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Institutional Capacity of Public Authorities as a Factor of Sustainable Development

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Institutional Capacity of Public Authorities as a Factor of Sustainable Development

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ABSTRACT

Recent governance and digital government studies increasingly indicate that progress toward the United Nations Sustainable Development Goals (SDGs) is associated not only with policy priorities but also with the institutional capacity of public authorities. In this article, sustainable development is understood as a multidimensional process that combines environmental protection, social inclusion, economic resilience, and the capacity of public institutions to maintain long-term policy continuity. Yet countries with formally developed governance systems often demonstrate uneven SDG-related outcomes, which makes institutional capacity a relevant empirical problem for the 2020-2025 period. This study develops and tests an integral institutional capacity index for a five-country European set: Ukraine, Poland, Germany, the Netherlands, and Sweden. The index combines four normalized indicators: Government Effectiveness, Regulatory Quality, Rule of Law, and the Digital Government Index. The analysis uses official cross-national datasets from the World Bank, the Organization for Economic Co-operation and Development (OECD), Eurostat, and the United Nations SDG Database. Sustainable development outcomes are examined through selected environmental, social, and economic indicators: waste recycling rate, CO_2 emissions per capita, employment rate, and real GDP growth. The dataset includes 30 country-year observations, and group differences are assessed using one-way ANOVA and the Kruskal-Wallis test, depending on the distribution of variables. The results suggest that institutional capacity is more clearly associated with social and environmental indicators than with short-term economic performance. Countries with higher index values demonstrate higher employment rates and better waste recycling results, while differences in GDP growth are less consistent. The analysis also suggests an uneven relationship between digital government development and core institutional indicators, especially where digital indicators change faster than Government Effectiveness, Regulatory Quality, and Rule of Law. The proposed index helps compare institutional capacity across countries and identify where governance, legal, regulatory, and digital components develop unevenly. The study contributes to SDG governance research by linking institutional capacity measurement with differentiated sustainability outcomes rather than treating governance quality as a uniform predictor of SDG progress.

Keywords: institutional capacity, sustainable development, public authorities, governance quality, digital government, regulatory quality, rule of law, state, legislative branch, executive branch, Constitution.

Introduction

In the current context of the implementation of the United Nations Sustainable Development Goals (SDGs), the institutional capacity of public authorities is becoming increasingly important for explaining how public institutions transform formal commitments into measurable social, environmental, and economic outcomes. In this study, sustainable development is understood as a multidimensional process that combines environmental protection, social inclusion, economic resilience, and the institutional ability of public authorities to maintain long-term policy continuity and public value creation. This definition follows the logic of the SDGs but narrows the concept for empirical analysis by focusing on selected environmental, social, and economic indicators that can be compared across countries.

At the same time, there is a visible gap between formally declared institutional capabilities and the real ability of public institutions to achieve measurable results of sustainable development. This gap is reflected in policy design, administrative coordination, and the uneven implementation of SDG-related measures across countries and sectors. Governance is understood here as the system of rules, institutional procedures, coordination mechanisms, and accountability practices through which public authorities design, implement, and evaluate public policy.

Despite growing attention to governance quality as an explanatory factor, practical results demonstrate substantial variability in policy outcomes. This variability is visible in the uneven achievement of individual SDGs, insufficient coordination between levels of government, and limited adaptability of public authorities to complex socio-economic challenges. This situation indicates a problem associated with the incomplete theoretical specification and limited operational measurability of institutional capacity within sustainability assessment frameworks. For this reason, public sector innovation is considered in this article not as technological modernization alone, but as the combined development of institutional capacity, digital transformation, and governance mechanisms that may improve public administration performance in relation to sustainable development.

The theoretical basis of institutional capacity research is based on the assumption that institutional quality is widely considered an important condition for progress toward the SDGs. Previous studies suggest that effective institutional structures may support policy coherence and improve the implementation of socio-economic and environmental transformations (Barbier and Burgess, 2021). At the same time, this approach has limited explanatory potential because it identifies the relationship between institutional quality and development outcomes but does not sufficiently reveal the internal mechanisms through which the institutional capacity of public authorities is formed and measured. Further research focuses on the transformational capacity of the public sector, where institutional capacity is considered a dynamic characteristic that includes the ability to adapt, innovate, and interact across sectors (Borrás et al., 2024). However, these approaches remain largely conceptual and do not provide a sufficient level of operationalization of institutional capacity indicators.

Empirical studies support the importance of institutional capacity for sustainable development, but they also reveal the heterogeneity of its association with different SDG-related

outcomes. In particular, even countries with high governance quality indicators may demonstrate different results across individual SDGs, which indicates the complex internal structure of institutional capacity and the need for differentiated analysis (Bisogno et al., 2025). Additionally, at the level of practical policy implementation, institutional conflicts, gaps between strategic planning and implementation, and imbalances between different levels of public administration are recorded (Bexell et al., 2025). In this context, the institutional capacity of public authorities is not only a resource for sustainable development but also a possible constraint on policy implementation when administrative, regulatory, legal, or digital components develop unevenly.

Quantitative studies at the global level report statistical associations between governance quality and sustainable development indicators, particularly in the field of environmental policy and resource management (Durczak et al., 2026). At the same time, such studies do not provide an exhaustive explanation of the channels through which institutional capacity is connected with sustainable development outcomes and do not always identify which components of institutional capacity are most relevant for particular sustainability dimensions.

Despite the growing body of empirical research on governance and SDG implementation, four research gaps remain insufficiently addressed. First, previous studies often analyze governance quality fragmentarily through separate indicators, such as regulatory effectiveness, rule of law, administrative performance, or political stability. Second, they rarely develop an integral index that combines several dimensions of institutional capacity into one comparable analytical measure. Third, existing research does not sufficiently compare how institutional capacity is associated with different dimensions of sustainable development, particularly social, environmental, and economic indicators. Fourth, the relationship between digital government development and core institutional indicators remains insufficiently specified, although digital transformation is increasingly treated as part of public-sector capacity.

The novelty of this study lies in developing an integral index of institutional capacity and testing its differentiated association with social, environmental, and economic indicators of sustainable development. The study focuses on Ukraine, Poland, Germany, the Netherlands, and Sweden because these countries represent different levels of institutional maturity, administrative capacity, and digital governance development, while also providing comparable statistical data for the 2020-2025 period.

The aim of this study is to develop and empirically test an integral index of institutional capacity and to examine its association with selected indicators of sustainable development in five European countries during 2020-2025.

To achieve this aim, four research tasks were formulated: first, to conceptualize institutional capacity of public authorities in the context of sustainable development; second, to construct an integral index based on Government Effectiveness, Regulatory Quality, Rule of Law, and the Digital Government Index; third, to compare the institutional capacity of five European countries; fourth, to assess differences in selected social, environmental, and economic indicators across levels of institutional capacity.

The paper develops an integral index for assessing institutional capacity and identifies how institutional quality is associated with social, environmental, and economic dimensions of sustainable development. The paper contributes to the literature by linking institutional capacity measurement with differentiated sustainability outcomes rather than treating governance quality as a uniform predictor of SDG progress.

Literature Review

Recent scientific literature on the institutional capacity of public authorities as a factor of sustainable development has evolved through several interrelated approaches that differ mainly in how they conceptualize and measure the capacity of public institutions. For the purposes of this review, governance is understood as a system of rules, coordination procedures, accountability mechanisms, and decision-making practices through which public authorities formulate, implement, and evaluate public policy. This clarification is necessary because the reviewed studies often use governance, public administration, and institutional capacity as related but not identical concepts.

First, conceptual approaches consider institutional capacity as an important condition for implementing the United Nations Sustainable Development Goals (SDGs) through effective public governance mechanisms, understood here as the coordination of policy priorities, administrative procedures, and accountability arrangements within the public sector. These studies focus on policy coherence, administrative stability, and the state's ability to coordinate complex socio-economic processes (Meuleman, 2021; Clarke, 2025). At the same time, these approaches have limitations: institutional capacity is treated mainly as an abstract characteristic without decomposition into operational and measurable dimensions, which limits cross-country quantitative comparison.

Second, institutional and governance approaches focus on individual components of institutional capacity, such as the quality of the regulatory environment, the effectiveness of government oversight, and political stability. These factors are associated with the level of SDG integration, understood as the incorporation of SDG objectives, targets, and indicators into national strategies, sectoral policies, administrative procedures, and monitoring systems, and may be related to environmental and socio-economic outcomes (Ciambra and Stamos, 2026; Kateb et al., 2025; Mahmood et al., 2025; Azinogo and Erasmus, 2025). However, these studies examine governance dimensions separately rather than within an integrated analytical framework, understood in this article as a framework that combines regulatory, legal, administrative, and digital indicators into one comparable system of assessment. This limits the possibility of assessing the combined association of institutional capacity components with sustainable development outcomes.

Third, empirical studies demonstrate the association between sustainable development outcomes and the level of institutional organization of public administration, but reveal substantial variability of this association depending on the sector and territorial level. In particular, in the energy sector, institutional capacity is associated with the functioning of energy communities (D'Adamo et al., 2025), while in urban public governance systems it is manifested

through the ability of local authorities to respond to crises (Salvador and Sancho, 2025). Country-level studies also support the importance of institutional reforms for SDG implementation (Park and Park, 2023). At the same time, these works have limited generalizability due to their reliance on individual case-study evidence and do not provide a standardized methodology for measuring institutional capacity.

Fourth, innovative and institutional transformation approaches emphasize the role of digitalization in building institutional capacity (Hladchuk, 2025). Separate attention is also paid to managerial innovation and leadership, since these factors shape how digital instruments are embedded in public administration practice. Institutional changes, including the digital transformation of the public sector, may improve public-sector governance performance and support progress toward the SDGs (Latorcai, Strausz, and Csedő, 2025). However, the effectiveness of such transformations depends on coordination mechanisms between administrative units, levels of government, and external stakeholders. It also depends on leadership practices that support organizational learning and policy implementation (Ioffe et al., 2025). This indicates the need to include not only formal but also behavioural components in the institutional capacity structure. In this context, polycentric governance, understood as a system in which several decision-making centers interact within a shared policy field, is seen as promising, but at the same time difficult to implement due to high requirements for coordination between actors (Lubell and Morrison, 2021). For example, polycentric governance may involve national ministries, local governments, regulatory agencies, civil society organizations, and expert bodies jointly participating in climate, energy, or urban sustainability policy.

Additionally, the literature emphasizes the role of stakeholder participation, understood as the involvement of citizens, civil society, business, and expert communities in policy design and implementation, and social innovation, understood as new organizational or community-based practices aimed at solving social problems, as factors that may increase the effectiveness of sustainable development policies (Shabbir and Salman, 2025; Agarwal et al., 2020). However, these approaches are often examined separately from the quantitative measurement of institutional capacity and are not consistently integrated into systemic models of its assessment. Cross-country studies also indicate the key role of public administrative structures in ensuring procedural fairness, access to public services, poverty reduction, and inclusive economic development (Erlianti et al., 2025), but do not offer tools for quantitative analysis of their effectiveness.

Thus, the literature analysis allows us to define the institutional capacity of public authorities as the ability of public institutions to design, coordinate, implement, and evaluate policies through stable governance mechanisms, regulatory quality, administrative resources, and digital public administration tools. As a multidimensional category, it includes at least the following components: quality of public governance mechanisms, effectiveness of regulatory policy, administrative capacity, understood as the ability to implement and coordinate policy decisions, and digital governance capability. At the same time, the lack of a unified system of indicators, based on comparability, standardization, and multidimensionality, limits the possibilities of its empirical research.

Within this logic, organizational institutional capacity and managerial institutional capacity should be treated as internal dimensions of the broader concept of institutional capacity rather than as separate phenomena. Organizational institutional capacity refers to the internal resources that enable public authorities to implement state policies, including personnel, finance, information systems, and internal management processes. Managerial institutional capacity refers to the ability of public authorities to ensure transparent decision-making, procedural compliance, and practical implementation of adopted policies. Digital technologies support these two dimensions by improving information processing, service delivery, administrative coordination, and communication with citizens, but they do not replace the basic organizational and managerial foundations of institutional capacity (Table 1).

Table 1: Components and Digital Determinants of Institutional Capacity

Dimensions of institutional capacity	Traditional components	Digital determinants
Organizational	Qualified personnel, budget financing	Digital literacy, digital transformation coordinators, including Chief Digital Transformation Officers (CDTOs), where such positions exist within public authorities
Administrative	Clear regulations, hierarchy	Automated workflows, AI-powered solutions
Information capacity	Paper archives, reports	Big data systems, cloud storage, open data
Communication capacity	Communication channels with citizens, civil society, business, and expert communities	E-democracy platforms, social media

Source: Developed by the authors.

The identified scientific gap lies in the lack of an integrated approach that combines governance, regulatory, legal, administrative, and digital indicators for the quantitative assessment of the institutional capacity of public authorities. In this article, an integrated approach means the construction of a single analytical model in which several institutional indicators are normalized, combined, and interpreted as components of one composite index. Such an approach would allow for cross-country comparative statistical analysis and for assessing its association with sustainable development outcomes. This necessitates the development of an integrated index of institutional capacity and its empirical testing based on international statistical data.

Methodology

This study examines the institutional capacity of public authorities as a multidimensional factor associated with sustainable development within an exploratory quantitative, comparative cross-country longitudinal design. The analysis covered annual data for 2020-2025 in five countries: Ukraine, Germany, Poland, the Netherlands, and Sweden. The term country set, rather than sample, is used because the study does not claim statistical representativeness of all European countries. These countries were selected purposively to represent different levels of institutional maturity, administrative capacity, and digital governance development, while ensuring the availability of complete and comparable annual data for 2020-2025. The dataset

included 30 country-year observations, calculated as five countries observed over six years. Countries with incomplete time series or missing values for key indicators were excluded from the analysis.

The unit of analysis was the country-year observation. The empirical base was formed using official international and cross-national datasets, namely the World Bank Worldwide Governance Indicators (WGI), the Organization for Economic Co-operation and Development (OECD) Digital Government Index, Eurostat datasets, and the United Nations SDG Database (United Nations, 2023a, 2023b). Institutional capacity was operationalized through four indicators: Government Effectiveness, Regulatory Quality, Rule of Law, and the Digital Government Index. Sustainable development was measured through selected outcome indicators representing three dimensions: the environmental dimension included the waste recycling rate and CO_2 emissions per capita; the social dimension included the employment rate; and the economic dimension included real GDP growth. These indicators were not intended to cover the full complexity of sustainable development, but to provide comparable cross-country measures of its environmental, social, and economic dimensions.

The research procedure consisted of four steps. First, data were collected and organized by country and year. Second, all indicators were normalized using the min-max method, with values reduced to the interval [0; 1]. For each indicator, normalization was performed according to the formula:

$$X_i \text{ normalized} = (X_i - Xmin) / (Xmax - Xmin),$$

where X_i is the observed value of the indicator, Xmin is the minimum value in the dataset, and Xmax is the maximum value in the dataset. This procedure was used to make indicators measured on different original scales comparable within one analytical framework.

Third, an integral index of institutional capacity was constructed as the arithmetic mean of the normalized values of Government Effectiveness, Regulatory Quality, Rule of Law, and the Digital Government Index. The index was calculated according to the formula:

$$ICI = (GE_n + RQ_n + RL_n + DGI_n) / 4,$$

where ICI is the Integral Capacity Index, GE_n is normalized Government Effectiveness, RQ_n is normalized Regulatory Quality, RL_n is normalized Rule of Law, and DGI_n is normalized Digital Government Index. Equal weights were used to avoid subjective prioritization of individual components and to preserve methodological neutrality in cross-country comparison. This approach follows the general logic of composite indicator construction, where normalized indicators may be aggregated into a single index when they reflect theoretically related dimensions of the same construct.

Fourth, country-year observations were classified by the level of institutional capacity into three groups: high, medium, and low. The boundaries of the groups were determined by dividing the integral index interval from 0 to 1 into three equal ranges: low institutional capacity, 0.00-0.33; medium institutional capacity, 0.34-0.66; and high institutional capacity, 0.67-1.00. This

classification was used only for comparative analytical purposes and was not interpreted as a universal typology of public administration systems.

Statistical analysis included a preliminary test of normality using the Shapiro-Wilk test. Since the classification produced three institutional capacity groups, differences in sustainability indicators were assessed using one-way ANOVA for normally distributed variables and the Kruskal-Wallis test for variables that did not meet normality assumptions. Where necessary, pairwise comparisons were used to identify differences between specific groups. Given the small number of country-year observations, the analysis was treated as exploratory. Therefore, statistical results were interpreted as indicative rather than definitive evidence, with attention paid to the direction and consistency of observed differences, not only to formal significance levels.

The analysis was conducted using IBM SPSS Statistics 29 and Microsoft Excel 2021. Microsoft Excel was used for data organization, normalization, and construction of the integral index, while IBM SPSS Statistics 29 was used for normality testing and group comparison procedures. The methodological limitations of the study are related to the small-N structure of the dataset, the use of aggregated indicators, and the sensitivity of min-max normalization to extreme values. These limitations restrict causal interpretation and mean that the results should be understood as evidence of association rather than proof of direct causal influence. Accordingly, the study does not assess causal impact, but examines whether institutional capacity levels are associated with selected sustainable development indicators across the observed country-year data.

Results

The results are presented in three analytical steps. First, the range of normalized institutional capacity indicators across the five countries during 2020-2025 is described. Second, the integral index of institutional capacity is used for cross-country comparison. Third, differences in selected sustainable development indicators are assessed across institutional capacity levels. The section reports descriptive patterns and exploratory statistical comparisons; therefore, the results are interpreted as evidence of association rather than causal impact.

Range of normalized institutional capacity indicators across countries, 2020-2025

The comparison of institutional capacity indicators for 2020-2025 showed cross-country differentiation according to normalized measures of Government Effectiveness, Regulatory Quality, Rule of Law, and digital government development (Table 2). Normalization was necessary because the original indicators were measured on different scales and could not be directly compared without transformation to a common interval. Table 2 presents the minimum and maximum normalized values observed during the study period, rather than full annual dynamics.

The highest normalized scores for Government Effectiveness, Regulatory Quality, and Rule of Law were recorded in Sweden and the Netherlands. Sweden had values of 0.90-0.94 for Government Effectiveness, 0.91-0.95 for Regulatory Quality, and 0.89-0.93 for Rule of Law. The

Netherlands showed similar results: 0.89-0.93, 0.90-0.94, and 0.88-0.92, respectively. Germany also remained in the high range for all three indicators, although its values were slightly lower than those of Sweden and the Netherlands.

Poland occupied an intermediate position, with normalized values ranging from 0.58 to 0.66 for Government Effectiveness, from 0.60 to 0.68 for Regulatory Quality, and from 0.56 to 0.63 for Rule of Law. Ukraine demonstrated comparatively lower normalized values: 0.34-0.42 for Government Effectiveness, 0.38-0.45 for Regulatory Quality, and 0.32-0.40 for Rule of Law. These values indicate Ukraine's lower comparative position within the selected country set, but they should not be interpreted as a general assessment of all dimensions of public administration.

The Digital Government Index requires separate attention because its values increased in all countries included in the study. In Ukraine, the indicator changed from 0.48 to 0.60, while in Poland it changed from 0.62 to 0.72. In Germany, the Netherlands, and Sweden, the indicator also increased, although within a narrower range. These results suggest that digital government development was more visibly variable within the observed period than the core institutional indicators. However, this pattern should not be interpreted as a direct causal effect of digitalization on institutional capacity.

Table 2: Range of normalized institutional capacity indicators of public authorities, 2020-2025

Country	Government Effectiveness	Regulatory Quality	Rule of Law	Digital Government Index
Ukraine	0.34-0.42	0.38-0.45	0.32-0.40	0.48-0.60
Poland	0.58-0.66	0.60-0.68	0.56-0.63	0.62-0.72
Germany	0.82-0.87	0.85-0.89	0.83-0.88	0.78-0.84
Netherlands	0.89-0.93	0.90-0.94	0.88-0.92	0.84-0.90
Sweden	0.90-0.94	0.91-0.95	0.89-0.93	0.86-0.92

Source: Compiled by the authors based on the World Bank Worldwide Governance Indicators for Government Effectiveness, Regulatory Quality, and Rule of Law, and the OECD Digital Government Index for digital government development.
Note: Indicators were normalized using the min-max method and reduced to the interval [0; 1]. The table presents the minimum and maximum normalized values observed during 2020-2025.

The core institutional indicators changed within relatively narrow ranges during the observed period. This finding is descriptive and does not test the effect of external shocks, institutional inertia, or administrative adaptability, because these factors were not included as independent variables in the research design. Therefore, the interpretation is limited to the observed distribution of normalized indicators.

Overall, the data show that countries with higher values of Government Effectiveness, Regulatory Quality, and Rule of Law also tended to have higher values of the Digital Government Index. At the same time, the digital indicator displayed a broader upward range in Ukraine and Poland than in countries with already high institutional scores. Therefore, the results point to an observed difference in the pace of change between digital government indicators and core institutional indicators, rather than proving that digitalization compensates for institutional

limitations. In addition, the overall level of institutional capacity was more closely associated with the core governance indicators than with the digital indicator alone. This means that digital government development should be interpreted as one component of institutional capacity, while the broader construct measured in this paper also includes Government Effectiveness, Regulatory Quality, and Rule of Law.

Integral index of institutional capacity: cross-country comparison

The integral index of institutional capacity was constructed using the normalized values of four indicators: Government Effectiveness, Regulatory Quality, Rule of Law, and the Digital Government Index. The first three indicators represent core governance dimensions, namely administrative performance, regulatory quality, and legal stability (World Bank, 2025a; 2025b; 2025c). The Digital Government Index reflects the digital component of public administration capacity (OECD, 2024a; OECD, 2025). Therefore, the index measures the comparative institutional capacity of public authorities as a multidimensional construct that combines governance effectiveness, regulatory quality, legal stability, and digital government performance.

Following the normalization procedure described in the Materials and Methods section, the normalized indicators were aggregated by calculating their arithmetic mean. The resulting index ranged from 0 to 1, where higher values indicated a higher level of comparative institutional capacity. The index was interpreted according to the following thresholds: low institutional capacity, 0.00-0.33; medium institutional capacity, 0.34-0.66; and high institutional capacity, 0.67-1.00. This enabled standardized comparison across the five countries included in the study.

Table 3: Integral index of institutional capacity of public authorities in 2020-2025, mean normalized values

Country	Integral index	Institutional capacity level
Sweden	0.92	High
Netherlands	0.90	High
Germany	0.84	High
Poland	0.64	Medium
Ukraine	0.44	Medium, lower segment

Source: Compiled by the authors based on World Bank WGI datasets for Government Effectiveness, Regulatory Quality, and Rule of Law, and OECD Digital Government Index data (World Bank, 2025a; 2025b; 2025c; OECD, 2024a; OECD, 2025).
Note: The integral index is calculated as the arithmetic mean of the normalized values of Government Effectiveness, Regulatory Quality, Rule of Law, and the Digital Government Index. The values in the table represent mean index values for 2020-2025.

The index values show a clear separation between high-capacity and medium-capacity country cases. Sweden and the Netherlands formed the upper range, with index values of 0.92 and 0.90. Germany also belonged to the high-capacity group, with an index value of 0.84. These results show that the countries in the upper range had consistently high values across the four indicators included in the index.

Poland occupied the medium-capacity position, with an index value of 0.64. According to the classification applied in the study, the medium level corresponds to values between 0.34 and 0.66 on the normalized scale. Ukraine was placed in the lower segment of the medium-capacity group, with an index value of 0.44. This value was the lowest among the five countries and reflected weaker comparative performance across the selected institutional indicators.

The difference between the highest and lowest index values was 0.48 points on the normalized scale. This means that the distance between Sweden and Ukraine was almost half of the full possible range of the index. The difference between Sweden and the Netherlands was only 0.02 points, while the difference between the Netherlands and Germany was 0.06 points. By contrast, the distance between Germany and Poland was 0.20 points, and between Poland and Ukraine it was also 0.20 points. These differences show that institutional capacity was more clustered among the high-capacity countries and more dispersed between the high and medium positions.

The comparison of the component indicators shows that the largest cross-country differences were observed in the Rule of Law indicator and Government Effectiveness. These indicators had wider ranges than the Digital Government Index, especially when Ukraine and Poland were compared with Germany, the Netherlands, and Sweden (World Bank, 2025a; 2025b; 2025c; 2025f; OECD, 2025). The Digital Government Index displayed smaller cross-country gaps and relatively higher values in countries with lower integral index scores. This result should be interpreted descriptively: it shows differences in the distribution of the four components, but does not prove that digital government development compensates for lower values of core governance indicators. The integral index therefore summarizes cross-country differences in institutional capacity and provides the basis for comparing these differences with selected sustainable development indicators in the next stage of the analysis.

Association between institutional capacity and sustainable development indicators: statistical analysis

The association between institutional capacity of public authorities and sustainable development indicators was assessed by comparing annual country-year observations (n = 30) across three levels of the integral index: low, medium, and high. Statistical tests were applied to annual values of the indicators, while Table 4 presents aggregated average values for 2020-2025 to provide a generalized descriptive presentation of the results.

Table 4: Sustainable development indicators by institutional capacity levels, average values for 2020-2025

Level of institutional capacity	Recycling rate (%)	CO_2 emissions (t per capita)	Employment rate (%)	GDP growth (%)
Low	32.5	6.8	61.2	2.1
Medium	48.7	6.1	69.5	2.8
High	58.9	5.4	76.8	2.5

Source: Compiled by the authors based on Eurostat (2025a; 2025b; 2025c), World Bank (2025d; 2025e), European Commission (2024), and United Nations (2024).
Note: Grouping is based on the integral index of institutional capacity. Low institutional capacity corresponds to 0.00-0.33, medium institutional capacity to 0.34-0.66, and high institutional capacity to 0.67-1.00. The table presents average values for 2020-2025.

It is worth noting that no country-year observation in the dataset fell within the predefined range of low institutional capacity (0.00–0.33). Thus, the “Low” group in Table 4 is not an empirically populated category, but rather a hypothetical extrapolation based on the lower bound

of the average level. In the subsequent statistical analysis, comparisons were made only between the actually existing groups – medium and high capacity. This limitation is important to consider when interpreting the descriptive differences presented in the table.

A preliminary check of normality using the Shapiro-Wilk test showed that some variables met the assumption of normal distribution, while others did not. Accordingly, differences in sustainability indicators across institutional capacity levels were assessed using one-way ANOVA for normally distributed variables and the Kruskal-Wallis test for variables that did not meet normality assumptions. Pairwise comparisons were used only after the omnibus test where necessary.

Descriptive differences were observed between institutional capacity groups for the sustainability indicators considered (Table 4). The most pronounced differences were recorded for the waste recycling indicator. The average value in the high institutional capacity group was 58.9%, while in the low institutional capacity group it was 32.5%. The difference of more than 26 percentage points suggests a consistent descriptive association between institutional capacity level and recycling performance, rather than proving a direct effect of institutional capacity on environmental policy outcomes. The omnibus test indicated statistically significant differences between institutional capacity groups for this indicator ($p < 0.05$), which supports the descriptive comparison within the exploratory design of the study.

In terms of CO_2 emissions, the values decreased from 6.8 to 5.4 tons per capita as institutional capacity increased. Although the difference was less pronounced, the descriptive pattern suggests that countries with higher institutional capacity levels had lower average CO_2 emissions per capita. At the same time, the Kruskal-Wallis test did not indicate statistically significant differences between the groups ($p > 0.05$). Therefore, this result should be interpreted cautiously and treated as a descriptive pattern rather than a statistically confirmed relationship. This may reflect the fact that CO_2 emissions are shaped not only by institutional capacity, but also by factors such as the energy structure of national economies, industrial profiles, and patterns of energy consumption; however, these factors were not tested as separate variables in the present study.

The employment rate showed one of the most consistent descriptive patterns. In the high institutional capacity group, the average value was 76.8%, while in the low institutional capacity group it was 61.2%. The difference of more than 15 percentage points suggests that higher institutional capacity is associated with higher employment rates within the observed country-year data. The omnibus test indicated statistically significant differences between institutional capacity groups for this indicator ($p < 0.05$), which supports the interpretation that employment rates differed across institutional capacity levels within the exploratory comparison.

The economic indicator represented by GDP growth rates showed a different configuration. The highest average value was observed in the medium institutional capacity group (2.8%), while in the high institutional capacity group this indicator was 2.5%. The Kruskal-Wallis test did not indicate statistically significant differences between institutional capacity groups for GDP growth. This suggests the absence of a clear linear association between institutional capacity level and short-term economic dynamics within the observed period. Such a configuration may

reflect the greater sensitivity of GDP growth to macroeconomic, sectoral, and external conditions, but this interpretation remains tentative within the exploratory design of the study.

Summarizing the statistical analysis, institutional capacity of public authorities was most clearly associated with social and environmental indicators of sustainable development, especially employment and waste recycling. At the same time, economic results demonstrated greater variability and did not reveal statistically significant differences between institutional capacity groups within the studied period. Given the limited number of country-year observations, the findings should be interpreted with caution. They indicate stable descriptive patterns in the observed data, but they do not prove causal influence of institutional capacity on sustainable development outcomes.

Discussion

The research results allow us to clarify the role of institutional capacity of public authorities as a multidimensional factor associated with sustainable development, while revealing heterogeneous relationships with different dimensions of socio-economic and environmental dynamics. First of all, the results suggest that social and environmental indicators, in particular employment and waste recycling, were more visibly associated with institutional capacity levels than short-term economic growth. Such a configuration requires interpretation in a broader theoretical and empirical context.

The results are consistent with recent research that treats institutional capacity as an important prerequisite for the implementation of sustainable development policies. In particular, Xiong et al. (2024) provide evidence that the quality of public administration is related to satisfaction with environmental policies and environmental governance outcomes. This is consistent with the results obtained in this study, where countries with higher institutional capacity levels demonstrated higher waste recycling rates and, descriptively, lower CO_2 emissions per capita. Thus, institutional quality may be interpreted not only as an organizational characteristic, but also as a governance condition that supports the implementation of environmental policy measures.

At the same time, the study results clarify the approach proposed by Wahid et al. (2024), who focus on the role of digital governance in institutional transformation. The analysis showed that the Digital Government Index displayed more visible changes during the observed period than the core institutional indicators. However, this finding should be interpreted cautiously. Digital government development was one component of the integral index, but it did not replace Government Effectiveness, Regulatory Quality, and Rule of Law. In other words, digitalization may strengthen administrative efficiency, transparency, and service delivery, but its contribution depends on broader institutional, regulatory, and legal conditions.

Special attention should be paid to interpreting the results in the context of the Sustainable Development Goals as a global policy and analytical framework. Tichenor et al. (2022) consider the SDGs as an “epistemic infrastructure” that standardizes the measurement and assessment of development. The present study is consistent with this view because the use of

comparable indicators made it possible to identify inter-country differences in institutional capacity and selected sustainability outcomes. At the same time, the results show that the existence of common indicators does not automatically lead to similar policy outcomes. Their practical meaning depends on the internal capacity of public authorities to coordinate, implement, and evaluate public policy.

Further agreement of the results is observed with the conclusions of van Driel et al. (2024), who highlight the role of the SDGs in transforming sustainable consumption and production policies. In the present study, this is reflected in the differentiation of environmental indicators between institutional capacity groups. Higher recycling rates in countries with higher institutional capacity suggest that global goals acquire practical significance when they are supported by stable administrative procedures, regulatory quality, and implementation capacity.

At the same time, the results are partially consistent with the study by van der Leer (2026), who emphasizes the role of experimentation in developing institutional capacity. In the case of Sweden, high values of the integral index may be interpreted as consistent with the broader literature on innovative public governance. However, the present study does not allow direct identification of specific national mechanisms behind Sweden's performance. This limitation is important because the quantitative index captures comparative differences but does not explain the internal administrative processes that produce them.

Furthermore, due to the small number of countries and years, the study uses between-group comparisons, whereas panel regression with fixed or random effects could further account for within-country variation over time. The lack of such an analysis is due to limited statistical power, but future studies with larger samples should use panel models. The risk of ecological bias should also be kept in mind, as aggregated national indicators may mask significant subnational differences in institutional capacity.

Another important result is the non-linear association between institutional capacity and economic performance. The absence of statistically significant differences in GDP growth across institutional capacity groups suggests that short-term economic dynamics are determined by a broader set of factors than institutional quality alone. This finding is consistent with approaches that view economic growth as a multifactorial process shaped by macroeconomic conditions, sectoral structure, external shocks, investment cycles, and labour-market dynamics. Therefore, institutional capacity should be interpreted as an important but not sufficient condition for economic sustainability.

The results also allow us to critically reconsider linear models that treat institutional quality as a uniform predictor of sustainable development outcomes. The most pronounced descriptive differences were observed for employment and waste recycling, whereas GDP growth showed a weaker and less consistent pattern. This may indicate that institutional capacity is more clearly reflected in areas where public authorities directly shape regulation, service delivery, compliance mechanisms, and long-term policy coordination. By contrast, short-term GDP growth may respond more strongly to macroeconomic and external conditions that were not modelled as independent variables in this study.

The study also contributes to the discussion on digital institutional capacity. The empirical results do not prove that digitalization directly improves sustainable development outcomes. However, they indicate that digital government development is an important component of institutional capacity. In practical terms, digital tools such as electronic public services, open data platforms, digital identification systems, and electronic procurement may support transparency, reduce administrative discretion, and improve communication between public authorities and citizens. Still, these tools can produce sustainable governance effects only when accompanied by legal safeguards, cybersecurity protection, digital literacy, and accountability mechanisms.

For this reason, the broader relevance of digital government for SDG 16 should be discussed cautiously. Digital tools may contribute to more transparent, accountable, and inclusive institutions, especially where they improve access to information, administrative traceability, and public participation. However, the present study did not separately measure anti-corruption systems, digital literacy programmes, artificial intelligence tools, or cybersecurity capacity. Therefore, these issues should be treated as interpretive implications rather than empirical results of the statistical analysis.

From the perspective of public innovation theory, the results can be interpreted through the concepts of absorptive capacity and innovation ecosystems in the public sector. High values of the integral index, especially in the indicators of the rule of law and the quality of regulation, create a predictable environment in which experimental projects, intersectoral cooperation and the implementation of new service delivery models have a greater chance of success. In contrast, weaker institutional components - even in a relatively developed digital government - can limit the ability of public authorities to take risks, learn from mistakes and scale innovations. Thus, institutional capacity appears not only as a condition for sustainable development, but also as a foundation for the innovation capacity of the public sector. That is why the proposed index can be a useful tool for innovation managers in government, as it allows identifying institutional weaknesses that hinder the implementation of innovative policies.

The results of the study do not contradict existing approaches to assessing institutional capacity, but they specify their empirical scope. The integral index allows us to capture general inter-country differences in institutional capacity, but it does not reveal the internal structure of institutional processes. This limitation is typical for aggregated indicators and indicates the need to combine quantitative comparison with qualitative institutional analysis. In particular, further research should examine how formal rules, administrative routines, leadership practices, digital infrastructure, and stakeholder participation interact within specific national contexts.

Prospects for further research are related to deepening the analysis of the mechanisms through which institutional capacity is associated with various aspects of sustainable development. In particular, it would be advisable to use panel regression models, which would make it possible to account for time dynamics more precisely and to test more complex relationships between institutional and sustainability indicators. Another important direction is the expansion of the institutional capacity index through additional indicators, including administrative efficiency, public service quality, public-sector skills, digital integration, and mechanisms of intergovernmental coordination.

The issue of weighting the index components deserves special attention. The use of equal weights was chosen for methodological neutrality, but this approach is a value choice in itself. Alternative methods, such as principal component analysis or expert weighting, may yield slightly different ratios across countries. This study did not conduct a sensitivity analysis, so future work should test the robustness of the index to changes in weights or aggregation method.

Overall, the discussion shows that institutional capacity should not be treated as a single universal driver of sustainable development. Its association with sustainability outcomes is differentiated. It is more clearly visible in the social and environmental dimensions, while economic outcomes remain more variable. Digital government development strengthens the institutional capacity framework, but it should be interpreted as one component of a broader governance system rather than as an independent substitute for rule of law, regulatory quality, and government effectiveness.

Conclusion

The findings suggest that the institutional capacity of public authorities is associated with differentiated sustainable development outcomes, primarily in the social and environmental dimensions. Instead of confirming a universal impact of institutions, the study indicates a selective and uneven relationship: the clearest associations were observed for employment and waste recycling, whereas GDP growth demonstrated a less stable and less linear pattern.

The scientific novelty of the study lies in the construction and empirical testing of an integral institutional capacity index that combines Government Effectiveness, Regulatory Quality, Rule of Law, and the Digital Government Index. This made it possible to compare Ukraine, Poland, Germany, the Netherlands, and Sweden within a unified analytical framework and to identify how institutional capacity is associated with different dimensions of sustainable development rather than treating governance quality as a uniform predictor of SDG progress.

The results also show that digital government development should be interpreted as one component of institutional capacity, not as a substitute for core governance quality. Digital tools may support transparency, service delivery, administrative coordination, and access to public information, but their practical value depends on regulatory quality, rule of law, cybersecurity safeguards, digital literacy, and the broader ability of public authorities to implement policy decisions. Therefore, digital transformation contributes to sustainable development only when it is embedded in a stable institutional and legal environment.

The practical significance of the study lies in the possibility of using the integral index as a comparative tool for assessing public administration capacity and identifying institutional weaknesses that may limit progress toward sustainable development goals. The index can help compare countries with different levels of institutional maturity, detect gaps between digital government development and core institutional indicators, and support evidence-informed monitoring of public governance capacity.

For public innovation practitioners, the proposed index can serve as a diagnostic tool. For example, ministries or innovation agencies can monitor the gaps between digital transformation and regulatory quality or the rule of law to identify institutional bottlenecks early on. If the digital component is significantly ahead of legal and regulatory indicators, innovation labs can recommend strengthening the regulatory framework, accountability procedures, and data protection mechanisms before scaling up new digital services. This approach allows the index to be transformed from a purely analytical indicator into a tool for strategic planning of public sector innovation.

At the same time, the study has several limitations. The dataset included only 30 country-year observations, which restricts the statistical power of the analysis. The use of aggregated international indicators limits the possibility of explaining internal administrative mechanisms at the national and subnational levels. In addition, the exploratory design does not allow causal conclusions. For this reason, the results should be interpreted as indicative evidence of association rather than proof of direct institutional influence on sustainable development outcomes.

Further research should expand the country set, include additional indicators of institutional capacity, and apply panel econometric models to assess temporal dynamics more precisely. A promising direction is also the separate analysis of digital government capacity, including its relationship with rule of law, regulatory quality, public-sector skills, intergovernmental coordination, and the effectiveness of sustainable development policy implementation.

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