end-to-end and this is an over a thousand kilometer long cable.[9]

But then comes another problem: further transmission from there is only possible under EU internal electricity market rules (there is no mention of the construction of any direct Hungarian-Romanian pipeline in the project), which on the one hand builds on the commercial interconnection of the markets, and on the other hand it is not possible to make capacity restrictions beyond one year at border crossings. This hardly worked out and industry accepted legal restriction in itself

[9] Jeremy Gordonnat and James Hunt, 'Subsea cable key challenges of an intercontinental power link: case study of Australia–Singapore interconnector' (2020) 4(2) *Energy Transitions* 169. https://doi.org/10.1007/s41825-020-00032-z

prevents long term agreements. The electricity industry works differently than the gas industry. There have been no capacity restrictions here for a long time, and that is no way, that the countries of interest can exempt themselves from under it.

Article 16(9) of the Electricity Regulation is key here. It says: *"Capacity shall be allocated via market-based mechanisms, such as auctions. No transmission capacity shall be reserved for the exclusive use of any market participant or category of participants."* Additionally: *"The maximum contract duration for the procurement of balancing capacity shall be one year."* So, explicit reservations of cross-border capacity for more than one year are not allowed, unless very specific exceptions apply (usually with NRA or ACER approval). And the reason for that is very simple: to prevent market foreclosure. Long-term cross-border capacity reservations can block access for others (especially new entrants), and distort price signals in the day-ahead and intraday electricity markets. Also EU policy promote liquid, short-term markets (especially day-ahead and intraday), with cross-zonal capacities made available close to real time, not locked up long in advance. Reserving capacity long-term can result in underuse or inefficient allocation, especially when market conditions change. The EU wants capacity to go where it's most needed. Market mechanisms with long-term physical transmission rights (PTRs) have mostly been phased out or converted into financial transmission rights (FTRs) on forward markets (e.g. long-term capacity rights up to 1 year via auctions, not bilateral reservation).

So then, what is still allowed? Long-term transmission rights (LTTRs) via Auctions, which means that TSOs must offer long-term cross-zonal capacity rights (monthly and annual products), but these are: non-exclusivity (allocated via competitive international auctions), financial or option-based (not physical reservations) and typically "use-it-or-sell-it" (UIOSI). Market participants can secure hedging via: FTRs / PTRs up to 12 months via coordinated capacity auctions.

The only exemption is granted by Article 63 of the Electricity Directive or Article 19 of Regulation 2019/943, for: new interconnectors, merchant investments, projects granted exemption by NRAs and approved by ACER or the European Commission, and these rare exemptions must be temporary, not harming competition and being transparent and proportionate.

Well, all can be said about the planned Black Sea Cable at present, but not these.

Also, some more obstacles pop up when we look at the conditions of OTC contracts, longer than 1 year, where the basic rule is that long-term OTC contracts must not distort competition or create market foreclosure. Contracts cannot block market access for new entrants. Market-dominant players must not abuse their position (Article 102 TFEU) and long-term Power Purchase Agreements (PPAs) must not restrict flexibility or liquidity of the short-term markets.

Also the Regulation (EU) No 1227/2011 on Wholesale Energy Market Integrity and Transparency (REMIT) says that all wholesale energy contracts,

including long-term OTC ones, must be reported to the Agency for the Cooperation of Energy Regulators (ACER), and even if OTC, the contract must be registered if it relates to supply or transportation of electricity within the EU and affects cross-border trade, so transparency must be ensured even if the deal is private or state or business secret.

While not a blanket ban, contracts longer than one year shall not be suitable for certain services such as: balancing capacity or ancillary services, where EU rules limit contract durations (typically to 1 year or less, unless a derogation is granted). Contractual arrangements must not hinder the TSO's ability to manage system balancing and congestion. The relevant TSOs or NRAs may scrutinize long-term capacity commitments if they affect grid reliability or cross-border flows. And than come the national rules and regulations jungle:

While EU law allows long-term OTC contracts, Member States may impose additional conditions, e.g.: Notification or pre-approval of contracts involving regulated entities. Special provisions for contracts with public undertakings or capacity mechanisms. Definition of what counts as a "long-term contract" (some countries consider >1 month, others >1 year). (Example: Romania changed its definition in 2021 to allow "long-term" contracts from 1 month onward on centralized markets, expanding the OTC flexibility.)

For the Hungarian side, the possibly available capacity does not seem too significant either. If the capacity is only distributed proportionally and the project promoters do not involve an actor who has already operated a long submarine cable, Hungary would get about 250 MW of the 1,000 MW capacity.

From the point of view of the technical evaluation of the project, it is also important to know that the most recent similar (currently the longest) submarine cable project put into operation in Europe is the North Sea Link. The cable is a 720 km long, 1,400 MW North Sea cable link connecting the electricity systems of Norway and the United Kingdom, which began operations in October 2021. The length of the cable, which is a proud political feature of the project, actually results in a cable at least 50% longer than the current longest cable, which may present a number of previously unforseen technical problems.[10] Only the acknowledged economic electricity market losses on the North Sea Link, as declared by Nordpool

[10] Hitachi Energy, a global technology leader that is advancing a sustainable energy future for all, today announced it has handed over the North Sea Link power interconnector to Statnett, the national power grid operator in Norway, and National Grid, which owns and manages gas and electricity infrastructure in the UK and northeastern United States. The link, which is the world's longest subsea power interconnector, is enabled by HVDC Light®, Hitachi Energy's high-voltage direct current (HVDC) technology, interconnects Norway's and the UK's power grids, which are separated by the North Sea. North Sea Link has the capacity to transmit 1,400 megawatts (MW) of renewable power through a 720-kilometer HVDC underwater cable, which is enough electricity to supply 1.4 million UK homes.*1 It allows Norway to import wind power from the UK and the UK to import hydropower from Norway. This efficient power exchange will help increase grid resilience in both countries, reduce fossil-fuel power generation in the UK and avoid 23 million tons of carbon emissions by 2030.

are currently set at 3,4%.[11] Losses are not linear to distance, physical electricity losses,[12] due the law of Ohm can reach higher numbers. [13] More information about both physical and financial/market loss factors can be found in this article, analyzing the nordic subsea cables.[14]

Geology does not help the project either, since the bottom of the Black Sea consists of two basins: the Western Black Sea and the Eastern Black Sea, which are separated from each other by the Central Black Sea High (Andrusov Ridge). The maximum water depth is 2245 m. Both basins are tectonically active as a result of the continued northward movement of the Arabian Plate causing the westward movement of the Anatolian Block along the North and East Anatolian Faults. And from this it does not seem that there is peace at the bottom of the sea.

V. Renewable energy from the Caucasus?

The source page of the above project also seems rather uncertain. Based on Azeri data, the country's total installed electricity generation capacity is 7,542.2 MW. Of this, the installed capacity of power plants operating with renewable energy sources is 1304.5 MW, which is 17.3% of the total capacity. The installed capacity of renewable energy sources – excluding large hydropower plants – was 194 MW in 2021, which is 2.5% of the total electricity generation capacity. Instead of the increased use of existing hydropower plants, the amount of electricity produced from renewable energy sources accounted for only 5.8% of the total production. Currently, therefore, the electricity production in Azerbaijan contains a low proportion of renewable energy sources, and is mainly based on fossil energy sources. In 2021, Azerbaijan's electricity production was 27.8 TWh, of which about 1.6 TWh was exported, which, based on the above, came mainly from fossil sources.

However, it is also an undoubted fact that an investment program was launched in 2022 for the intensive use of renewable energy sources. Based on the official potential estimate in Azerbaijan, the potential of economically viable and technically feasible renewable energy sources is 27,000 MW (of which 3,000 MW wind energy, 23,000 MW solar energy, 380 MW biomass and 520 MW hydropower). However, it is also important from the point of view of energy production that the capacity utilization of solar and wind power plants in Azerbaijan is 16-17% based on IRENA data. We cannot expect significantly different capacity utilization from

[11] Nord Pool, 'Loss functionality' <https://www.nordpoolgroup.com/en/trading/Day-ahead-trading/loss-functionality/> accessed 31 March 2026.

[12] Wilfried Frelin, Christophe Moreau, Dag Willen, Carsten Thidemann, Volker Waschk, Gabriel de Robien and Nathalie Boudinet, 'Measurements of Losses on Three-Core Submarine Power Cables' in *Jicable'15: 9th International Conference on Insulated Power Cables* (Versailles, 21–25 June 2015) paper B3.7, 1.

[13] Hossein Farahmand, Daniel Huertas-Hernando, Leif Warland, Magnus Korpås and Harald G Svendsen, 'Impact of System Power Losses on the Value of an Offshore Grid for North Sea Offshore Wind' in *2011 IEEE Trondheim PowerTech* (IEEE 2011) 1. https://doi.org/10.1109/PTC.2011.6019345

[14] Andrea Tosatto and Spyros Chatzivasileiadis, 'HVDC Loss Factors in the Nordic Power Market' (2021) 190 *Electric Power Systems Research* 106710. https://doi.org/10.1016/j.epsr.2020.106710

new investments either, as this basically depends on the geographical conditions. As a consequence, there appears to be a contradiction between the production possibilities of the possible renewable capacities in Azerbaijan and the capacity utilization necessary for the return of the planned pipeline. Obviously, this contradiction could be refined with a more detailed modeling that accurately depicts the possibilities of hydropower plants (presumably this will also be done by CESI SpA experts), but at first glance, the difference seems very large.

The situation on the Georgian side of the Azeri-Georgian border is also peculiar. Georgia's electricity production in 2021 was 12.6 TWh, with an import balance of 1.6 TWh. So, Georgia's electricity system currently relies on imports, but about 81% of its own production came from hydropower plants. In 2021, the total installed electricity generation capacity in Georgia is 4,525.1 MW. Of this, 105 operating hydropower plants account for the largest part, which represents approximately 3,350 MW (74%). In addition, there are 20.7 MW of wind power plants (0.5%), while the remaining 1154.4 MW (25.5%) are fossil (mainly gas-based) generating units. Georgian wind farms operate at 20-22% capacity utilization, while solar panels operate at 14-20% capacity utilization. Based on the official Georgian estimate, the country has significant hydropower potential (15,000 MW), but approx. 3,000 MW of solar and wind power plants could also be integrated into the system.

VI. Conclusions

Based on the above, if we leave aside the technical issues of the establishment and the uncertain political environment of the Black Sea with the ongoing Russian/Ukrainian war, it cannot be ruled out that the jointly optimized production of the Georgian and Azeri hydropower plants, as well as the Azeri solar and wind power plants, would be able to fill the submarine cable, but these Azeri solar and wind power capacities do not exist yet.

Will there be such a capacity when the cable is ready? How can you create a business model for electricity transmission via cable, in which we just don't know what price, what capacity and what capacity utilization we want to reach? How many internal EU electricity market rules should be observed and respected until the investors feel it legally safe to move into such a huge project?

For the time being, integrated operation with Georgian hydropower plants also seems to be a theoretical possibility, since this would require a very closely integrated market operation between the two countries, and it is not clear what interest these countries have in the joint export of renewable energy when their own fossil production should also be used. and it could be replaced with renewables (this is especially possible in the case of Azerbaijan). It is worth recalling that the World Bank's preliminary investigation, completed earlier, also started from the assumption that the cable is being built solely for the purpose of renewable electricity transmission.

Perhaps this is also why the President of Azerbaijan stated in July 2022 that the development of the use of renewable energy sources "...allows us to save natural gas and export the saved natural gas, especially given that the demand for our gas has now increased dramatically...".

Overall, the project raises a number of technical and business questions, but Hungary also has another strategic problem. It is not clear how Hungary, as a mainland state, can participate in the production of a renewable project that is connected to an area far from the EU. The rules of the internal market are completely clear, i.e. long-term capacities cannot be booked at border crossings, as analyzed in detail above.

And this rule will not be changed for a single cable project, as it is the basis of internal market integration. If there was no internal energy market integration, the Hungarian renewable energy potential would not be exploited either.

Maybe the idea of the European "Super Grid" should be dealt with here as well? Furthermore, it might be worth thinking about the distance from which electricity should be delivered to the territory of the EU?

There is certainly a distance that no longer results in a physically and both commercially feasible project, even if it seems like a good idea politically. However, one thing is certain, if a feasibility study were not prepared, we would have no chance to answer the above questions more precisely.

STATEMENTS

Disclosure statement
No potential conflict of interest was reported by the author.

Funding
The author received no financial support for the research, authorship, or publication of this article.

Data deposition and availability
There is no data set associated with the study. No data deposition was required for this study.

Use of Artificial Intelligence
The author did not use any artificial intelligence–based system in the preparation of this article.

Author contributions (CRediT)
Conceptualization; Methodology; Investigation; Formal analysis; Resources; Data curation; Writing – Original Draft; Writing – Review & Editing.

DIGITALIZATION OF LOCAL LEGISLATION - POTENTIAL USES-CASES FROM HUNGARY

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DOI: 10.47272/KIKPhD.2026.1.3

ABSTRACT
The digitalization of local legislation can take several directions: on the one hand, the automatization of the legislative process itself (or certain elements thereof) and, on the other hand, the "coding" of the legislation that has been drafted ("Law as a Code" concept) so that it can be almost instantly implemented in the various legislative systems, thereby enabling certain legislative sub-systems to implement the "coded" legislation automatically and immediately, or enabling them to track changes automatically. In our paper, after a review of the relevant literature, we examined the possibilities and limitations of the realization of the concept in practice starting at the very first phase: what attitudes and demands can be identified by the local authorities.

KEYWORDS
Local Legislation; Digitalization of Legislation, Law as a Code, Rules as a Code, Legal Logic.

ARTICLE HISTORY
SUBMITTED 20 Febr 2026 | REVISED 3 March 2026 | ACCEPTED 7 March 2026

I. Introduction

Since 2010, we have seen the implementation of a number of concepts in Hungary aiming at digitalization[1] and making administration faster, more flexible and more efficient for customers. However, the digitalisation of public administration should not be assessed solely from the perspective of organisational efficiency, since it is also closely connected to the transparency of administrative action, including the accessibility, traceability and comprehensibility of administrative and regulatory processes.[2] Regarding the courts, the digitalization process also started a few years ago, with many services and procedures available electronically. In these areas, there have been similar developments across Europe, and different LegalTech solutions "did not only affect the private sector of legal services but have found their way into the field of the judiciary in some jurisdictions."[3] However, this paper does not focus on these issues, but rather on the digitalization of legislation, especially local legislation, and its future potential uses.

The digitalization of local legislation can take several directions: on the one hand, the automatization of the legislative process itself (or certain elements thereof) and, on the other hand, the "coding" of the legislation that has been drafted ("Law as a Code" concept) so that it can be almost instantly implemented in the various legislative systems, thereby enabling certain legislative sub-systems to implement the "coded" legislation automatically and immediately, or enabling them to track changes automatically.

The use of advanced information and communication technologies in the field of legislation – to support consultation on draft legislation, to simplify drafting of legislation, to publish legislation, to facilitate access to existing legislation, etc. – is no longer considered to be an absolute novelty. It is clearly a decade-old trend.[4] In Hungary, the Integrated Legislative System (ILS), launched in 2016, is perhaps the most significant milestone in the digital decision-making process of the government to date. As the main module of the ILS, the Electronic Legislative Drafting System (ELDS) serves the 3 main specialized systems, "ParLex", which

[1] Anett Kalmárné Pölöskei, *Elektronikus közigazgatás* [Electronic Public Administration] (2018) 5 <https://bmkszf.hu/dokumentum/2944/EKozigazgatas.pdf> accessed 31 March 2026.

[2] Balázs Hohmann, 'The Principles and Fundamental Requirements of the Transparency on the Public Administrative Proceedings' in Suresh P (ed), *Proceedings of the IIER International Conference, Dubai, UAE* (International Institute of Engineers and Researchers 2019) 1–4.

[3] ana Soukupová, 'AI-Based Legal Technology: A Critical Assessment of the Current Use of Artificial Intelligence in Legal Practice' (2021) 15(2) Masaryk University Journal of Law and Technology 279, 280 https://doi.org/10.5817/MUJLT2021-2-6

[4] Tímea Drinóczi, 'Összehasonlító jogalkotástan: trendek és kihívások' [Comparative Theory of Legislation: Trends and Challenges] in Tibor Nochta and Gábor Monori (eds), *Ius est ars – Ünnepi tanulmányok Visegrády Antal professzor 65. születésnapja tiszteletére* [Ius est ars – Commemorative Papers in Honour of the 65th Birthday of Professor Antal Visegrády] (Pécsi Tudományegyetem Állam- és Jogtudományi Kar 2015) 172–173, 175, 177.

supports the parliamentary legislative drafting and decision-making workflow, "GovLex", which supports the governmental legislative drafting workflow, and "LocLex", which is used for drafting municipal decrees.[5]

Another potential approach to the digitalization of legislation could be the creation, publication and immediate integration of legislation into certain specialized systems as computer codes, either during the legislative process or after the legislation has been adopted, a concept widely referred to as "Law as a Code" or "Rules as a Code" (RaC).[6]

A clear, widely accepted definition of "Law as a Code" has not yet been crystallized in the literature.[7] The essence of the concept can be captured in the authentic representation of legislation in a form suitable for machine interpretation, as a computer program code,[8] that is, it aims to produce normative content in a computer-interpretable form, in addition to the current natural language form, optimized for human understanding and interpretation. This is not just a machine-readable format, but a machine-consumable format, which requires that the legal norm "is available in such a code or code-like form that the software can understand, interact with, for example, to perform a calculation or establish an eligibility condition."[9]

Some of the legal norms are ultimately reflected as computer codes even today, in many cases, business stakeholders use software solutions to comply with legislation,[10] but we can also think of how an accounting program can perform certain calculations, or how specialized administrative systems are developed to implement the legislation. However, coding is done independently of the legislator and, in some cases, by different actors in different ways. A central element of the RaC concept is that the transformation of legislation into codes takes place within some kind of organized and regulated framework, even at the level of legislation. This has the significant added value of enabling different software solutions to interpret the law directly, thus minimizing the time between legislation and implementation and enabling efficient, uniform application of the law.

This concept can be applied at almost all levels of legislation. In addition, in our view, there are particularly significant advantages to be gained from the fact that

[5] E Balás, 'IJR és Nemzeti Jogszabálytár: mi változik április 1-től?' [ILS and National Legislation Repository: What Will Change from 1 April?] (Jogkövető, 2021) <https://jogkoveto.hu/tudastar/integralt-jogalkotasi-rendszer> accessed 31 March 2026.

[6] These terms will be used as synonyms throughout the paper.

[7] James Mohun and Alex Roberts, *Cracking the Code: Rulemaking for Humans and Machines* (OECD Working Papers on Public Governance No 42, OECD Publishing 2020) 16 https://doi.org/10.1787/3afe6ba5-en

[8] Mohun and Roberts (n 6) 16–17.., See also Matthew Waddington, 'Machine-consumable Legislation: A Legislative Drafter's Perspective – Human v Artificial Intelligence' (2019) 2 *The Loophole* 21, 23 https://doi.org/10.1787/3afe6ba5-en

[9] Mohun and Roberts (n 6) 18.

[10] Mohun and Roberts (n 6) 16–17.

interfaces between legislative provisions - whether at the same or different levels of the sources of law - can be better identified through coding, and even, in some cases, changes to a related provision that are inevitably required as a result of a change in one of the norms can be automated.

The Law as a Code approach is unlikely to apply to the legal system as a whole, and it is more realistic to suggest that this concept may represent a way forward in the area of certain rules[11] that involve quantifiable processes in the application of and compliance with the law and require less discretion, or in the resolution of challenges arising from the interfaces of legislative provisions. We believe that, in addition to a general approach to the concept, it may be useful to analyze a specific, well-defined use-case. With this in mind, our research focuses to local legislation and implementation, namely to examine the need for digitalization options in relation to the municipalities' internal law drafting (internal policies).

However, before presenting the details of the research in Chapter 3, it is worth briefly reviewing the basic literature on the coding of law.

II. Literature Review

Examining the regulatory role of technology and the interface between technology and law as regulatory instruments is not a recent development. One of the best-known milestones in this discourse is undoubtedly the work of Lawrence Lessig, his essay "The Laws of Cyberspace",[12] presented at a conference in 1998 draws attention to the fact that in cyberspace, in addition to the regulatory role of law, the regulatory power of the "code" is very important, and that the latter ultimately has as much coercive power over the behaviour of users as the physical infrastructure of the real world. By code, Lessig mean "the software and hardware that constitutes cyberspace as it is—the set of protocols, the set of rules, implemented, or codified, in the software of cyberspace itself, that determine how people interact, or exist, in this space."[13]

The Law as a Code concept seeks to eliminate the discrepancy between legislation and the regulatory impact of technology, including time lags (rules often take a significant amount of time to be coded into software) and differences in interpretation (the code ultimately does not produce the exact output intended by the legislator in the text of the legislation).[14] In addition, the relevant literature identifies a number of other advantages of the concept, in particular the testing and simulation of the impact of public policy objectives,[15] the increased transparency of

[11] Mohun and Roberts (n 6) 19.

[12] Lawrence Lessig, 'The Laws of Cyberspace' (1998) <https://cyber.harvard.edu/works/lessig/laws_cyberspace.pdf> accessed 31 March 2026

[13] Lessig (n 11) 3-4.

[14] On the translation-gap phenomenon, see Mohun and Roberts (n 6) 31-32.

[15] Waddington (n 7) 30-31.

the codes that ensure implementation,[16] the clear and unambiguous formulation of the norm, which is unavoidable for coding purposes,[17] or the reduction of bureaucracy in the application of the law.[18] Furthermore, there are of course significant limitations and challenges in applying the concept, which may arise, for example, from the complexity and rapid change of legal relationships or the possible lack of equivalence between the natural language version and the coded text.[19] It can be a serious problem that the rules and codes, while transparent in principle, can be difficult for the average person to understand. This "*phenomenon may undermine confidence in the predictability of law and in law in general, and the legitimacy of law*".[20] From this perspective, transparency cannot be understood as the mere formal availability of the applicable rule or code; it also requires that the addressees and the bodies applying the law are able to understand, reconstruct and verify the normative links between the natural-language rule, its digital representation and its practical administrative application.[21] The risks of Rules as Code extend beyond mere technical translation errors. Kennedy identifies a particularly serious structural problem, the 'ossification' whereby the executable code, once deployed, becomes practically irreversible, embedding potentially mistaken legislative interpretations and making subsequent corrections disproportionately costly.[22]

Classification of the levels of digitalization is also an important question in the relevant legal literature. Based on Wong's classification,[23] there are seven levels of digitalization of legislation from a technological point of view, and an overview of these will help to put the cases we are researching into context. These are the followings:

- Level 0: the authentic medium of the legal instrument is analogue (paper-based) and it does not exist in any digital or electronic form.

[16] Mohun and Roberts (n 6) 41.

[17] Nicoletta Rangone, 'Artificial Intelligence Challenging Core State Functions: A Focus on Law-Making and Rule-Making' (2023) 8 Revista de Derecho Público: Teoría y Método 95, 104 https://doi.org/10.37417/RDP/vol_8_2023_1949

[18] Mohun and Roberts (n 6) 42.

[19] Mohun and Roberts (n 6) 31-32.

[20] Zsolt Ződi, *Platformok, robotok és a jog* [Platforms, Robots and the Law] (Gondolat 2018) 201.

[21] Balázs Hohmann, *Az átláthatóság értelmezése és követelményrendszere a közigazgatási hatósági eljárások tükrében* [The Interpretation and Requirement System of Transparency in the Light of Administrative Authority Procedures] (Novissima Kiadó 2022) 16.

[22] Kennedy also refer to an actual case: the Australian Pintarich case, in which an automated tax decision was found unreviewable under conventional judicial review standards because the relevant legal reasoning was embedded in software. Rónán Kennedy, 'Rules as Code and the Rule of Law: Ensuring Effective Judicial Review of Administration by Software' (2024) 16(1) Law, Innovation and Technology 170, 178–179, 185–187 https://doi.org/10.1080/17579961.2024.2313801

[23] Meng Weng Wong, *Rules as Code: Seven Levels of Digitisation* (Singapore Management University Centre for Computational Law 2020) 2–23 <https://ink.library.smu.edu.sg/sol_research/3093/> accessed 31 March 2026.

- Level 1: the legislation is available electronically (but not yet suitable for computer processing).
- Level 2: the level of use of digital applications and products. In this context, legislation can be accessed and applied through some specialized application (specialized systems) into which the provisions are written via the implementing programming language, typically as an "if-then-else" function. In this case, the service provider directly encodes the relevant legislation into the software.
- Level 3: the creation of a separate "rule engine", in the course of which a specialized, standardized programming language is used to encode the rules, which can then potentially be used by any application capable of processing that programming language.
- Level 4: creating ontologies. This entails the creation of machine-processable ontologies with definitions, typologies and sets of relations and rules to complement existing systems. Ontologies specialize in describing essentially constitutive rules and often provide answers to cross-cutting questions (e.g. what counts as a working day).
- Level 5: creating "digital twins". This involves the creation of a natural language version and a machine-processable coded version, integrated into the legislative process, simultaneously and with respect to each other during the first drafting, even by having a dedicated software develop the natural language version.
- Level 6: tooling automation. At this level, the coded version can be directly linked to services for automation purposes (e.g. expert systems, document generators, contract management systems).
- Level 7: universal adoption of RaC concept. This is not actually a new level in terms of technological implementation, the authors merely specifically mention the stage at which the use of the above becomes widely accepted.

Of course, these seven levels do not necessarily appear as purely distinct stages, they may overlap or some levels may be omitted, and, with the exception of the seventh level, each level may be interpreted in relation to a well-defined set of rules. The practice of encoding certain legal provisions in target software in certain areas of law, which is still widespread today, represents only level 2 under this classification.

Finally, we must mention that the Large Language Models (LLMs) may affect the RaC approach, so the potential role of LLMs in automating parts of the encoding process has attracted considerable research interest. Soni and Kennedy first emphasise a fundamental incompatibility: RaC systems rely on deductive reasoning applied to fixed, encoded rules, whereas LLMs operate through inductive, probabilistic inference – generating statistically likely strings of words rather than deterministically applying legal norms. This structural mismatch creates a 'black box' problem in the field of RaC: since LLM reasoning cannot be fully traced or

explained, integrating LLMs directly into RaC systems would undermine the transparency and predictability that the Rules as Code approach is designed to guarantee. According to the authors one answer may be Chain-of-Thought prompting ('CoT'), which „*involves providing a multi-step few-shot learning approach where a larger problem is broken down into smaller intermediate steps to solve before arriving at the final solution. The application of CoT in legal reasoning lies in breaking down complex legal questions into smaller steps that incorporate various legal equations such as court judgment, repeal of legislation and other factors.*"[24]

III. Methods and Results of the Research

In the field of digitalization of local legislation, the Faculty of Law and Political Sciences of the University of Pécs and one of its market partners, DMS One Kft., interested in potential software development, conducted research between July 2022 and March 2023, which was complemented by a research between October 2022 and September 2023, supported by the programme of the Ministry of Justice. In addition to a general literature review of the subject, we aimed to answer to the research question, that *how could the internal policy-making of municipalities (or other organisations with similar self-governing structures, such as universities) be affected by the use of IT tools to manage the links between the internal policies and the central legislation that partly determines their content; is there a need for such IT solutions on the part of the concerned organisations?*

Our assumptions were the following:

- A number of internal policies are adopted by the municipalities, the content of which is partly determined by central legislation, and which must be amended periodically in the light of changes to such legislation;
- Monitoring legislation in this regard and the resulting amendments to the policies requires significant human resources;
- IT tools can help organisations to identify the interfaces between internal norms and central legislation.

In the course of the research, we aimed to confirm or refute these assumptions, in short, to assess the need for such an IT solution. To this end, we chose a questionnaire survey and in-depth interviews as our research methods.

III.1. Research Methodology

The questionnaire survey (the content of the questionnaire can be found in Annex 1) had been carried out in the cities of three different counties of Hungary, assuming

[24] Keshav Soni and Rónán Kennedy, 'Rules as Code and Large Language Models' (Law School Policy Review, 28 February 2025) <https://lawschoolpolicyreview.com/2025/02/28/rules-as-code-and-large-language-models/> accessed 31 March 2026.

that, even without statistical representativeness, these cities roughly represent the cities of Hungary in terms of size and sensitivity to the problem.

Our questionnaire survey sought to answer the question of what "user" needs the technological implementation of digital lawmaking should meet, what priorities can be identified, and, on the other hand, our analysis is focused on local legislation, given that municipalities are those entities that issue the most legislation and have experience in using electronic specialized systems in recent years (since the introduction of the so-called ASP systems[25]). The sample was drawn from urban municipalities in three counties, as cities are considered to be the type of municipality where digital implementation of legislation and lawmaking can be identified as a more realistic vision compared to other (small) municipalities. The questionnaire was sent to all the cities (52) of county Somogy, Bács-Kiskun and Baranya, with the administrative assistance of the government offices of the counties concerned, in March 2023.

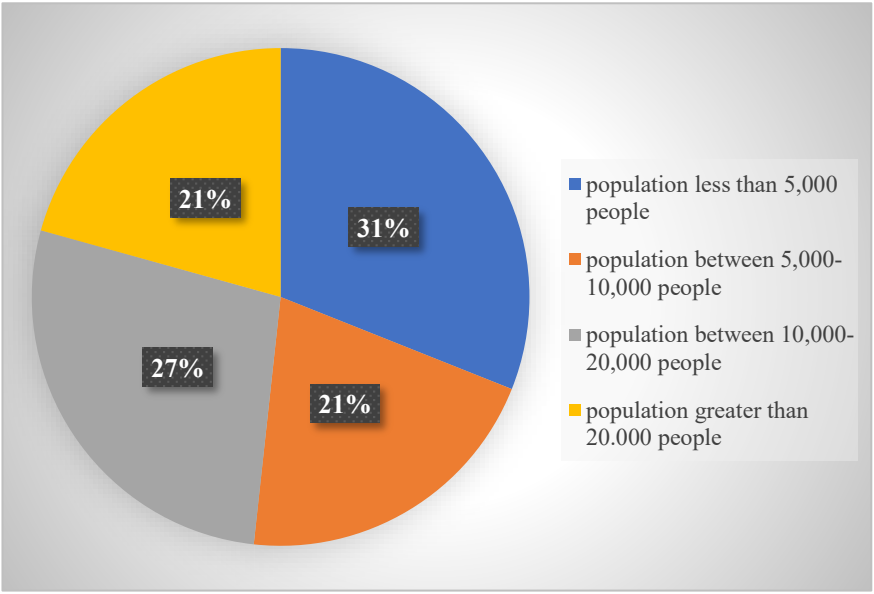
Moreover, in-depth interviews were conducted with some stakeholders to gain a deeper understanding of the issue and to collect feedback that could not be quantified in the questionnaire survey. The questionnaire was prepared jointly with a representative of a municipality, a county government office – the authority responsible for the legal supervision of municipalities – and a university, an organization with a large number of bylaws and operating under the principle of self-government.

III.2. Results of the Questionnaire Survey

The questionnaire received a total of 29 responses from the three counties (55% completion rate). Somogy and Bács-Kiskun counties had 10 to 10 respondents, while Baranya county had 9 respondents. The distribution by population of the cities that completed the questionnaire is shown in the figure below:

[25] The ASP system is composed of a framework system, specialized systems (e.g. municipal tax system, management system, real estate cadastral system, document management system), supporting systems and the data warehouse. See 'Az önkormányzatok szolgálatában' [In the Service of Municipalities] (Önkormányzati ASP Alkalmazásközpont) <https://alkalmazaskozpont.asp.lgov.hu/node/13> accessed 31 March 2026.

Figure 1 – Distribution of respondents by population



Source: Author's own empirical research, own edited.

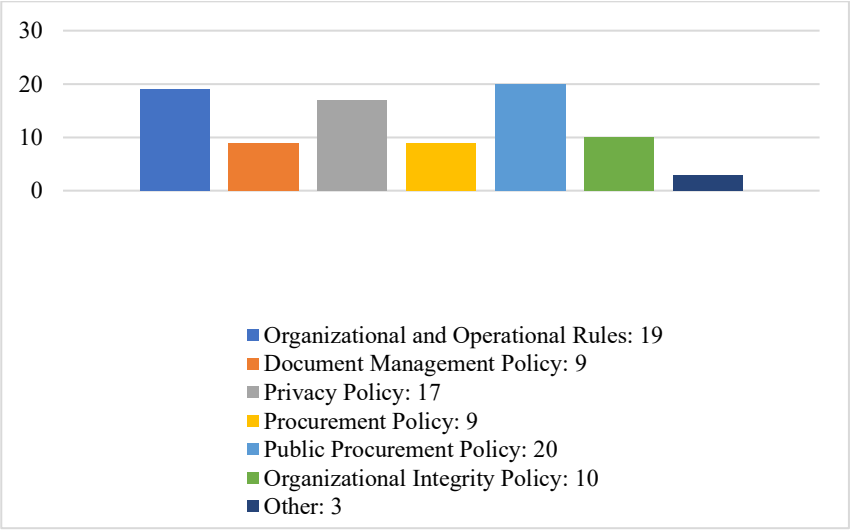
The questionnaire survey addressed the importance of using IT tools to support the recording and modification of policies ("How important do you think it is to have an IT system to support the recording and modification of your policies? (1 - not important; 5 - very important). The overall score of the responses to this question was 4.41 out of 5, i.e. the municipalities concerned (would) consider IT support for the management of the policies to be of great importance.

The questionnaire also addressed the question of which policies are most likely to be affected, i.e. which policies are most affected by the changing legislative environment. For this question, more alternatives could be selected from a choice of seven:

- Organizational and Operational Rules
- Document Management Policy
- Privacy Policy
- Procurement Policy
- Public Procurement Policy
- Organizational Integrity Policy
- Other

The responses suggest that all of the above policies have a significant "exposure" to changes in legislation. The results of the responses are summarized in the figure below.

Figure 2 - Aggregated designation of a given policy



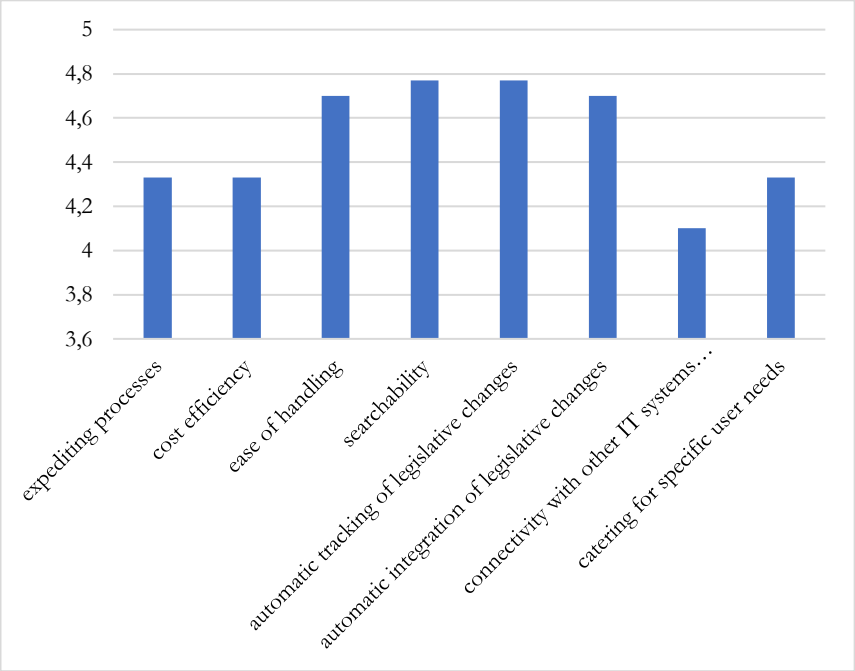
Source: Author's own empirical research, own edited.

From the aggregated results, it can be seen that exposure to changes in legislation is realistic for all of the pre-defined policies, but there are three in particular that are noteworthy also in this context: the Organizational and Operational Rules, the Privacy Policy and the Public Procurement Policy.

The research also assessed the expectations that municipalities think an IT system should meet. The relevant question read as follows: "Please rate on a scale of 1 to 5 the following aspects of IT systems supporting the management of policies:

- expediting processes
- cost efficiency
- ease of handling
- searchability
- automatic tracking of legislative changes
- automatic integration of legislative changes
- connectivity with other IT systems supporting decision-making
- catering for specific user needs."

Figure 3 - Summary of responses on expectations



Source: Author's own empirical research, own edited.

The aggregated results show that all pre-defined and potential "user-friendly" support services received high scores, with none scoring below 4 in importance. Among these high scores, searchability, tracking legislative changes and automatic integration of changes stand out, which shows that these are important requirements of the target group.

III.3. Experiences from the In-Depth Interviews

The in-depth interviews were based on the assumption that digitalization could also bring significant progress in the area of internal rule-making (policy-making), and that there are real and significant user needs and administrative burdens in this area.

An in-depth interview revealed that the Municipality of Terézváros, District VI of Budapest, operates according to more than 50 internal instructions and policies, which together "exceed 1,000 pages". The continuous adaptation of this body of local rules to the changing legislative environment is a "major challenge" for the staff of the municipality. The review is carried out on a quarterly basis and at least 10 to 15 pieces of legislation have to be taken into account, in particular in the areas of public finance, public procurement, labour and occupational health and

safety, data protection and whistleblowing. The drafting, reviewing and validation of internal policies is not a separate professional activity within the municipality, and there are no dedicated human resources available for this legal task.

It can be concluded that, although it is a real and continuous task (burden) for the offices of the municipalities to ensure the legal compliance of internal policies, this task is not carried out with sufficient intensity, given the human resources and time required, and the belief that "these regulatory instruments do not have the same role in a municipality as in a ministry."

Furthermore, "there are primary policies (public service, public procurement, commitments) that we keep up-to-date, and there are policies that are not used on a daily basis, which are more of a way of tracking events."

It is thought-provoking that in the office examined, legislative changes affecting internal policies are notified "on an ad hoc basis", in fact, it is the task and responsibility of the department of the office to monitor changes in the legislation to the portfolio of which the given sector belongs.[26]

A further in-depth interview sheds light on the same issue from the perspective of the county government office responsible for legal supervision.

According to the interviewee:

- "*The notaries of municipalities are often unable even to identify the cases in which policies are to be issued, as the regulatory area is very broad.*"

- "*In several cases it is unclear who is authorised to issue policies (notary, mayor) and whether the policy should be approved by the municipal council based on its content*."

- *"Once issued, the policies are not kept in force. In its reports, the State Audit Office often criticizes the absence of policies or the failure to revise them, or the confusion between the office's organizational and operational rules and its rules of procedure under the Public Finance Act."*

- *"The regulations are issued by the head of the body in a normative instruction under the Act on Legislation[27], which does not constitute a decision under the Act on Municipalities in Hungary[28], thus they do not have to be submitted to the legal supervisory procedure, and their content is not known to the government offices."*[29]

The experiences of the in-depth interview with the legal counsel of the University of Pécs are very similar. The University of Pécs operates according to a total of at least 1-2000 pages of about 120 different policies. Keeping up-to-date of this huge body of internal legislation is also "a very serious challenge due to the volume and the volatility of the legislation". The University has a wide range of activities and the relevant legislation is therefore also very diverse, including rules

[26] Based on an interview with Dr. Sándor Mogyorósi, notary (Office of the Municipality of Terézváros, District VI of Budapest), 25 March 2023.
[27] Act CXXX of 2010 on Legislation
[28] Act CLXXXIX of 2011 on Municipalities in Hungary
[29] Based on an interview with Dr. Bernadett Müllerné Juhos, director-general (Government Office of Baranya County), 29 March 2023.

on education, contracting, labour issues, employment protection, document management, public procurement or data protection. Monitoring changes is a routine task, with "two lawyer colleagues monitoring the Hungarian Gazette on a daily basis and reporting changes." However, this is a time-consuming task in itself, "as, first of all, the amendments relevant to the University have to be selected, and then the internal professional responsible for the area affected by the amendments has to be contacted and agreed whether the change in legislation requires a change in the policy."

The monitoring of changes is a continuous process, but policy changes are made every few months, according to the schedule of Senate meetings. There is no dedicated colleague (or department) whose sole responsibility is to prepare the amendments to the policies, but all the staff in the Legal Department are involved in the process to a greater or lesser extent.

Policies that are not up-to-date can pose significant risks, especially as they include many forms that are used in everyday processes. In a possible administrative or judicial procedure, it can cause serious problems if the day-to-day processes do not follow the legal requirements. The storage and management of policies in a uniform order, as well as the identification and visualization of the interfaces between policies and legislation, would be of great help in keeping policies up-to-date.[30]

Summarizing the experience of the in-depth interviews, it can be concluded that

- Municipalities/universities are responsible for the compliance of a large number and scope of internal standards with a wide range of legislation, which poses a significant challenge on a day-to-day basis, both in terms of monitoring changes and implementing amendments;

- In this area, any technical solution that could help to identify the link between policies and central legislation and to track changes to this central legislation would be of considerable help.

These findings are fully in line with the results of the questionnaire survey, complementing and explaining the reasons behind the results shown there.

IV. Conclusions

Among the possible directions for the digitalization of legislation, one of the most exciting issues is the practical application of the Law as a Code concept, the essence of which is that in addition to the form in which it is currently published in natural language, optimized for human understanding and interpretation, the normative content will be produced also in a form that can be processed by computers. Many levels of this can be envisaged, but as a result of our research we believe that rather

[30] Based on an interview with Dr. Emese Hadnagy, Head of Department (University of Pécs), 3 March 2023.

than a general, broad application of the concept, it is worth thinking in terms of small, focused projects that address a specific problem. In our study, we examined the directions of digitalization possibilities in relation to the internal rule-making (policy-making) of the municipality, the requirements for IT solutions and, above all, the existence of the need for them. In this area, we concluded that there is a significant user demand for exploring the links between internal policies and legislation, including the transposition of policy changes that inevitably result from legislative amendments, which the Law as a Code concept can also support.

STATEMENTS

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This paper is based on the results of research carried out within the framework of the Ministry of Justice's programme aimed at improving the quality of legal education. The research received financial support under this programme.

Data deposition and availability

There is no data set associated with the study. No data deposition was required for this study.

Use of Artificial Intelligence

The authors did not use any artificial intelligence–based system in the preparation of this article.

Author contributions (CRediT)

Gergely László Szőke: Conceptualization; Methodology; Investigation; Formal analysis; Resources; Data curation; Writing – Original Draft; Writing – Review & Editing.

Adrián Fábián: Conceptualization; Methodology; Resources; Writing – Review & Editing.

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Erika Lutring: Investigation; Formal analysis; Writing – Original Draft.

Péter Tilk: Conceptualization; Resources; Writing – Review & Editing.

ANNEX 1 – Questionnaire for municipalities

1. How important do you think it is to use an IT system in your office that supports the administrator's work in individual cases in the application of the law by the authorities?

(Please rate your answer on a scale of 1 to 5; 1 - not important; 5 - very important)

1 2 3 4 5

2. How important do you think it is to have an IT system to support the recording and amendment of your policies?

(Please rate your answer on a scale of 1 to 5; 1 - not important; 5 - very important)

1 2 3 4 5

3. Which are those policies the content of which is most affected by the changing legislative environment? (You can tick more than one answer)

- ☐ Organizational and Operational Rules
- ☐ Document Management Policy
- ☐ Privacy Policy
- ☐ Procurement Policy
- ☐ Public Procurement Policy
- ☐ Organizational Integrity Policy
- ☐ Other

4. Please rate on a scale of 1 to 5 (1 - not important; 5 - very important) the following aspects of IT systems supporting the application of law by authorities in specific cases:

- expediting processes
  1 2 3 4 5
- cost efficiency
  1 2 3 4 5
- ease of handling
  1 2 3 4 5
- searchability
  1 2 3 4 5
- automatic tracking of legislative changes
  1 2 3 4 5

- automatic integration of legislative changes
  1 2 3 4 5
- connectivity with other IT systems supporting decision-making
  1 2 3 4 5
- catering for specific user needs
  1 2 3 4 5

5. Please rate on a scale of 1 to 5 (1 - not important; 5 - very important) the following aspects of the IT systems supporting the management of the policies:

- expediting processes
  1 2 3 4 5
- cost efficiency
  1 2 3 4 5
- ease of handling
  1 2 3 4 5
- searchability
  1 2 3 4 5
- automatic tracking of legislative changes
  1 2 3 4 5

- automatic integration of legislative changes
  1 2 3 4 5
- connectivity with other IT systems supporting decision-making
  1 2 3 4 5
- catering for specific user needs
  1 2 3 4 5

THE INHERITANCE OF CRYPTOCURRENCY AND CRYPTOWALLET PROFILES

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DOI: 10.47272/KIKPhD.2026.1.4

ABSTRACT
The digitalisation is one of the most important aspect in the twenty-first century, and thus huge amount of personal data is being accumulated about each person day-by-day. It is still a debate in many countries who we could view these datasets after the passing of the person and whether the heirs should have the right to access and maintain the dignity, memory of the deceased. One of the element of the so-called 'digital inheritance' would be cryptocurrency which contains an enormous economic potential. This study explores and highlights the reality, the possibility of the inheritance of cryptocurrency, also the wallets, especially the online platform accounts, which these assets are stored in, in a European context through the already existing cases in the world.

KEYWORDS
Cryptocurrency; digital inheritance; non-fungible tokens; post-mortem; online accounts.

ARTICLE HISTORY
SUBMITTED 25 Febr 2026 | REVISED 15 March 2026 | ACCEPTED 20 March 2026

I. Introduction

In the twenty-first century vast amount of data is being generated about a single person. Humanity as a whole could create 402.74 million terabytes of data each day according to our lastest information, and the annual number grows every year at least twety percent since 2010[1]. As a comparison one day a single person could generate approximately between 100–700 MB of data, or about 36.5 GB to 255.5 GB annually[2]. Vast amount of the latter could be considered personal data under the European regime and the General Data Protection Regulation[3] (GDPR), as it could be somehow connected to or indentify a natural person[4]. The legal status, the inheritability of these data or the access to them by the heirs of the deceased are highly debated. One could argue for the perspective of dignity and the maintaining of the memory of the person, but in the last few years also arises the economical questions. Persons could store valuable informations on several online platforms in personal accounts maintained by tech giants like Google, Apple or Microsoft. The acces to these not only means a way to uphold the memory of a certain individual, but in several cases they could host passwords, bank account informations, or even unpublished novels that could worth a small fortune for the heirs. The question is of utmost importance in the digital age of the world to deal with. The study focuses on one aspect of the aforementioned problem, namely the inheritance of the cryptocurrency and as a personal data, the online personal accounts of cryptocurrency wallets. The study examines the hungarian legal regulation and the european perspectives, as well as explores the the findings of the legal scientific literature and views at a few existing cases.

II. The elements of digital assets

As a starting point to articulate the problem we have to define what could be considered as digital assets. According to the European Law Institute (ELI) digital asset is any representation of value the meets the following three criteria[5]. Firstly it needs to be exclusively stored, displayed and administered electronically. Secondly it shall be able to be a subject to a right of control, enjoyment or use with no regads

[1] Fabio Duarte, 'Amount of Data Created Daily' (Exploding Topics, 2026) <https://explodingtopics.com/blog/data-generated-per-day#how-much-data-is-generated-every-day> accessed 31 March 2026.

[2] Michael Jimmink, 'How Much Data Can One Person Generate???' (LinkedIn, 2024) <https://www.linkedin.com/pulse/how-much-data-can-one-person-generate-michael-jimmink-mba-dxscc> accessed 31 March 2026.

[3] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC [2016] OJ L119/1. (hereinafter: GDPR)

[4] GDPR Article 4 (1).

[5] European Law Institute, *ELI Principles on the Use of Digital Assets as Security* (Report, European Law Institute 2022) 17 <https://www.europeanlawinstitute.eu/fileadmin/user_upload/p_eli/Publications/ELI_Principles_on_the_Use_of_Digital_Assets_as_Security.pdf> accessed 31 March 2026.

to the legal origin of the right. Thirdly it should be capable of being transferred between parties. ELI also states the it is irrelevant in the context of the definition what the design feature of the platform are, whether the asset represents monetary value or what protection technologies (for example cryptography) are be used to prevent undue replication, trasmission. According to this definition a huge variety of things could fall under the umbrella. Common examples for digital assets could be files stored on one's personal computer, or in a cloud service, digitally purchased items such as e-books, video games, NFTs, social media account or even cryptocurrencies[6].

The study must also differentiate between cryptocurrency and the so-called Non-Fungible Tokens. There are countless different types of cryptoassets[7] and these assets consists of various features. The main concept of cryptoassets could be categorised into four sub-categories. These are: utility tokens; asset/security/investment/equity tokens; payment tokens; and hybrid tokens, which combines certain elements of the previous ones.

Utility tokens provide access to a service or product and the value of the token adheres to that right of access. These typically do not have exchange function. An example would be the Basic Attention Token (BAT) giving out for digital advertising.

Asset or security tokens digitally represent a different rights or claims against the issuer or third parties, such a profitshare.

Payment tokens are used to pay for goods or services, to make payments. These are used for exchange functions as their main purposes, but could only be considered as quasi-money due to the high volatility of their exchange rate, which contributes to the fact that most people uses these as investments. The payment tokens could be otherwise called cryptocurrency and which would be the main focus of the study[8].

In comparison to the previous ones, NFTs are digital tokens that are non-fungible (non-exchangeable), due to the fact that these correspond to goods that are unique because of their certain characteristics, such as a digital work of art[9].

They cannot be exchanged for the same amount of the same type because of their uniqueness and their different properties.

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[6] Ágnes Juhász, 'Inheriting Digital Assets – A Glimpse Into the Future' (2024) 14(4) Juridical Tribune – Review of Comparative and International Law 547, 548 https://doi.org/10.62768/TBJ/2024/14/4/02

[7] Compare to the database of coinmarketcap.com.

[8] Zsolt Halász, 'The Development of Crypto Legislation in Europe' (2024) 12(1) Hungarian Yearbook of International Law and European Law 439, 441–442 https://doi.org/10.5771/9783748946526-439.

[9] Katharina Garbers-von Boehm, Helena Haag and Katharina Gruber, *Intellectual Property Rights and Distributed Ledger Technology with a Focus on Art NFTs and Tokenized Art* (European Parliament, Policy Department for Citizens' Rights and Constitutional Affairs 2022) 13 <https://www.europarl.europa.eu/RegData/etudes/STUD/2022/737709/IPOL_STU(2022)737709_EN.pdf> accessed 31 March 2026.

They are irreproducible due to the consistance of an irreplicable information or dataset embeded in the token itself[10].

On the European Union level we can find a unified approach to the legal provision regarding cryptoassets in the form of the MiCA Regulation[11]. We have to emphasise that the MiCA Regulation extend to the regulation of digital assets that are non-transferable, that are unique and not substitutable and to those that are financial instruments within the framework of the MiFID Directive[12]. Because the study focuses on the inheritance and assessability by the heirs and not the financial aspects of the tokens I will use cryptoasset in the context of cryptocurrency and NFTs.

There are numerous solutions to store cryptoassets nowadays. Cryptocurrency wallets store long lines of letters and numbers so-alled private keys, that can be paired with public keys on a blockchain to access one's personal cryptocurrency or other digital assets. These wallets could be hardware wallets, where a physical device contains the private key in a usually offline format. The literature also talks about paper wallets, where the wallet would be the print version of the private key, or a QR code. In these cases the inheritance would be tied to the physical thing itself, thus no access question arise in the context of the so-called 'cold wallets'. The other category of cryptocurrency wallets are 'hot wallets' because they are connected to the internet most as a default. These could be software wallets, in which case the private key is stored in a software on one of the devices of the person for example computer and mobile phone. The other type of these wallets are web-based wallets, where an internet provider stores for the person the private key and this could be accessed anywhere, from any device[13]. In the cases of these latter wallets the problem could be where the heirs do not have necessary login information thus the stored financial value of these data could be lost forever.

[10] Claudia Di Bernardino and others, *NFT – Legal Token Classification* (EU Blockchain Observatory and Forum 2021) 2 <https://blockchain-observatory.ec.europa.eu/publications/nft-legal-token-classification_en> accessed 31 March 2026.

[11] Regulation (EU) 2023/1114 of the European Parliament and of the Council of 31 May 2023 on markets in crypto-assets, and amending Regulations (EU) No 1093/2010 and (EU) No 1095/2010 and Directives 2013/36/EU and (EU) 2019/1937 [2023] OJ L150/40.

[12] Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU [2014] OJ L173/349.

[13] Allie Grace Garnett, 'Cryptocurrency Wallets: The Ultimate Beginner's Guide' (Britannica Money) <https://www.britannica.com/money/cryptocurrency-wallet> accessed 31 March 2026.

III. Inheritance of online accounts

The personal online account are considered personal data in themselves, according to the Hungarian Data Protection Authority stated in 2015[14], because they can be connected with the data subject and conclusions could be drawn from them regarding the individual. In accordance with this GDPR rules extend to the process of these personal accounts. But the (33) parangraph of the Preambule of GDPR states the its provision shall not be applied tot he data of the deceased. However, the GDPR creates the possibility for member states to have legislation about the question in their own national jurisdictions.

A few EU countries have already made changes to their national data protection regime to give some form of access for the heirs. In Hungary the data protection act creates the possiblity for the testator to leave a statement with the data controller regarding their will about the data processing in case of their death[15]. However this provision only give acces to the heirs if the controller have made such statement. Also there is the problem that relatives have to know about the existance of these disclosures, and should reach out to the data controller in order to exist their rights. In the case, when there is no knowledge on their part it is almost impossible to map the whether there are any rights they can invoke. If there is no statement, then there is no possibility for the heirs to acces data, thus the stored value is lost for them forever on the internet.

IV. Conclusions

The question of whether the heirs could have access to the personal data, especially the online accounts of the deceased is a rising topic all over the world. The problem with digital- or cryptoassets is that too few owners realise how much care they should focus on their estate planning during their lives. We can see, that the society as a whole is not yet conscious enough to deliberately decide about their digital heritage. Vast amount data is being lost for realtives due to lack of access information and the lack of access rights for them. This lost section of human (digital) persona does not only carry emotional, but in many cases huge financial significance as well. In the European Union there is a trend among the legislatures where, because they have realised the situation of digital inheritance, they are making regulations about the topic on a national level. As of right now there is no single, unionwide piece of legislation that would unify or harmonise the question, but starting from the French-inspired legal systems there are solutions to give access to heirs of the recently departed.

[14] Nemzeti Adatvédelmi és Információszabadság Hatóság, *A Nemzeti Adatvédelmi és Információszabadság Hatóság ajánlása az online adatok halál utáni sorsáról* [Recommendation by the National Authority for Data Protection and Freedom of Information on the Fate of Online Data After Death] (11 November 2015) <https://www.naih.hu/files/Ajanlas_online-adatok-halal-utani-sorsarol.pdf> accessed 31 March 2026.
[15] 2011. évi CXII. törvény az információs önrendelkezési jogról és az információszabadságról [Act CXII of 2011 on the Right to Informational Self-Determination and Freedom of Information], s 25.

STATEMENTS

Disclosure statement
No potential conflict of interest was reported by the author.

Funding
The author received no financial support for the research, authorship, or publication of this article.

Data deposition and availability
There is no data set associated with the study. No data deposition was required for this study.

Use of Artificial Intelligence
The authors used Perplexity AI solely as an auxiliary tool to identify potentially relevant scientific literature. All sources, references, interpretations, arguments and conclusions were independently checked, selected and verified by the authors. The authors take full responsibility for the content of the manuscript.

Author contributions (CRediT)
Conceptualization; Methodology; Investigation; Formal analysis; Resources; Data curation; Writing – Original Draft; Writing – Review & Editing.