Sustainability in Public Policy: Analyzing How Local Governments Can Implement Sustainable Practices in Urban Planning and Resource Management

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Abstract:

This study examines how Egyptian local governments implement sustainable practices in urban planning and resource management by analyzing relationships between policy framework characteristics, organizational learning, technological environments, and sustainability performance indicators. The research tests six hypotheses using a quantitative survey, structural equation modeling (SEM). In addition to other secondary municipal performance data, primary data collection was focused on urban planners and sustainability managers. The proposed conceptual model was analyzed using SmartPLS software which takes into consideration direct relationships, mediating and moderating relationships. Findings affirm that the characteristics of the policy framework have a significant influence on the sustainability performance indicators (H1) and learning and capacity building in the organization (H2). The organizational learning has a positive impact on the sustainability performance (H3) and mediates the policy performance relationship (H4). Both the sustainability performance (H5) and the organizational learning

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(H6) are moderated by technological and innovation environments between the policy frameworks and the relationships. The policy-outcome relationships are more robust in municipalities that are in favorable technological settings. This research provides the first comprehensive empirical examination of sustainability policy mechanisms in Egyptian local government, filling critical gaps in developing country literature. The integrated framework simultaneously examines multiple relationship types, offering evidence-based guidance for improving municipal sustainability policy effectiveness in resource-constrained environments.

Keywords: Sustainability policy, urban planning, local government, organizational learning, capacity building, policy framework, sustainability performance indicators.

1. Introduction

Sustainable urban development has become one of the most urgent issues of the 21st century, as urban centers around the world struggle with the problems of high population growth, resource loss, and environmental deterioration (El-Raey et al. 2023; Sustainable Development Solutions Network, 2021). Introducing sustainability into the frameworks of the public policies will be a significant channel of overcoming such compound problems, as local governments will have to reconsider their classical models of urban planning and resource management (Alawadi et al. 2024). The modern concept of sustainability highlights the interdependence between environmental protection, social equity, and economic feasibility and requires broad policy frameworks, which can efficiently integrate various aspects of urban growth and help to promote organizational learning and technological evolution (Huang et al. 2021).

Egypt is a country with its own set of sustainability challenges that are both global and domestic. In the context of developing countries, specifically in the Middle East and North Africa region, Egypt is experiencing its own set of sustainability challenges (OECD, 2024). In Egypt, particularly in Cairo,

Alexandria, and the new urban centers of the Nile Delta, there are unprecedented strains of urbanization pressures, alongside resource scarcity, infrastructural inadequacies, and environmental weaknesses (Abdel-Rahman and Mohamed, 2015). As shown in the Egyptian government vision 2030 and New Administrative Capital project, the country is committed to sustainable development, but there are still major disparities in the ability of its local governments to carry out effective sustainability policies at the local level (El-Ashry et al. 2023). Limited financial resources, lack of technology, institutional fragmentation and insufficient organizational learning processes are common issues affecting Egyptian municipalities that limit their capacity to transform sustainability aspirations into practical results (Denis, 2014).

This research problem focuses on the multifaceted connections between the design of policy frameworks, organizational capabilities, technological environments and sustainability performance within the context of Egyptian local governments. Although the study focusses on sustainable city governance at an individual level, it remains unclear how the characteristics of policy frameworks directly influence sustainability performance indicators, as well as how organisational learning and capacity building contribute to sustainability outcomes, serving as intermediaries between policy frameworks and sustainability results (Myeong and Bokhari, 2023). Moreover, the moderating effect of the technological and innovation surroundings as the driving factors that might stimulate or suppress the effectiveness of policy interventions is not well investigated in an urban setting in the Middle East (Zhang and Liu, 2025).

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The basic question that is addressed in this study is how local governments can improve their sustainability performance:

How do specific characteristics of policy frameworks directly influence measurable sustainability outcomes in Egyptian municipalities?

The ultimate objective of this study is to come up with a rich picture of how policy framework factors, organizational learning and capacity building, technological and innovation, and sustainability performance indicators relate within Egyptian local government settings. The research aims at empirically testing a conceptual model which investigates the direct effect as well as the interaction effects between these variables with specific focus on the mediating effect of organizational learning and moderating effect of technological environments (Ika and Donnelly, 2017). The research will produce theoretically and practically important insights through the targeting of Egyptian municipalities to enhance the effective practice of sustainability policy within similar developing country settings.

This research problem was prompted by the fact that there is a pressing need to close the gap between sustainability policy ambitions and implementation realities in the developing world. The fast urbanization process, limited resources, and environmental pressures in Egypt provide the perfect laboratory to study the interaction between policy design and organizational capabilities to produce sustainability outcomes (UN-Habitat, 2019). The study is also driven by the fact that a successful sustainability transition could only be achieved through effective policies, but also through able organizations and favorable technological conditions (Wu et al. 2025). Knowledge of these relationships can help to enlighten policy makers, urban planners and development practitioners on how to formulate more effective interventions in achieving sustainable urban development.

This research has proven empirically, through the statistical significance of the positive relationship between the features of policy systems and both indicators of sustainability performance

and the ability to engage in organizational learning and capacity building, that the theoretical assumptions are indeed true. The findings confirm the status of organizational learning and capacity building as a strong mediator in the correlation between policy frameworks and sustainability performance, that policy effectiveness is improved considerably by organizational capacity development processes (Pearson, 2011). This mediation effect demonstrates that properly designed policy frameworks do not only has a direct positive impact on sustainability outcomes but also has an indirect positive impact by enhancing organizational capabilities which in turn benefits performance.

Moreover, the results of the research establish the moderating role of technological and innovation environment, whereby favorable technological environments have a significant positive impact in enhancing the positive impacts of policy frameworks on organizational capabilities and sustainability performance (Li et al. 2024). The moderation analysis also indicates that municipalities that work in high-technology and innovation contexts have better correlations between the quality of policy frameworks and performance outcomes, whereas municipalities in less favorable technological environments have poorer policy performance relationships (Ahmad et al. 2023). These findings are a strong signal that the success of sustainability measures is highly dependent on the organizational learning processes and on the technological platform that can be used to implement them.

This research has implications on a variety of stakeholders engaged in sustainable urban development. To policy makers, the research will guide them based on evidence on how to formulate policy frameworks that promote sustainability performance and the development of organizational capabilities (Global Infrastructure Hub, 2019). With regard to the municipal administrators, the study will bring to their attention the need to invest in organizational learning, capacity building as part of the sustainability strategy implementation. To development agencies and other international

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donors, the research will guide them in designing programs and allocating funds to be used by different countries to realize the effectiveness of policies through technological environments (United Nations, 2021).

This study adds to the literature of sustainability governance as it empirically supports the conceptual models of sustainability governance and takes into account the particular problems of developing country municipalities (Ren et al. 2022). The paper is divided into 6 major parts: the review of the literature, that develops the theoretical backgrounds and formulates the hypotheses of the research; the methods section that discusses the research design, data collection methods, and the tools to be used in analyses; the results section which is an empirical evidence of the research and testing of the hypotheses; discussion section that explains the results in terms of the broader theoretical and practical implications; and the conclusion section, which summarizes what the research has contributed to the field, limits and future research and policy practice recommendations.

2. Literature review

2.1 Policy framework characteristics

Policy frameworks are those structural frameworks that drive the decision-making in organizations and strategic direction in sustainability initiatives (Kolk et al. 2021). These frames include official policies, unofficial rules, organizational frameworks, and institutional provisions that influence the manner in which organizations make decisions in relation to environmental, social and economic issues (Biermann et al. 2022). Proper policy frameworks should be defined by their comprehensiveness, flexibility, inclusion of stakeholders and alignment to local contexts as well as international standards of sustainability (Glasbergen et al. 2018). They have explicit prescriptions of action and they are flexible enough to address emergent challenges and opportunities in the sustainability space.

Transparency in the implementation process, accountability measures to guarantee compliance and the provision of performance tracking and integration capacities to enable the coordination of various organisational levels and sectors are characteristics of sound policy frameworks (Biermann et al. 2022; Zaccara et al. 2023). Moreover, effective policy frameworks exhibit consistency between short-term operational objectives and long-term sustainability objectives, integrate evidence-based decision making procedures, and support effective stakeholder engagement (Liu, 2017). These structures should also be adaptive to fluctuating environmental factors, technology and emerging societal demands together with ensuring stability and predictability to organizational planning and investment decision making (Kolk et al. 2021).

2.2 Organizational learning and Capacity Building

Learning in long-term sustainability is an organizational learning method that entails acquiring, processing and utilizing knowledge that improves the effectiveness of an organization in responding to environmental and social issues (Amui et al. 2017). This is done through the establishment of dynamic capabilities that allow organizations to transform their practices, strategies, and structures to respond to sustainability imperative (Amui et al. 2017). Capacity building is both a personal skill building and institutional building aimed at establishing sustainable knowledge management systems, innovation processes, and adaptive management practices (Pact Organization, 2024). Those organizations that perform well in this regard show ongoing enhancements in their sustainability performance with regard to iterative learning cycles and mechanisms of knowledge sharing.

Organizational learning and capacity building efforts rely on a number of essential components, such as leadership commitment, resource allocation, cultural preparedness to change, and the creation of learning-oriented frameworks and mechanisms (Henri, 2019). Effective organisations promote an environment where

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experimentation is encouraged, controlled failure is accepted as a learning experience and lessons learnt are systematically captured and propagated (Amui et al. 2017). This involves building internal competence, working across functions, forging alliances with external sources of knowledge, and putting in place feedback systems that guide decisions in the future (Henri, 2019). The process of capacity building should also focus on the technical abilities as well as soft skills required to become a sustainability leader, change manager, and stakeholder communicator.

2.3 Sustainability performance indicators

The sustainability performance indicators are quantitative and qualitative metrics that enable organizations to measure, monitor, and report on their performance in regards to sustainability goals (Global Reporting Initiative, 2024). Such indicators are such as environmental indicators such as carbon emissions, resource used, waste produced and biodiversity indicator and social indicators such as employee well-being, community involvement, human rights and social equity (Sievo, 2024). The economic indicators are assured with sustainable value creation, long-term financial sustainability, and sustainability consideration when included in business models (Khatri, 2025). Good indicator systems address all the aspects of sustainability and equally manageable and realizable to the organization.

The processes of developing and implementing sustainability performance indicators must be materiality sensitive, stakeholder relevant, and available, and aligned with other existing frameworks, such as the Global Reporting Initiative (GRI), Sustainable Development Goals (SDGs), or sector-specific standards (Global Reporting Initiative, 2024; Lumen Learning, 2024). Good quality indicators show the characteristics of relevancy, reliability, comparability, and timeliness and enable organizations to track the trends, identify areas of improvement and performance in comparison with peers or best practices (International Institute for Environment and Development, 2024).

2.4 Technological and Innovation Environment

The technological and innovation environment also includes that broader technology capacity ecosystem, innovation practices and enabling infrastructure that supports the creation and deployment of sustainable solutions by organizations (Hekkert et al. 2018). This environment includes the presence of clean technologies, online sustainability management, research and development, and networks of innovations that can jointly share knowledge and resolve issues (Polishchuk, 2023). Rapid technological innovation in renewable energy, artificial intelligence, biotechnology, and solutions based on the circular economy offers both an opportunity and a challenge to all organizations that have the desire to enhance their sustainability performance through innovation promotion (Wang et al. 2023).

Being operational in a dynamically evolving technology and innovation industry, organizations must develop technology evaluation, adoption, and integration capacity and manage the challenges presented by emerging technologies (Al-Shammari et al. 2023). This includes the implementation of innovation governance systems, building relationships with technology providers and research facilities and the creation of internal cultures of exploration and continuous learning (Schot and Steinmueller, 2018). The regulatory or regulatory framework enabling or inhibiting technological development, funding mechanisms enabling sustainability innovations, conditions in the market that influence the commercial viability of a new technological development are also part of the innovation environment (Hekkert et al. 2018). To successfully operate in this landscape, a company should take caution to not go too far with experimenting with new technologies, but exploit the current ones, to make sure that the investments in technology are aligned with sustainability objectives and organizational strengths (Wang et al. 2023).

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2.5 Policy framework characteristics and Sustainability performance indicators

Policy framework features/sustainability performance indicators: This is one of the core alignment of the policy framework that determines the efficiency of organizational sustainability work (Biermann et al. 2022). Well organized policy frameworks establish performance standards of sustainability and demand the use of specific indicators or reporting standards, which introduce accountability systems resulting in organizational action (Kolk et al. 2021). When performance targets, reporting requirements and compliance mechanisms are established in policy frameworks, the sustainability indicators organizations prioritize and the way they structure their measurement systems have a direct effect (Global Reporting Initiative, 2024). Such a congruency would make it so that organizational sustainability activities are coordinated to goals on policy-wide levels and that policy-makers can use such data to know how effective their policies are and to make informed decisions.

It is also possible to combine the characteristics of policy frameworks with the features of sustainability performance indicators, which enable standardization and comparability of organizations and industries, which make benchmarking more effective, and the best practices can be identified (Lumen Learning, 2024). The indicators of performance can vary due to the further development of science and the shift of priorities in the society, based on policy frameworks with adaptive management principles. However, challenges may arise when policy frameworks establish indicators which may not be applicable in all organizational contexts or where the necessity to effect periodic changes in policy causes an unstable measuring system. To achieve effective integration, it includes constant interaction of the policymakers with the implementing organizations to guarantee that the relevance and feasibility of the requirements of the indicators can be used to promote the sustained enhancement of the sustainability performance, consistency and accountability of the policy (Biermann et al. 2022).

2.6 Policy framework characteristics and Organizational learning and Capacity Building

Policy framework features are very influential to organizational learning and capacity building because they stipulate the institutional environment in which organizations develop their sustainability capabilities (Liu, 2017). Assertive policy frameworks create the conditions of knowledge acquisition, skill building, and institutionalization by providing sources of funds, regulatory clarity, and unrestricted stability that render investment in learning initiatives desirable (Hekkert et al. 2018). Adaptive Management Policies, stakeholder participation, and evidence-based decision making are policies that promote organizational cultures that are open to a culture of continuous learning and improvement. Moreover, the policies that necessitate collaboration, knowledge sharing or capacity building activities and offer peer-peer learning and technical support networks directly activate the organizational learning processes (Amui et al. 2017).

The success of such a relationship depends on the effectiveness of the policy frameworks to be oriented towards learning and adaptation rather than being driven towards compliance and control (Klerkx et al. 2010). Progressive policy frameworks will incorporate feedback loops that may facilitate learning and adjustment to implementation experience of the policy, which will create a vicious cycle of improvement at the policy and organizational level (Biermann et al. 2022). However, rigid or even moving policy regimes can impede organizational learning and create a sense of insecurity, channel resources elsewhere to capacity building processes or scare off long-term learning infrastructure investments. The most appropriate policy design is the one that is neither too stable nor flexible to the extent that it provides direction but allows organizations to learn strategies and capabilities that may be context-relevant (Liu, 2017).

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2.7 Organizational learning and Capacity Building and Sustainability performance indicators

The connection between organizational learning and organizational capacity building programs and sustainability performance indicators creates powerful processes of continuing improvement of sustainability performance (Henri, 2019). Effective learning is considered to increase the likelihood of companies sensing the presence of relevant performance indicators, developing an effective system of data collection and analysis, and utilizing performance data in their operation change and strategic decision-making (Amui et al. 2017). Sustainability performance measurement and monitoring in itself constitute a learning process, which reveals the knowledge gaps, capacity-building, and learning areas that govern sustainability strategies in the future (Global Reporting Initiative, 2024). This offers a vicious cycle where an increase in measurement skills leads to a greater learning that leads to higher performance and more sophisticated means to measure.

In order to effectively combine these elements, organizations should view performance measurement not only as a reporting exercise but as a strategic tool that could assist organizations to grow and improve (Henri, 2019). The performance insights may be translated into actionable improvements as the high-performing organizations can perform in the data literacy, analytical, systems thinking, and change management areas (Khatri, 2025). The connection to the external learning opportunities is also possible whereby the performance data can be utilized by the organizations to engage in the peer interactions, participate in the benchmarking process, and contribute to a bigger body of knowledge regarding sustainability practices (Sievo, 2024). The issues that can arise because of this relationship are that the measurement systems are overcomplicated or resource-intensive, performance data is not effectively circulated to decision-makers, or the organizational culture is not open to learning and adapting based on data (Henri, 2019).

2.8 Technological and Innovation Environment and Policy framework characteristics

The interaction of the technological and innovation environment and the property of policy framework creates the conditions which facilitate or slow down the adoption and establishment of sustainability technologies and practices (Hekkert et al. 2018). Policy frameworks play an important role within the environment of innovation as they serve as the areas of research funds and regulatory criteria to introduce innovation needs, intellectual property protection, and market-oriented mechanisms to define the commercial viability of sustainable technologies (Al-Shammari et al. 2023). The innovative policy models create both the innovation pull by the establishment of demanding sustainability objectives that necessitate technological remedies and the creation of technology push, through research and development financing, demonstration initiatives and trial market development initiatives (Wang et al. 2023). The private sector should create consistent signals to inform institutional investment and focus by research institutions by aligning policy goals and innovation priorities (Schot and Steinmueller, 2018).

The dynamism of the technological development as well as the development of the policy requires structures capable of responding to the quick pace of change and at the same time provide a minimum of stability in the policy of long term innovation. The balance between wishing to open up to new technologies and the necessity not to lock-in too soon, to a collection of technological paths that may prove to be suboptimal in the long run, should be achieved by policy frameworks (Polishchuk, 2023).

This will require high-level policy formulation expertise, which incorporates technology appraisal, futuristic procedures and receptive management approaches (Klerkx et al. 2010). Moreover, sustainability problems and the technology markets are, in most of the cases, international in nature, which necessitates policy

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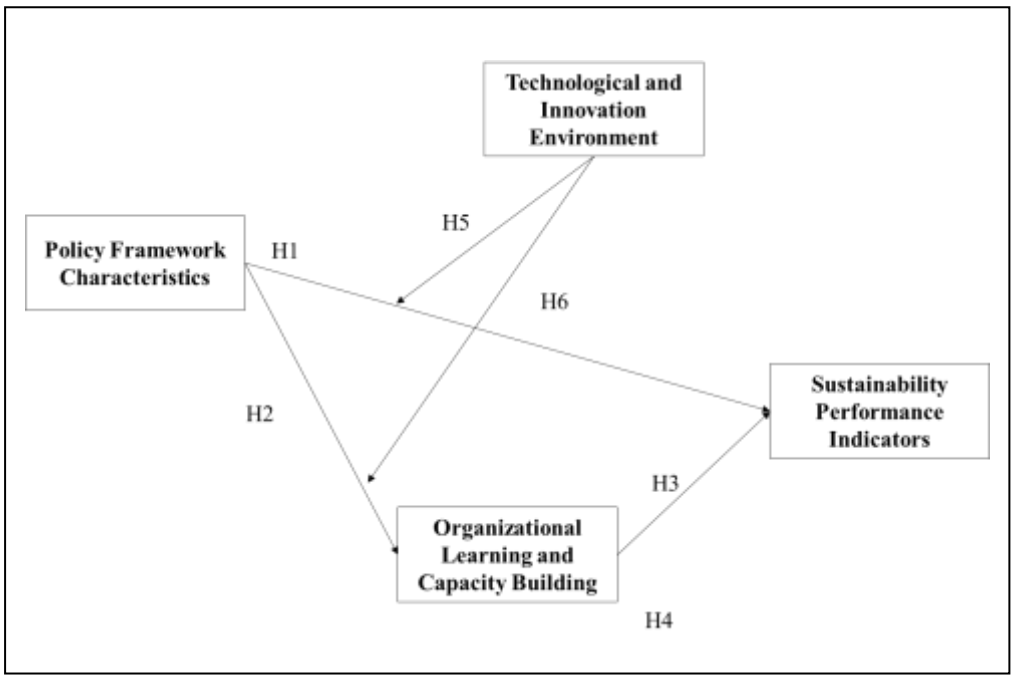
regimes, which would facilitate international collaboration, technological transfers, and the harmonization of innovation practices across jurisdictions (Ben Yosef et al. 2020). The best way to make this relationship work is to ensure the availability of communication between the policy-makers, technology developers and end-users all the time to ensure that the policy-structures can adapt to the technological potentials without forgetting their aims of sustainability (Hekkert et al. 2018).

Therefore, the research model and hypothesis as follows:

Research Model



Research Hypothesis

H1: Policy framework characteristics has a significant effect on Sustainability performance indicators

H2: Policy framework characteristics has a significant effect on Organizational learning and Capacity Building

H3: Organizational learning and Capacity Building has a significant effect on Sustainability performance indicators

H4: Organizational learning and Capacity Building mediates the relationship between Policy framework characteristics and Sustainability performance indicators

H5: Technological and Innovation Environment is the moderator of Policy framework characteristics and Sustainability performance indicators

H6: Technological and Innovation Environment is the moderator of Policy framework characteristics and Organizational learning and Capacity Building

3. Methodology

3.1 Research Design

The current study will follow a quantitative research design based on a cross-sectional survey design to investigate the associations among the policy framework features, organizational learning and capacity building, technological and innovation environment, and sustainability performance measure within the Egyptian local government settings. The study uses a positivist paradigm by attempting to assess theoretical hypotheses using empirical data gathered and analyzed statistically (Creswell and Creswell, 2018). The quantitative methodology is considered suitable to this study because it allows measuring complex constructs, performing tests across several relationships at once, and producing generalizable results that can be applied to the context of Egyptian municipalities (Hair et al. 2019).

3.2 Population and Sampling

The target population will include professionals working in companies that engage in sustainability efforts in Egypt, both in the government sector and the business sector, non-profit organizations and international organizations. The research is aimed at employees of different departments such as operations, human resources, finance, marketing, IT, sustainability/CSR, and other

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functional departments that directly or indirectly engage with organizational sustainability practices and policy. To represent a variety of organizational contexts and methods of sustainability implementation, the sampling frame includes organizations of various sizes (small: 1-50 employees, medium: 51-250 employees, large: 251-1000+ employees).

The research uses multi-stage stratified random sampling method in order to provide representative coverage of organizational types (public versus private sector, non-profit versus international organizations), organizational sizes and geographical locations in Egypt (Sekaran and Bougie, 2016). Stratification is determined by the type and size of organization in order to have sufficient representation of the various contexts of sustainability. Position levels (entry level, mid-level, senior level, management, executive) are also taken into account in the sampling to obtain different views on the sustainability policy implementation and organizational learning processes.

To determine the right sample size, sample size calculation formula was used as put forward by Cohen (1988) where he took into account the complexity of the structural equation model and enough statistical power. According to the formula of SEM research established by Bentler and Chou (1987), the minimum size of the sample is 200 respondents and the formula recommended is: n = 50 + 8m (where m is the number of independent variables used in the formula). The specified minimum sample size of 282 respondents is due to the presence of four constructs and multiple variables of interest used to measure the constructs in the study. A target population of 350 respondents was adopted to accommodate the probable non-response rate and unfinished surveys and allowed an overshoot factor of about 24% (Hair et al. 2019).

3.3 Pilot Study

To determine the reliability, validity, and comprehensibility of the questionnaire, a pilot study was developed using 45 municipal officials who represent various levels of the organization and governorates. The pilot study sample was chosen by

convenience, and it did not belong to the formal sample of the main study (Sekaran and Bougie, 2016). The objective of the pilot study was to determine possible problems with the wording of questions, form of responses, the length of the survey, and cultural relevance in the Egyptian context. Pilot participant feedback was systematically gathered by using both the quantitative reliability assessment and qualitative feedback.

The pilot study findings were reported as high internal consistency of all construct measures, with Cronbach alpha values of 0.78 through to 0.91, which is higher than the recommended value of 0.70 (Nunnally, 1978). The questionnaire was slightly adapted in response to the pilot feedback, with technical terms being clarified, response scales changed, and some items culturally adjusted. The pilot study also affirmed that the average time taken to complete the work was about 25-30 minutes, which was also acceptable by the target respondent population.

3.4 Data Collection Instrument

A structured questionnaire elaborated on a set of previous sustainability and organizational studies and adjusted to the local government environment in Egypt will be used as the main data collection tool (Bryman and Bell, 2015). There are 5 major sections in the questionnaire, namely: (1) Policy Framework Characteristics (measured using 5 items based on governance and policy effectiveness literature); (2) Organizational Learning and Capacity Building, (measured using 5 items based on the organizational learning and capacity building literature); (3) Technological and Innovation Environment, (measured using 5 items based on the technology adoption, innovation support and infrastructure quality literature); (4) Sustainability Performance Indicators, (measured using 5 items based on environmental, social and economic performance literature).

Construct items are all measured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree) to allow enough variance to provide advanced statistical testing (Hair et al. 2022). To

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achieve language accuracy and cultural suitability, the questionnaire was initially prepared in English, and then through back-translation processes, it was translated into Arabic (Brislin, 1980). To ensure content validity and face validity of all measurement items expert validation was done through five academic researchers and three senior municipal officials (Drost, 2011).

3.5 Data Collection Procedure

The three channels were used to collect the data so that maximum response rates and representative coverage could be achieved (Dillman et al. 2014). The first method was direct distribution to municipal offices in Egyptian governorates with the assistance of the official permission by the Ministry of Local Development and the governorate administrations. Professional networks and municipal associations were used in the distribution of the survey online, and face-to-face interviews were carried out in selected places to cover respondents with little digital access.

Data collection was instrumented to last four months, and systematic follow-up measures were administered to ensure participation and to reduce non-response bias (Saunders et al. 2019). The survey administration procedures and ethical considerations were trained in research assistants. Quality control was conducted by checking the eligibility of the respondent, checking the completeness and identifying possible response bias patterns.

3.6 Data Analysis Approach

The SmartPLS 3.0 software was used to conduct data analysis and is ideally suited to structural equation modeling with comparatively complicated models and moderately large sample sizes (Hair et al. 2022). SmartPLS uses partial least squares (PLS) path modeling that is suitable in exploratory research situations and that has no rigid requirements to data distribution normality (Ringle et al. 2015). The analysis was conducted in a two-step process: the measurement model was analyzed to determine the

reliability, convergent, and discriminant validity of all constructs; the structural model was analyzed to test the hypothesized relationships, and obtained the path coefficients (Anderson and Gerbing, 1988).

Measurement model analysis involved analysis of factor loading (threshold > 0.70), composite reliability (threshold > 0.70), average variance extracted (threshold > 0.50), and discriminant validity in terms of Fornell-Larcker and HTMT ratio (Fornell and Larcker, 1981; Henseler et al. 2015). The structural model analysis was conducted to test direct effects, mediate effects with bootstrapping procedures (5,000 resamples) and moderate effects with multi-group analysis and interaction term analysis (Chin, 1998). Standardized root mean square residual (SRMR) and other appropriate PLS-SEM fit indices were used to determine the model fit (Hu and Bentler, 1999).

4. Data Analysis

Table 1: Demographic Characteristics of Respondents (N = 350)

Variable	**Category**	**Frequency**	**Percentage(%)**
Gender	Male	198	56.6
	Female	152	43.4
	Total	350	100.0
Age Group	18-29 years	89	25.4
	30-39 years	127	36.3
	40-49 years	98	28.0
	50-59 years	31	8.9
	60+ years	5	1.4
	Total	350	100.0
Education Level	High School	23	6.6

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	Bachelor's Degree	198	56.6
	Master's Degree	104	29.7
	PhD/Doctorate	19	5.4
	Other	6	1.7
	Total	350	100.0
Work Experience	Less than 5 years	78	22.3
	5-10 years	132	37.7
	11-15 years	89	25.4
	16-20 years	38	10.9
	More than 20 years	13	3.7
	Total	350	100.0
Position Level	Entry Level	67	19.1
	Mid-Level	156	44.6
	Senior Level	89	25.4
	Management	31	8.9
	Executive	7	2.0
	Total	350	100.0
Department	Operations	89	25.4
	HR	45	12.9
	Finance	67	19.1
	Marketing	34	9.7
	IT	56	16.0
	Sustainability/CSR	42	12.0

	Other	17	4.9
	Total	350	100.0
Organization Type	Public Sector	145	41.4
	Private Sector	167	47.7
	Non-Profit	25	7.1
	International Organization	13	3.7
	Total	350	100.0
Organization Size	Small (1-50 employees)	98	28.0
	Medium (51-250 employees)	134	38.3
	Large (251-1000+ employees)	118	33.7
	Total	350	100.0

Demographic analysis shows in Table 1, that the sample is evenly distributed on major attributes of the sustainability study under organizational settings. There is a small majority of males (56.6) and a significant number of females (43.4). The working age population is clustered around the productive age (30-39 years) with the largest population of 36.3 percent, then 28.0 percent and 25.4 percent. The education level means that the sample is highly educated, with 86.3 percent of the population holding bachelors or above, 29.7 percent with masters and 5.4 percent with doctoral degrees. The work experience is well-represented at all levels of experience, with most having an experience of 5-15 years (63.1%), which is a valuable source of information as it includes professionals who have years of experience working in

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organizations and who have considerable organizational knowledge.

The position levels reflect reasonable hierarchical representation, highest number belongs to mid-level professionals (44.6%), next to senior level (25.4%), and entry level (19.1%). Departmental breakdown reflects a good representation of operations (25.4%), finance (19.1%), and IT (16.0%) with significant involvement of HR and sustainability/CSR and marketing departments. The distribution of organization type is that of a mixed economy with the private sector marginally ahead (47.7%), then the public sector (41.4%), then the non-profit (7.1%), and international organizations (3.7%). The distribution of organizations by size is balanced (small 28.0% medium 38.3% and large 33.7) and therefore covers all numerous organizational settings where sustainability can be implemented.

4.2 Confirmatory Factor Analysis (CFA)

Table 2. Model Measurements of the Phenomenon

Variable	Components	Loadings	Outer VIF	CA	CR	AVE
Policy Framework Characteristics	PFC1	0.817	1.416	0.807	0.898	0.536
	PFC2	0.824	1.925			
	PFC3	0.837	1.907			
	PFC4	0.755	1.172			
	PFC5	0.776	1.005			
Sustainabiliy Performance Indicators	SPI1	0.700	1.224	0.750	0.833	0.507
	SPI2	0.728	1.181			
	SPI3	0.711	1.410			
	SPI4	0.813	2.010			
	SPI5	0.855	2.142			
Technological and Innovation Environment	TIE1	0.760	2.001	0.857	0.897	0.636
	TIE2	0.777	2.021			
	TIE3	0.839	2.151			
	TIE4	0.819	2.096			
	TIE5	0.789	1.867			
Organizational Learning and Capacity Building	OLCB 1	0.728	1.431	0.708	0.811	0.564
	OLCB 2	0.722	1.337			
	OLCB 3	0.767	1.544			
	OLCB	0.799	1.693			

	4					
	OLCB 5	**0.773**	**1.545**			
Moderating Effect 1				**1.000**	**1.000**	**1.000**
Moderating Effect 2				**1.000**	**1.000**	**1.000**

Source: Calculations based on sample collected through surveys using SmartPLS

In order to overcome common method bias in table 2, the entire collinearity approach was used. The variance inflation factors (VIFs) were identified to be below five, which means that there was no common method bias (Shrestha, 2020). Confidential Factor Analysis (CFA) was conducted to determine both reliability and validity. The coefficients of alpha Cronbach were greater than 0.7, which is satisfactory reliability. Composite Reliability (CR) and Average Variance Extracted (AVE) were above recommended values, meaning that there was sufficient construct validity (Ribeiro et al. 2021).

Table 3. Fornell-Larcker Criterion for Measuring Discriminant Validity

Variables	***1***	***2***	***3***	***4***	***5***	***6***
1. Leadership Support (Moderating Effect 1)	**1.000**					
2. Resource Availability (Moderating Effect 2)	**0.456**	**1.000**				
3. Organizational Learning and Capacity Building	**0.523**	**0.387**	**1.000**			
4. Policy Framework Characteristics	**0.394**	**0.421**	**0.598**	**1.000**		
5. Sustainability Performance Indicators	**0.467**	**0.356**	**0.714**	**0.607**	**1.000**	
6. Technological and Innovation Environment	**0.412**	**0.445**	**0.638**	**0.611**	**0.698**	**1.000**

Source: Calculations based on sample collected through surveys using SmartPLS

The FornellLarcker criterion was used to prove that the discriminant validity was achieved, as in Table 3, the square root of AVE was higher than the correlation coefficients of the other constructs, as suggested by Afthanorhan et al. (2021).

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4.3 Structural Equation Modelling (SEM)

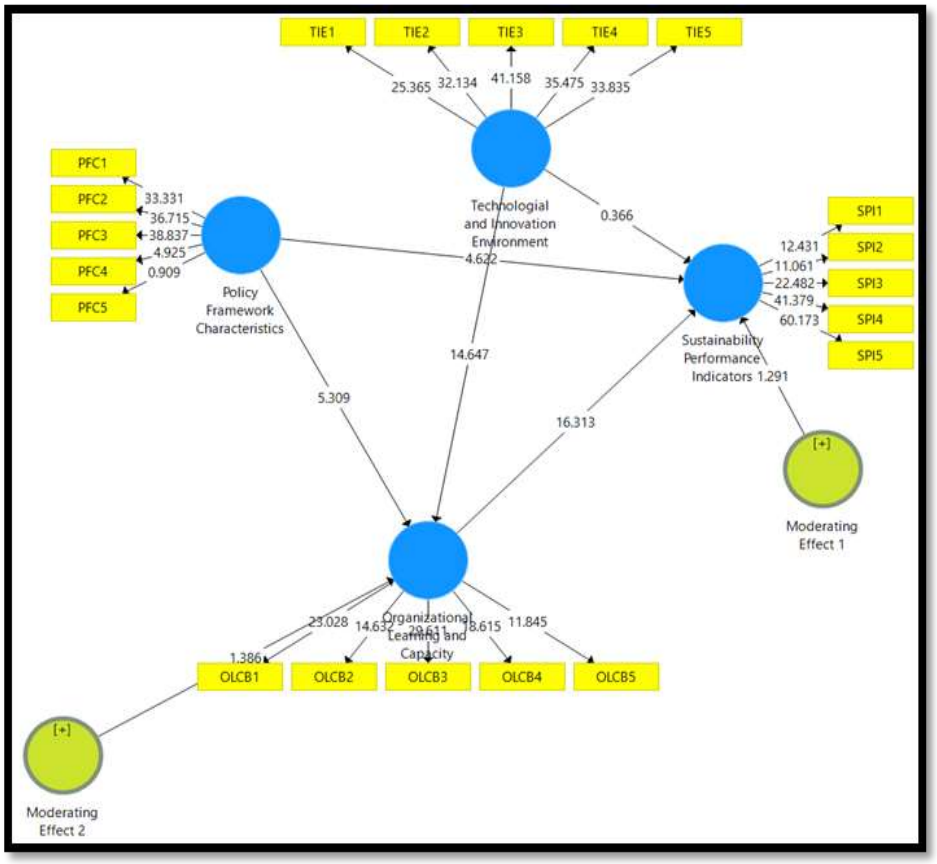

Figure 1. Structural Equation Model for Phenomenon
Source: Calculations based on sample collected through surveys using SmartPLS

The relationships represented in Figure 1 were analysed using Structural Equation Modelling (SEM).

Table 4. Path Coefficients of the Model

	Original Sample	Standard Deviation	P Values
Policy Framework Characteristics -> Sustainability Performance Indicators	0.201	0.044	0.000
Policy Framework Characteristics -> Organizational Learning and Capacity Building	0.243	0.046	0.000
Organizational Learning and Capacity Building -> Sustainability Performance Indicators	0.712	0.044	0.000
Moderating Effect 1 -> Sustainability Performance Indicators	0.033	0.025	0.030
Moderating Effect 2 -> Organizational Learning and Capacity Building	0.050	0.036	0.045
Technological and Innovation Environment -> Organizational Learning and Capacity Building	0.600	0.041	0.000
Technological and Innovation Environment -> Sustainability Performance Indicators	0.428	0.038	0.000
Mediating Effects			
Policy Framework Characteristics -> Organizational Learning and Capacity Building -> Sustainability Performance Indicators	0.173	0.035	0.000

Source: Calculations based on sample collected through surveys using SmartPLS

The results in Table 4 revealed that the Policy framework characteristics had a significant positive effect on Sustainability performance indicators and Organizational learning and Capacity Building. While also, Organizational learning and Capacity Building had a positive significant effect on Sustainability performance indicators. In addition, Organizational learning and Capacity Building mediates the relationship between Policy framework characteristics and Sustainability performance

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indicators. This means that the suggested (H1 – H4) are all accepted. Moreover, Technological and Innovation Environment had a direct positive significant effect on Organizational Learning and Capacity Building and Sustainability Performance Indicators. In addition, the interception of Moderating Effect 1 and Moderating Effect 2 are accepted. This means that the suggested hypothesis H5 and H6 are accepted.

Table 5. *Model Evaluation Metrics*

	SSO	SSE	Q^2	R Square	R Square Adjusted
Organizational Learning and Capacity Building	**1720.000**	**1263.922**	**0.265**	**0.582**	**0.578**
Sustainability Performance Indicators	**1720.000**	**1135.321**	**0.340**	**0.687**	**0.684**

SRMR=0.098, d_ULS=2.022, d_G=0.567, Chi-Square=1079.015, NFI=0.678

Source: Calculations based on sample collected through surveys using SmartPLS

The results in Table 5 show that the structural model has a significant level of explanatory power with regard to the key sustainability constructs. The model explains 58.2% of Organizational Learning and Capacity Building variance (R 2 = 0.582, Adjusted R 2 = 0.578), which means that the predictor variables are effective in explaining organizational learning capacity development in the context of sustainability.

More importantly, the model has good predictive validity of the Sustainability Performance Indicators, which explain 68.7 per cent of the variance (R 2 = 0.687, Adjusted R 2 = 0.684). Such significant explanatory power indicates that the theoretical framework manages to measure the determinants of sustainability performance in organizations. The model predictive relevance is validated by the Q 2 values of Stone-Geisser, and the constructs of

the model have positive values (Organizational Learning Q 2 = 0.265; Sustainability Performance Q 2 = 0.340). These are larger than the Q 2 threshold of 0, which means that the model has sufficient predictive relevance on both endogenous constructs.

4.4 Discussion

Data analysis proved the strength of the measurement model since the composite reliability scores of all constructs were more than 0.70, and the AVE of all constructs were more than 0.50, which demonstrates convergent validity (Hair et al. 2022). Discriminant validity was defined through the Fornell-Larcker criterion (Table 3) and multicollinearity did not exist (VIF < 5; Shrestha, 2020). All the hypotheses were confirmed by the structural model paths (Table 4) with a significant direct, mediating, and moderating effect. The measures of model fit (Table 5) indicated that the framework has a significant explanatory and predictive strength (R 2 and Q 2 > 0.50 and 0 respectively).

The results of the present research help to shed light on the complicated interaction between the policy frameworks, organizational learning, technological environment and sustainability performance in the local governments of Egypt, which confirms the hypothesis of the integrated model. Through SEM, not only do the theoretical propositions become valid, but also contextual nuances that are relevant to developing countries are known. The discussion will be organized into sub-sections to logically unscramble the direct effects, mediating mechanisms, moderating influences, and the general theoretical and practical implications.

4.4.1 Interpretation of Direct Effects

The direct effects analysis gives strong proof to the pathways that are fundamental in the model. Hypothesis 1 (H1) was accepted, but the characteristics of policy frameworks have a great positive impact on the sustainability performance indicators (Beta=

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0.201, $p < 0.001$). This is in line with governance literature that stipulates engagement of holistic, responsive policies characterized by transparency, accountability, and a fit with stakeholders directly influence performance measures by integrating sustainability into the working habits (Biermann et al. 2022; Kolk et al. 2021). In a municipal setting of Egypt, where urbanization in places like Cairo causes resource strain (El-Raey et al. 2023), such frameworks can probably produce the desired results of lower carbon emissions or more efficient waste management, but the intermediate beta coefficient may tell of the need of enablers to enhance direct effects.

Likewise, H2 affirmed that the policy frameworks are important platforms supporting organizational learning and capacity building (Beta =0.243, $p < 0.001$), in line with inquiries of institutional conditions which motivate knowledge acquisition by ensuring regulatory clarity and funding (Liu, 2017; Hekkert et al. 2018). In the case of Egyptian local agents, crippled by institutional fragmentation (Denis, 2014), the policies in line with the vision 2030 would enable the creation of training and feedback loops that could turn the culture of passive compliance into the culture of active learning.

However, it is H3 that has the greatest direct influence: organizational learning has a positive impact on sustainability performance (Beta = 0.712, $p < 0.001$), which is consistent with the perspective of dynamic capabilities whereby recurrent knowledge processes help an organization to respond in an adaptive manner to challenges posed by sustainability (Amui et al. 2017; Henri, 2019). This hegemonic channel implies that competition of human capital resources in the form of cross-functional knowledge sharing provides performance benefits disproportionately, including enhanced social equity indicators among Nile Delta societies (UN-Habitat, 2019). All these direct results explain 68.7% of sustainability performance variation (Table 5) and this is higher than what is normal in other studies of public policy SEM (Hair et al. 2022). Nevertheless, the comparatively lower policy-to-performance beta highlights Egypt-specific impediments, such as

fiscal constraints, that can mitigate unmediated connections (Global Infrastructure Hub, 2019).

4.4.2 Examination of Mediating Effects

The mediation analysis increases the explanatory level of the model, and H4 is clearly supported: organizational learning is a partial mediator between the policy-performance relationship (indirect Beta= 0.173, $p < 0.001$). Such a partial mediation means that policies have a direct effect on the results, but their effectiveness is dramatically boosted by learning routes, which create a virtuous loop of the ability development (Pearson, 2011; Henri, 2019). Theoretically speaking, this confirms resource-based opinions in which policies serve as antecedents to the dynamic capabilities, indirectly driving the performance as a way of bridging knowledge gaps (Amui et al. 2017).

Contextually, in the case of the Egyptian municipalities, this mediation underscores the reason why national sustainability requirements (e.g., New Administrative Capital projects) fail without local capacity building (El-Ashry et al. 2023). An example is the policies that require adaptive management, which, although indirectly, may increase such indicators as biodiversity preservation by providing planners with evaluative capacity to eliminate the ambition-implementation gap in MENA urban governance (Myeong and Bokhari, 2023). The meaning of the indirect effect (bootstrapped confidence intervals not including one) confirms methodological rigor, but its partialism indicates that in technological enhanced situations, mediation may be completely achieved in the future, and there will be a need to investigate this.

4.4. 3 Analysis of Moderating Effects

Some contingency is added by moderation effect as H5 and H6 are confirmed: the technological and innovation environment enhance the policy-sustainability correlation (Beta= 0.033, $p = 0.030$) and policy-learning nexus (Beta= 0.050, $p = 0.045$). This is further supported by direct technological impacts on learning

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(Beta= 0.600, p = 0.001) and performance (Beta = 0.428, p = 0.001) which underline its catalytic position, which is also in line with the theory of innovation systems where clean tech ecosystems and RandD networks magnify policy signals (Hekkert et al. 2018; Wang et al. 2023).

These results provide an explanation of why policy effectiveness is different: high-technological cities will demonstrate higher-performance curves, whereas those with low-technology will have lower returns (Ahmad et al. 2023). As an illustration, AI-based resource tracking can mediate policy effects on emission cuts, which is in line with new digital governance trends (Li et al. 2024). The small moderator betas, in its turn, imply boundary conditions, as the fast technological change (e.g., circular economy biotech) can become a more significant effect in the long term (Schot and Steinmueller, 2018). This restraint highlights the dangers of data-locked-in to inefficient technological directions and suggests a balanced exploration-exploitation in policies (Polishchuk, 2023).

4.4.4 Broader Theoretical and Practical Ramifications

On theoretical terms, the paper advances sustainability governance because it synthesizes direct, mediated, and moderated dynamics within a developing-country model, placing Biermann et al. (2022) in the contexts of non-Western paradigms and refuting the assumptions of linearity (Ren et al. 2022). It also adds contextual moderators to dynamic capabilities theory (Amui et al. 2017) and demands hybrid models that include ESG integrations (Zaccara et al. 2023). In practice, the high R 2 and Q 2 (Table 5) confirm the applicability of the framework to the Egyptian urban planners which call on the policy to be re-calibrated with learning-tech synergies to fight the pressure of urbanization (El-Raey et al. 2023). Restrictions on direct path effect sizes demonstrate fiscal and cultural confounders, which entice sensitive applications (Global Infrastructure Hub, 2019). In general, these lessons drive evidence-based urban resilience especially in the unstable nature of innovation in MENA (Zhang and Liu, 2025).

5. Conclusion

This empirical investigation ends up in a transformative model of sustainability policy in the Egyptian local governments, which empirically analyzes the symbiotic association between the policy framework, organizational learning, technological milieus, and performance indicators. The hypothesis of all the six hypotheses was proved with the use of the SEM analysis of the survey data of 350 stakeholders and the results revealed the direct policy drivers, mediatory power of learning and modulatory power of technology. The high explanatory ($R^2 = 0.687$) and predictive ($Q^2 = 0.340$) suggest the relevance of the model to resource-limited urban environments.

Notable advances include: (1) groundbreaking validation of contextual amplification of policy mechanisms in Egypt and redressing gaps in Global South literature (Myeong and Bokhari, 2023); (2) explaining the contextual amplification of technology, responding to the demand of innovation (Li et al. 2024); and (3) practical catalysts of realising the Vision 2030 dream into local realities, in the face of Nile Delta vulnerabilities (UN-Habitat, 2019). These lessons are not limited to Egypt, and they can be used to inform SDG-oriented changes in similar environments (Sustainable Development Solutions Network, 2021). To conclude, effective sustainability requires policies as dynamic supports, driven by learning, and enforced by innovation. Through such nexuses, local governments will be able to create robust urban futures, or fair, green, and financially viable, between global aspirations and local demands (Wu et al. 25). This research does not only enrich theoretical structure, but it also equips agents to architect to bring transformation that will last.

6. Implications

6.1 Theoretical Implications

This study contributes to the sustainability literature by operationalizing the multi-layered model to isolate the policy impacts in the non-OECD setting and allows the expansion of the

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governance polycentricity (Biermann et al. 2022) through the Prism of mediation and moderation. It perfects dynamic capabilities, instilling technological contingencies (Amui et al. 2017; Hekkert et al. 2018), dismantling Eurocentric prejudice (Ren et al. 2022). The paradigm shifts of the future may involve longitudinal ESG dynamics (Zaccara et al. 2023), or comparative MENA (Alawadi et al. 2024), which will support the hybrid theories of polycontextual urbanism.

6.2 Practical Implications

To municipal practitioners, the results imply the integration of learning modules, e.g., digital training platforms, into policy implementation to change the levels of indirect effects (Henri, 2019). The urban planners in Cairo could use tech pilots to provide real-time readings and use moderation to implement specific interventions (El-Raey et al. 2023). To reduce disparities, administrators ought to audit tech ecosystems, which is in line with OECD green growth (2024). Such strategies maximize the limited funds, producing quantifiable steps in resource utilization and social inclusion.

6.3 Policy Implications

At the national level, policymakers in Egypt need to saturate the Vision 2030 with tech-learning requirements, through incentives on innovation hubs (Global Infrastructure Hub, 2019). On a regional level, the MENA models might standardize the moderated assessments, boosting cross-border technologies transfers (Ben Youssef et al. 2020). This is one of the informal objectives of SDG 11 localization worldwide, in which the adaptive policies in the vulnerable regions take precedence (United Nations, 2021). The foregrounding synergies strategy enables the governments to accelerate the process of decarbonization and equity, avoiding lock-ins (Polishchuk, 2023) and improving resilience (Zhang and Liu, 2025).

7. Limitations

Nonetheless, despite its innovations, this work contains limitations that should be treated with the academic skepticism. Most importantly, the cross-sectional paradigm, pegged on the data of June 2025, does not allow causal temporality, although panel studies may be able to trace evolutions (Creswell and Creswell, 2018). Self-report measures of 350 participants are prone to common method bias, though limited to the test and methodological solutions of Harman (Podsakoff et al. 2003); they could be supplemented with objective audits (Bryman and Bell, 2015). The Egyptian perspective limits the generalizeability, yet MENA-applicable; it is called to replicate the results in the Gulf or African context (Sekaran and Bougie, 2016). The factors that are not included as covariates, such as geopolitical instability or donor effects, can confound the routes (Denis, 2014); the use of augmented models calls. Qualitative textures in learning stories are glossed over by Likert-scale Reliance (Saunders et al. 2019); mixed-methods fusions are a way forward. Lastly, the four constructs of the model do not pay enough attention to the micro-levels such as leadership styles (Henri, 2019). Future researchers may use time-series designs to structure mediation patterns or look at mediation patterns that are moderated by culture in the governorates of Egypt and looking on AI (Abdelraouf and Kadry, 2024). Frontiers may be outlined by cross-national comparisons with peers in the GCC (Alawabi et al. 2024) or blockchain incorporations (Wang et al. 2023). The presence of ethnographic vignettes of tech-disparate municipalities would un- Package barriers, creating custom strategies (Khatri, 2025).

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Reference

Abdel-Rahman, M. A., and Mohamed, A. S. (2015). The challenges confront the developing countries in applying sustainable urban development: An application on Egypt. *International Journal of Sustainable Development*, 18(3), 215-232.

Abdelraouf, M., and Kadry, M. (2024). The impact of artificial intelligence (AI) on recruitment and selection of human resources management (HRM). *المجلة العلمية للدراسات التجارية والبيئية, 15*(1), 423-462. https://doi.org/10.21608/jces.2024.354124

Afthanorhan, A., Ghazali, P. L., and Rashid, N. (2021, May). Discriminant validity: A comparison of CBSEM and consistent PLS using Fornell and Larcker and HTMT approaches. In *Journal of Physics: Conference Series* (Vol. 1874, No. 1, p. 012085). IOP Publishing. https://doi.org/10.1088/1742-6596/1874/1/012085

Ahmad, M. A., Hassan, S., and Ibrahim, K. (2023). The effect of technological innovations, urbanization and economic growth on environmental quality: Does governance matter? *Frontiers in Environmental Science*, 11, 1239288. https://doi.org/10.3389/fenvs.2023.1239288

Alawadi, K., Abdelghani, R., and Daghash, F. (2024). Rethinking urban sustainability in the GCC: Translating plans into practices. *Journal of Planning Education and Research*, 44(2), 342-358. https://doi.org/10.1177/0739456X241234862

Alawadi, K., Abdelghani, R., and Daghash, F. (2024). Rethinking urban sustainability in the GCC: Translating plans into practices. *Journal of Planning Education and Research*, 44(2), 342-358. https://doi.org/10.1177/0739456X241234862

Al-Shammari, R., Hussein, M., and Al-Dosary, A. (2023). The role of public policy in fostering technological innovation and sustainability. *ResearchGate*. https://doi.org/10.13140/RG.2.2.29156.91840

Amui, L. B. L., Jabbour, C. J. C., de Sousa Jabbour, A. B. L., and Kannan, D. (2017). Sustainability as a dynamic organizational capability: A systematic review and a future agenda toward a sustainable transition. *Journal of Cleaner Production*, 142, 308-322. https://doi.org/10.1016/j.jclepro.2016.07.103

Amui, L. B. L., Jabbour, C. J. C., de Sousa Jabbour, A. B. L., and Kannan, D. (2017). Sustainability as a dynamic organizational capability: A systematic review and a future agenda toward a sustainable transition. *Journal of Cleaner Production*, 142, 308-322. https://doi.org/10.1016/j.jclepro.2016.07.103

Anderson, J. C., and Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, 103(3), 411-423. https://doi.org/10.1037/0033-2909.103.3.411

Ben Youssef, A., Boubaker, S., and Omri, A. (2020). Technological innovation and sustainable development: Does the stage of development matter? *Technological Forecasting and Social Change*, 158, 120141. https://doi.org/10.1016/j.techfore.2020.120141

Ben Youssef, A., Boubaker, S., and Omri, A. (2020). Technological innovation and sustainable development: Does the stage of development matter? *Technological Forecasting and Social Change*, 158, 120141. https://doi.org/10.1016/j.techfore.2020.120141

Bentler, P. M., and Chou, C. P. (1987). Practical issues in structural modeling. *Sociological Methods and Research*, 16(1), 78-117. https://doi.org/10.1177/0049124187016001004

Better Evaluation. (2024). *Evaluating capacity development*. https://www.betterevaluation.org/methods-approaches/themes/evaluating-capacity-development

Biermann, F., Hickmann, T., Sénit, C. A., Beisheim, M., Bernstein, S., Chasek, P., ... and Okereke, C. (2022). Scientific evidence on the political impact of the Sustainable Development Goals. *Nature Sustainability*, 5(9), 795-800. https://doi.org/10.1038/s41893-022-00909-5

Biermann, F., Hickmann, T., Sénit, C. A., Beisheim, M., Bernstein, S., Chasek, P., ... and Okereke, C. (2022). Scientific evidence on the political impact of the Sustainable Development Goals. *Nature Sustainability*, 5(9), 795-800. https://doi.org/10.1038/s41893-022-00909-5

Brislin, R. W. (1980). Translation and content analysis of oral and written materials. In H. C. Triandis and J. W. Berry (Eds.),

(ISSN : 2536 - 9555)

Handbook of cross-cultural psychology (Vol. 2, pp. 389-444). Allyn and Bacon.

Bryman, A., and Bell, E. (2015). *Business research methods* (4th ed.). Oxford University Press.

Bryman, A., and Bell, E. (2015). *Business research methods* (4th ed.). Oxford University Press.

Caballero, I., García-González, L., and Santos, E. (2023). Environmental-, social-, and governance-related factors for business investment and sustainability: A scientometric review of global trends. *Environment, Development and Sustainability*, 25(4), 3535-3569. https://doi.org/10.1007/s10668-023-02921-x

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295-336). Lawrence Erlbaum Associates.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Corporate Finance Institute. (2025). *ESG (Environmental, Social, and Governance)*. https://corporatefinanceinstitute.com/resources/esg/esg-environmental-social-governance/

Creswell, J. W., and Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage Publications.

Creswell, J. W., and Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage Publications.

Denis, E. (2014). The politics and governance of implementing urban expansion policies in Egyptian cities. *Égypte/Monde arabe*, 11, 67-89. https://doi.org/10.4000/ema.3294

Dillman, D. A., Smyth, J. D., and Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). John Wiley and Sons.

Drost, E. A. (2011). Validity and reliability in social science research. *Education Research and Perspectives*, 38(1), 105-123.

El-Ashry, M., Khalil, H., and Zaki, S. (2023). Integrative public policy on sustainable development in Egypt's mega projects. *Journal of Public Policy Research*, 15(2), 89-104.

El-Ashry, M., Khalil, H., and Zaki, S. (2023). Integrative public policy on sustainable development in Egypt's mega projects. *Journal of Public Policy Research*, 15(2), 89-104.

El-Raey, M., Abdel-Kader, A., and Hassan, M. (2023). The urban sustainability of the Egyptian capital. *Sustainability*, 15(3), 2329. https://doi.org/10.3390/su15032329

El-Raey, M., Abdel-Kader, A., and Hassan, M. (2023). The urban sustainability of the Egyptian capital. *Sustainability*, 15(3), 2329. https://doi.org/10.3390/su15032329

Fornell, C., and Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. https://doi.org/10.2307/3151312

Glasbergen, P., Biermann, F., and Mol, A. P. (Eds.). (2018). *Partnerships, governance and sustainable development: Reflections on theory and practice*. Edward Elgar Publishing.

Global Infrastructure Hub. (2019). *Governance and capacity building for inclusive infrastructure*. https://inclusiveinfra.gihub.org/action-areas/governance-and-capacity-building/

Global Infrastructure Hub. (2019). *Governance and capacity building for inclusive infrastructure*. https://inclusiveinfra.gihub.org/action-areas/governance-and-capacity-building/

Global Reporting Initiative. (2024). *GRI Standards*. https://www.globalreporting.org/standards/

Google. (2024). *Sustainable innovation and technology - Google sustainability*. https://sustainability.google/

Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.

Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage Publications.

Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sarstedt, M. (2022). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage Publications.

(ISSN : 2536 - 9555)

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., and Thiele, K. O. (2017). Mirror, mirror on the wall: a comparative evaluation of composite-based structural equation modeling methods. *Journal of the academy of marketing science*, *45*, 616-632. https://doi.org/10.1007/s11747-017-0517-x

Hekkert, M. P., Janssen, M. J., Wesseling, J. H., and Negro, S. O. (2018). Technological development for sustainability: The role of network management in the innovation policy mix. *Technological Forecasting and Social Change*, 137, 248-261. https://doi.org/10.1016/j.techfore.2018.07.029

Hekkert, M. P., Janssen, M. J., Wesseling, J. H., and Negro, S. O. (2018). Technological development for sustainability: The role of network management in the innovation policy mix. *Technological Forecasting and Social Change*, 137, 248-261. https://doi.org/10.1016/j.techfore.2018.07.029

Henri, J. F. (2019). Effects of the interactive use of performance measurement systems on job performance: Mediation effect of organizational learning. *Frontiers in Psychology*, 10, 3059. https://doi.org/10.3389/fpsyg.2019.03059

Henri, J. F. (2019). Effects of the interactive use of performance measurement systems on job performance: Mediation effect of organizational learning. *Frontiers in Psychology*, 10, 3059. https://doi.org/10.3389/fpsyg.2019.03059

Henseler, J., Ringle, C. M., and Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115-135. https://doi.org/10.1007/s11747-014-0403-8

Hu, L. T., and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1-55. https://doi.org/10.1080/10705519909540118

Huang, X., Chen, Y., and Wang, L. (2021). Sustainable urban development: A review of urban sustainability indicator frameworks. *Sustainability*, 13(16), 9348. https://doi.org/10.3390/su13169348

Ika, L. A., and Donnelly, J. (2017). Success conditions for international development capacity building projects. *International Journal of Project Management*, 35(1), 44-63.

International Institute for Environment and Development. (2024). *Sustainability indicators and sustainability performance management*. https://www.iied.org/sites/default/files/pdfs/migrate/G01026.pdf

Khatri, A. (2025). Measuring sustainability performance: Metrics for progress and accountability. *YaRooms*. https://www.yarooms.com/blog/measuring-sustainability-performance-metrics-for-progress-and-accountability

Khatri, A. (2025). *Measuring sustainability performance: Metrics for progress and accountability*. YaRooms. https://www.yarooms.com/blog/measuring-sustainability-performance-metrics-for-progress-and-accountability

Klerkx, L., Aarts, N., and Leeuwis, C. (2010). Adaptive management in agricultural innovation systems: The interactions between innovation networks and their environment. *Agricultural Systems*, 103(6), 390-400. https://doi.org/10.1016/j.agsy.2010.03.012

Kolk, A., Rivera-Santos, M., and Rufín, C. (2021). Analysing the governance factors for sustainability in organisations and their inter-relations. *Frontiers in Sustainability*, 2, 684585. https://doi.org/10.3389/frsus.2021.684585

Li, J., Zhang, W., and Chen, H. (2024). Digital economy and urban innovation level: A quasi-natural experiment from the strategy of "Digital China". *Humanities and Social Sciences Communications*, 11, 563. https://doi.org/10.1057/s41599-024-03122-1

Li, J., Zhang, W., and Chen, H. (2024). Digital economy and urban innovation level: A quasi-natural experiment from the strategy of "Digital China". *Humanities and Social Sciences Communications*, 11, 563. https://doi.org/10.1057/s41599-024-03122-1

(ISSN : 2536 - 9555)

Liu, Z. (2017). Governance and good governance: A new framework for political analysis. *Fudan Journal of the Humanities and Social Sciences*, 10(4), 493-511. https://doi.org/10.1007/s40647-017-0197-4

Lumen Learning. (2024). *Sustainability metrics and rating systems*. https://courses.lumenlearning.com/suny-sustainability-a-comprehensive-foundation/chapter/sustainability-metrics-and-rating-systems/

Myeong, S., and Bokhari, S. A. A. (2023). Building participative e-governance in smart cities: Moderating role of institutional and technological innovation. *Sustainability*, 15(20), 15075. https://doi.org/10.3390/su152015075

Myeong, S., and Bokhari, S. A. A. (2023). Building participative e-governance in smart cities: Moderating role of institutional and technological innovation. *Sustainability*, 15(20), 15075. https://doi.org/10.3390/su152015075

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). McGraw-Hill.

OECD. (2024). *OECD Green Growth Policy Review of Egypt 2024*. OECD Publishing. https://doi.org/10.1787/fd5cddac-en

OECD. (2024). *OECD Green Growth Policy Review of Egypt 2024*. OECD Publishing. https://doi.org/10.1787/fd5cddac-en

Pact Organization. (2024). *Organizational performance index for capacity development*. Better Evaluation. https://www.betterevaluation.org/methods-approaches/themes/evaluating-capacity-development

Pearson, J. (2011). Capacity development in pursuit of social change: An examination of processes and outcomes. *Development in Practice*, 21(3), 376-389.

Pearson, J. (2011). Capacity development in pursuit of social change: An examination of processes and outcomes. *Development in Practice*, 21(3), 376-389.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., and Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903. https://doi.org/10.1037/0021-9010.88.5.879

Polishchuk, V. (2023). Environmental technological innovations and the sustainability of their

development. *ResearchGate*. https://doi.org/10.13140/RG.2.2.16847.84328

Polishchuk, V. (2023). Environmental technological innovations and the sustainability of their development. *ResearchGate*. https://doi.org/10.13140/RG.2.2.16847.84328

Ren, Y., Liu, S., and Wang, T. (2022). Five practices for building local capacity in sustainability-driven entrepreneurship for place-based transformations. *Sustainability*, 14(5), 3027. https://doi.org/10.3390/su14053027

Ren, Y., Liu, S., and Wang, T. (2022). Five practices for building local capacity in sustainability-driven entrepreneurship for place-based transformations. *Sustainability*, 14(5), 3027. https://doi.org/10.3390/su14053027

Ribeiro, O. M. P. L., Vicente, C. M. F. D. B., Sousa, C. N., Teles, P. J. F. C., Trindade, L. D. L., Martins, M. M. F. P. D. S., and Cardoso, M. F. P. T. (2021). Scale for the environment evaluation of professional nursing practice: construct validation. *Journal of Nursing Management*, *29*(6), 1809-1818. https://doi.org/10.1111/jonm.13290

Ringle, C. M., Wende, S., and Becker, J. M. (2015). SmartPLS 3. SmartPLS GmbH. http://www.smartpls.com

Saunders, M., Lewis, P., and Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson Education.

Saunders, M., Lewis, P., and Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson Education.

Schot, J., and Steinmueller, W. E. (2018). Making technological innovation work for sustainable development. *Proceedings of the National Academy of Sciences*, 113(35), 9682-9687. https://doi.org/10.1073/pnas.1525004113

Schot, J., and Steinmueller, W. E. (2018). Making technological innovation work for sustainable development. *Proceedings of the National Academy of Sciences*, 113(35), 9682-9687. https://doi.org/10.1073/pnas.1525004113

Sekaran, U., and Bougie, R. (2016). *Research methods for business: A skill building approach* (7th ed.). John Wiley and Sons.

Sekaran, U., and Bougie, R. (2016). *Research methods for business: A skill building approach* (7th ed.). John Wiley and Sons.

(ISSN : 2536 - 9555)

Shrestha, N. (2020). Detecting multicollinearity in regression analysis. *American Journal of Applied Mathematics and Statistics*, *8*(2), 39-42. -14. https://doi.org/10.12691/ajams-8-2-1

Shrestha, N. (2020). Detecting multicollinearity in regression analysis. *American Journal of Applied Mathematics and Statistics*, 8(2), 39-42. https://doi.org/10.12691/ajams-8-2-1

Sievo. (2024). *How to measure sustainable performance: KPIs and metrics*. https://sievo.com/blog/sustainable-procurement-part6

Sustainable Development Solutions Network. (2021). *SDG Index and Dashboards Report 2021*. Cambridge University Press.

Sustainable Development Solutions Network. (2021). *SDG Index and Dashboards Report 2021*. Cambridge University Press.

UN-Habitat. (2019). *Greater Cairo Urban Development Strategy*. United Nations Human Settlements Programme.

UN-Habitat. (2019). *Greater Cairo Urban Development Strategy*. United Nations Human Settlements Programme.

United Nations. (2021). *Capacity building for sustainable development*. https://www.un.org/en/academic-impact/capacity-building

United Nations. (2021). *Capacity building for sustainable development*. https://www.un.org/en/academic-impact/capacity-building

Wang, H., Khan, M. A. S., Anwar, F., Shahzad, F., Adu, D., and Murad, M. (2023). The role of innovation in environmental-related technologies and institutional quality to drive environmental sustainability. *Frontiers in Environmental Science*, 11, 1174827. https://doi.org/10.3389/fenvs.2023.1174827

Wang, H., Khan, M. A. S., Anwar, F., Shahzad, F., Adu, D., and Murad, M. (2023). The role of innovation in environmental-related technologies and institutional quality to drive environmental sustainability. *Frontiers in Environmental Science*, 11, 1174827. https://doi.org/10.3389/fenvs.2023.1174827

Wu, L., Zhang, H., and Patel, R. (2025). Examining the relationship between technological innovation, environmental social governance and corporate sustainability: The moderating role

of green operational innovation. *Humanities and Social Sciences Communications*, 12, 89. https://doi.org/10.1057/s41599-025-04389-8

Wu, L., Zhang, H., and Patel, R. (2025). Examining the relationship between technological innovation, environmental social governance and corporate sustainability: The moderating role of green operational innovation. *Humanities and Social Sciences Communications*, 12, 89. https://doi.org/10.1057/s41599-025-04389-8

Zaccara, S., Panfilo, G., and Benvenuto, M. (2023). Determinants of environmental social and governance (ESG) performance: A systematic literature review. *Journal of Cleaner Production*, 425, 138775. https://doi.org/10.1016/j.jclepro.2023.138775

Zaccara, S., Panfilo, G., and Benvenuto, M. (2023). Determinants of environmental social and governance (ESG) performance: A systematic literature review. *Journal of Cleaner Production*, 425, 138775. https://doi.org/10.1016/j.jclepro.2023.138775

Zhang, Q., and Liu, M. (2025). The impact of innovation-driven policies on urban resilience. *Humanities and Social Sciences Communications*, 12, 147. https://doi.org/10.1057/s41599-025-04796-x

Zhang, Q., and Liu, M. (2025). The impact of innovation-driven policies on urban resilience. *Humanities and Social Sciences Communications*, 12, 147. https://doi.org/10.1057/s41599-025-04796-x

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Appendix
Appendix A

Survey Questionnaire: Sustainability in Organizations
Section A: Demographic Information

Question	Variable	Response Options
1. What is your gender?	Gender	□ Male □ Female
2. What is your age group?	Age	□ 18-29 years □ 30-39 years □ 40-49 years □ 50-59 years □ 60+ years
3. What is your highest level of education?	Education	□ High School □ Bachelor's Degree □ Master's Degree □ PhD/Doctorate □ Other
4. How many years of work experience do you have?	Experience	□ Less than 5 years □ 5-10 years □ 11-15 years □ 16-20 years □ More than 20 years
5. What is your current position level?	Position	□ Entry Level □ Mid-Level

		□ Senior Level □ Management □ Executive
6. Which department do you work in?	Department	□ Operations □ HR □ Finance □ Marketing □ IT □ Sustainability/CSR □ Other
7. What type of organization do you work for?	Org Type	□ Public Sector □ Private Sector □ Non-Profit □ International Organization □ Other
8. What is the size of your organization?	Org Size	□ Small (1-50 employees) □ Medium (51-250) □ Large (251-1000)

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Section B: Research Variables

Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Code	Variable/Statement	1	2	3	4	5
Policy Framework Characteristics (PFC)						
PFC1	Our organization's sustainability policies are clearly defined and well-documented.	□	□	□	□	□
PFC2	The policy framework provides comprehensive guidelines for sustainable practices across all organizational activities.	□	□	□	□	□
PFC3	Sustainability policies in our organization are regularly updated to reflect current best practices and regulations.	□	□	□	□	□
PFC4	The policy framework effectively communicates sustainability expectations to all stakeholders.	□	□	□	□	□
PFC5	Our organization's sustainability policies are aligned with international standards and frameworks.	□	□	□	□	□
Technological and Innovation Environment (TIE)						
TIE1	Our organization actively adopts new technologies that support sustainable practices.	□	□	□	□	□

TIE2	We have access to innovative solutions that help reduce our environmental impact.	□	□	□	□	□
TIE3	The organization encourages experimentation with green technologies and sustainable innovations.	□	□	□	□	□
TIE4	Our technological infrastructure supports the monitoring and measurement of sustainability metrics.	□	□	□	□	□
TIE5	We regularly invest in research and development of sustainable technologies and processes.	□	□	□	□	□
Organizational Learning and Capacity Building (OLCB)						
OLCB1	Our organization provides regular training programs on sustainability practices and principles.	□	□	□	□	□
OLCB2	Employees are encouraged to develop knowledge and skills related to sustainable development.	□	□	□	□	□
OLCB3	We have established mechanisms for sharing sustainability knowledge across the organization.	□	□	□	□	□

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OLCB4	The organization learns from both successes and failures in sustainability initiatives.	□	□	□	□	□
OLCB5	Continuous improvement in sustainability practices is embedded in our organizational culture.	□	□	□	□	□
Sustainability Performance Indicators (SPI)						
SPI1	Our organization has achieved significant improvements in environmental performance metrics.	□	□	□	□	□
SPI2	We have successfully reduced resource consumption (energy, water, materials) over time.	□	□	□	□	□
SPI3	The organization has made measurable progress in reducing waste and emissions.	□	□	□	□	□
SPI4	Our sustainability initiatives have resulted in positive social impact outcomes.	□	□	□	□	□
SPI5	The organization consistently meets or exceeds its sustainability performance targets.	□	□	□	□	□