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Measuring the Impacts of Digital Transformation on Climate Change Mitigation and Adaptation

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Abstract

Digital transformation plays an important role in accelerating climate action in Asia and the Pacific and achieving the Sustainable Development Goals (SDGs). However, the linkages between digital transformation and climate change mitigation and adaptation are complex. In order to support governments in making informed decisions and prioritizing digital investments for transformative SDG outcomes, this paper presents a matrix to measure the impact of digital transformation on SDG 13 (climate action) implementation. The impact matrix builds on the Digital Transformation Index framework of the United Nations Economic and Social Commission for Asia and the Pacific, and can be used as a descriptive, explanatory and prescriptive tool for evidence-based policymaking. Based on this impact matrix, policy and regulatory recommendations are provided to drive positive net impacts of digital transformation on climate action. In addition, the paper offers some concrete next steps for the refinement of the methodology and adoption of the matrix in policymaking.

Keywords: Digital Transformation, Climate Change, Mitigation, Adaptation.

1. Introduction

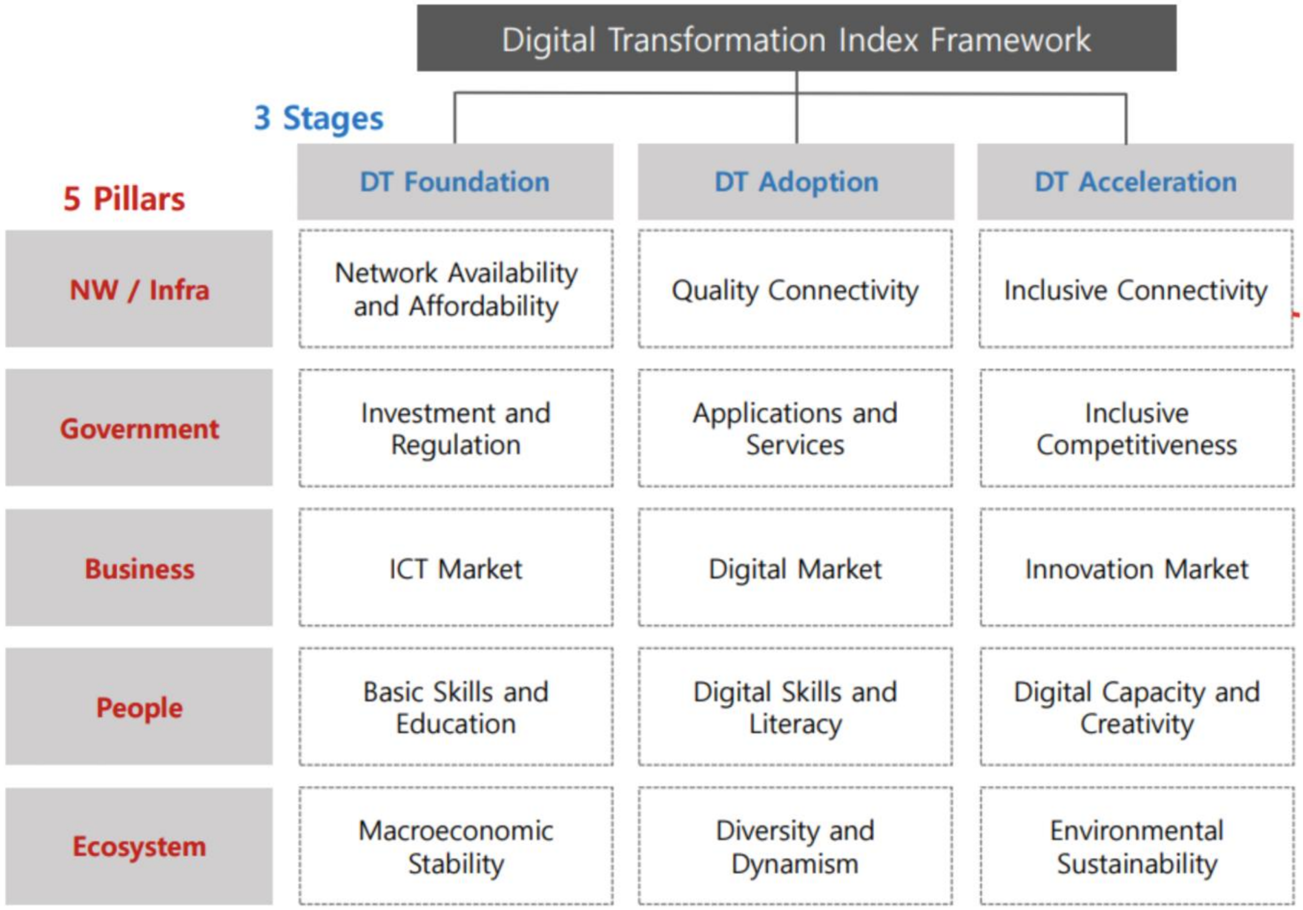
Digital transformation is a key enabler for climate change mitigation and adaptation, in line with the Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development (Mäkitie and others, 2023).

Drawing on the definition of digital transformation provided by Vial (2019), the term can be understood as the combination of information, computing, communication and connectivity technologies that introduce significant changes in economies and societies. This view of digital transformation implies that it consists not only of a technical phenomenon, but requires a paradigm shift “in terms of value creation, management, use and distribution through applications of disruptive technologies, including artificial intelligence (AI), digital data, connectivity and network” (United Nations Economic and Social Commission for Asia and the Pacific [ESCAP], 2022, p. 16).

Digital transformation has profound linkages with SDG 13 on climate action. However, challenges persist in measuring the impacts of digital transformation on meeting climate objectives and achieving the targets set for SDG 13. The measurement of the impacts of digital transformation in terms of climate change mitigation and adaptation is highly complex and often unsuccessful (Nishant, Kennedy, and Corbett, 2020), preventing evidence-based policymaking and investments.

With this background, a matrix is proposed in this paper to measure the impacts of digital transformation on the implementation of SDG 13 at the target and indicator levels. The matrix builds on the Digital Transformation Index (DTI) developed by ESCAP (Park, Jun, and Kim, 2022) (Figure 1).

Figure 1: The Digital Transformation Index framework



Notes: DT = Digital Transformation; NW = Network; and Infra = Infrastructure.

Source: Park, Jun, and Kim, 2022.

The next section provides an overview of the positive and negative linkages between digital transformation and climate change mitigation and adaptation. This is followed by a presentation of a matrix to better measure the impacts of digital transformation on the implementation of SDG 13 at the target and indicator levels in Section 3. Based on the matrix, Section 4 offers some policy and regulatory recommendations to drive positive net impacts of digital transformation on climate action, and Section 5 concludes the paper with a summary of the content and a discussion on the way forward.

2. Linkages between Digital Transformation and Climate Change Mitigation and Adaptation

The evolution of digital technologies has highlighted a strong linkage between digital transformation features and the goals of climate change mitigation and adaptation. These linkages are complex, as they include both positive and negative impacts.

The potential **positive impacts** of digital transformation on climate change mitigation and adaptation include the following:

- **Improved monitoring and analysis of climate-related phenomena** – Digital technologies have significantly advanced the capabilities to monitor and analyse climate-related data. For instance, earth observation satellites equipped with sensors provide critical data on atmospheric conditions, land and sea temperature, and vegetation health. This data can now be analysed using machine learning algorithms, helping to predict weather patterns and climate change effects with greater accuracy.
- **Improved efficiency of scarce resource distribution** – Digital solutions such as Internet of Things devices can optimize the distribution of resources like water and energy. For example, smart water meters can detect leaks and monitor water use in real time, which help in reducing wastage. In areas facing water scarcity, such systems ensure that available water is used efficiently, thereby supporting sustainable management of critical resources.
- **Integration of renewable energy resources (e.g., smart grids)** – Digital technologies enable the integration of renewable energy resources through smart grids. These grids use digital communication technology to detect and react to local changes in usage and generation. An example is the ability of smart grids to integrate solar and wind power, adjusting flows to match energy supply with demand. This reduces reliance on fossil fuels and enhances the resilience of the power system.
- **Support for circular economy initiatives** – Digital platforms facilitate the implementation of circular economy models by connecting consumers with sustainable products and services. For example, online marketplaces for recycled materials make it easier for businesses to buy and sell secondary raw materials, thereby reducing waste and the extraction of virgin resources. Blockchain technology can facilitate circular economy initiatives through its capacity to create transparent and traceable records in both the supply chain and the post-consumption phase, thereby minimizing waste and aiding in efforts to reduce climate change impacts (Medaglia and Damsgaard, 2020).
- **Implementation of sustainable transportation systems** – Digitalization has paved the way for sustainable transportation solutions, such as ride-sharing platforms and electric vehicle charging networks. Real-time data analytics can optimize public transport routes and schedules, reducing emissions and energy consumption. Additionally, apps that provide information on electric vehicle charging station availability encourage the adoption of electric vehicles.

- **Support for climate monitoring and compliance** – Digital tools play a vital role in monitoring compliance with environmental regulations. For instance, blockchain technology can be used to create transparent and tamper-proof systems for tracking carbon emissions across supply chains. Companies can use this data to ensure compliance with international climate agreements and make more informed decisions about reducing their carbon footprint.
- **Support for preparedness and response to climate-related disaster** – Digital advancements, such as early warning systems that utilize big data and predictive analytics, have become crucial in preparing for and responding to climate-related disasters. An example is mobile applications that provide real-time alerts for extreme weather events, allowing individuals and communities to take early action to minimize impact.

At the same time, digital transformation features carry potential **negative impacts** on climate change mitigation and adaptation, as follows:

- **Increased energy consumption** – Digital transformation leads to the proliferation of digital devices and data centres, which require significant energy to operate. For example, the energy consumed by streaming services is substantial because it requires maintaining vast server farms running 24/7. Electricity consumption driven by the proliferation of data centres, AI and the cryptocurrency sector has the potential to double by 2026. About 85 per cent of the additional electricity through 2026 is set to come from mostly the People’s Republic of China, India and South-East Asia (International Energy Agency, 2024).
- **Depleting scarce natural resources** – The manufacture of electronic devices depends on rare earth elements, which are limited in supply. Smartphones are an example, as they use rare earth elements in their screens and batteries, and the high demand contributes to the depletion of these scarce resources.
- **Increased electronic waste** – The rapid obsolescence of technology leads to increasing volumes of electronic waste. For instance, old smartphones are often discarded due to the constant release of newer models, contributing to the growing problem of electronic waste disposal and recycling.
- **Increased digital divide** – Digital transformation can widen the gap between those with digital literacy and access to digital technology and those without (Jun, Park, and Kim, 2022). As a result, communities without digital access can be excluded from the awareness of climate change phenomena, for example, in the form of online educational programmes about climate science; and from the use of climate-smart technologies, such as early warning systems, energy-efficient appliances and electric vehicles, which require access to digital platforms for purchasing, installation and maintenance.
- **Overreliance on technical solutions** – There is a risk of neglecting non-technical aspects of problem-solving when there is too much dependence on technology. For example, using complex algorithms to make hiring decisions might overlook the importance of human judgment and lead to biases, discrimination and exclusion that are not immediately evident in the technical solution.

The potential positive and negative impacts of digital innovation on climate change mitigation and adaptation, described above, are not mutually exclusive.

In some instances, potentially highly positive impacts of a digital transformation on climate change mitigation and adaptation are reduced in real-life implementation. For example, the use of Internet of Things sensors together with the capabilities of machine learning, on the one hand, can support the collection and analysis of more data, which results in the positive impact of improving the monitoring and analysis of climate-related phenomena. On the other hand, the use of the same technology stack can hinder the very same goal of improving monitoring and analysis. This happens when the data collected by sensors is not fully relevant and in an excessive amount (the data overload problem); and/or when the outputs of the analysis are inscrutable, because the machine learning algorithms used are not transparent (the black box problem).

In other instances, potentially positive impacts of a digital transformation can trigger negative impacts. For example, on the one hand, blockchain technology can be used to support circularity by enabling transparency and traceability in product supply chains and in post-use stages, reducing waste and contributing to climate change mitigation (Medaglia and Damsgaard, 2020). On the other hand, the same use of technology can have the negative impact of increased energy consumption. Blockchain, in fact, has often been highlighted as a particularly power-demanding technology, due to its computational intensity.

In the majority of cases the impact of a digital innovation must therefore be considered as the net result of combined positive and negative impacts. This can be mostly positive, mostly negative or possibly neutral. To help identify and benchmark net impacts of digital innovation on climate change mitigation and adaptation, the next section presents a matrix to measure the impacts of digital transformation on the implementation of SDG 13, focused on climate change.

3. A Matrix to Measure the Impacts of Digital Transformation on the Implementation of SDG 13

The linkages between digital transformation actions and climate change mitigation and adaptation need to be measured in terms of expected and actual impacts in a systematic manner. A matrix to measure impacts of digital transformation actions on the implementation of SDG 13 (climate action) at target and indicator levels is proposed (Table 1).

The matrix classifies digital transformation actions into the following five areas, drawing on the five pillars of the DTI developed by ESCAP (Park, Jun, and Kim, 2022) (Figure 1):

1. The **Network/Infrastructure** area captures the aspects of digital transformation initiatives related to establishing and diffusing digital resources, for example, broadband connectivity, digital network coverage and mobile devices.

2. The **Government** area captures the aspects of digital transformation initiatives related to establishing and diffusing digital regulatory frameworks and policies, for example, intellectual property protection regulation, national digital identification systems and national AI policies.

3. The **Business** area captures the aspects of digital transformation initiatives related to the private sector, for example, the diffusion of venture capital for tech entrepreneurs and investments in digital research and development by businesses.

4. The **People** area captures the aspects of digital transformation initiatives related to human resource development, for example, the support for digital literacy.

5. The **Ecosystem** area captures the aspects of digital transformation initiatives related to the development of the macro-level variables of the ecosystem context, for example, the development of strategic alliance deals and diversity in the ecosystem workforce.

The matrix can be used at the country level for the purpose of mapping (descriptive function), exploring correlations (explanatory function) and devising strategies (prescriptive function). The descriptive, explanatory and prescriptive uses of the matrix are discussed separately below.

Table 1: Digital transformation actions and SDG 13: An impact matrix

SDG 13		*Digital Transformation Actions*				
Target	**Indicator**	*Network/Infrastructure*	*Government*	*Business*	*People*	*Ecosystem*
13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population					
	13.1.2 Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030					
	13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies					
13.2 Integrate climate change measures into national policies, strategies and planning	13.2.1 Number of countries with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of the United Nations Framework Convention on Climate Change					
	13.2.2 Total greenhouse gas emissions per year					
13.3 Improve education, awareness-raising and human and institutional	13.3.1 Extent to which (i) global citizenship education and (ii) education for sustainable					

SDG 13		Digital Transformation Actions				
Target	**Indicator**	*Network/Infrastructure*	*Government*	*Business*	*People*	*Ecosystem*
capacity on climate change mitigation, adaptation, impact reduction and early warning	development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment					
13.a Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	13.a.1 Amounts provided and mobilized in United States dollars per year in relation to the continued existing collective mobilization goal of the $100 billion commitment through to 2025					
13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth	13.b.1 Number of least developed countries and small island developing States with nationally determined contributions, long-term strategies, national adaptation plans and adaptation communications, as reported to the secretariat of					

SDG 13		*Digital Transformation Actions*				
Target	**Indicator**	*Network/Infrastructure*	*Government*	*Business*	*People*	*Ecosystem*
and local and marginalized communities	the United Nations Framework Convention on Climate Change					

3.1 DESCRIPTIVE USE

The descriptive use of the matrix aims to map the level of maturity of digital transformation initiatives in each country against the degree of progress towards each SDG 13 indicator. For this purpose, the matrix should host two sets of values for each country in the Asia-Pacific region.

The first set of values is the quartiles in which the DTI scores of a country would be positioned, disaggregated in the five areas of Network/Infrastructure, Government, Business, People and Ecosystem. These values indicate how mature each country is in its level of digital transformation, in comparison with the rest of the countries in the Asia-Pacific region.

The calculation of the quartile positioning of each country's DTI score should draw on the methodology described in Park, Jun, and Kim (2022). However, each DTI score would need to be disaggregated in the five areas of Network/Infrastructure, Government, Business, People and Ecosystem, by removing the weights attributed to each area and then normalized to the value of 0–100.

In the matrix, the scores would then be grouped in four percentile groups based on a ranking of all countries in the Asia-Pacific for which scores are available. For the purpose of visual clarity, values would be colour coded, as follows (from high to low levels of maturity):

1. First percentile group in green
2. Second percentile group in yellow
3. Third percentile group in orange
4. Fourth percentile group in red

The second set of values is the quartile in which the value, for each of the SDG 13 target indicators of a country,[1] would be positioned. These values are expressed either as absolute numbers (e.g., SDG 13.1.1: number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population); as percentage values (e.g., SDG 13.1.3: proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies); or as dichotomous variables (e.g., SDG 13.1.2: presence or absence of adoption and implementation of national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030).

These quartile values would indicate the level of progress towards each SDG target indicator for each country, in comparison with the rest of the countries in the Asia-Pacific region.

Similarly to the DTI quartile values, these would also be coloured in green, yellow, orange and red. Differently from the DTI quartile values, however, the colouring would be aligned with the desirability of the scores, from the most desirable scores in green (e.g., lowest quartile in number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population – SDG 13.1.1; highest quartile in proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies – SDG 13.1.3), to the least desirable scores in red.

Table 2 provides an example of how a descriptive use of the matrix would look like, using fictitious data in a country for illustration.

[1] A source of SDG 13 target indicator values, albeit not complete, is available at https://unstats.un.org/sdgs/dataportal.

Table 2: Descriptive use of the impact matrix: An example

Target	Indicator		*Network / Infrastructure*	*Government*	*Business*	*People*	*Ecosystem*
			15	45	30	60	50
13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	60					
	13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies	70					

Most desirable quartile — Least desirable quartile

This descriptive use of the impact matrix lends itself to different uses by governments. These include using the matrix results for raising awareness among policymakers, businesses and non-governmental organizations; for monitoring and evaluation, by using the impact matrix for tracking the effectiveness of digital transformation initiatives in achieving SDG 13 targets; and for public communication, by using the impact matrix to communicate with the public about the impacts of digital transformation on SDG 13.

3.2 EXPLANATORY USE

The second use of the matrix aims at the quantification of possible correlations between digital transformation and levels of achievement of SDG 13 target indicators. For this purpose, the complete data set of available DTI scores for all countries of the Asia-Pacific region would be necessary, disaggregated by the five areas of Network/Infrastructure, Government, Business, People and Ecosystem, as described in Section 3.1. In addition, the data set of all values of SDG 13 target indicators in countries of the Asia-Pacific region would be necessary.

In this explanatory use, each cell of the impact matrix would host a correlation value between all the values of DTI scores (normalized to a value between 0 and 100 – see Section 3.1) and the values of SDG 13 target indicators, expressed either as absolute numbers, percentage values or dichotomous variables.

The choice of a measure of correlation would depend on: (a) the nature of the dependent variable; and (b) the distribution of the data. Regarding (a), as previously mentioned, SDG 13 target values are expressed in absolute numbers, percentages or dichotomous variables. This influences the choice of correlation measure. Regarding (b), to adopt specific measures of correlation (e.g., Pearson's r correlation coefficient), the type of distribution of the data needs to be ascertained first – for example, if the data is normally distributed or not.

Table 3 provides an example of how a correlation use of the matrix would look like, using fictitious data for illustration.

Table 3: Explanatory use of the impact matrix: An example

Target	Indicator	*Network/ Infrastructure*	*Government*	*Business*	*People*	*Ecosystem*
13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	*r*=0.70	*r*=-0.55	*r*=0.50	*r*=-0.60	*r*=0.45
	13.1.3 Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies	*r*=0.35	*r*=0.25	*r*=0.30	*r*=0.60	*r*=0.25

This explanatory use of the matrix supports an understanding of the intensity of the linkage between specific digital transformation areas and the impact on specific SDG 13 targets and indicators in the Asia-Pacific region as a whole.

The explanatory use of the impact matrix lends itself to different uses by governments. These include using the matrix results for resource allocation, by redirecting resources towards digital transformation initiatives that have the greatest impacts on each SDG 13 indicator; and for policy review and adjustment, by regularly reviewing and adjusting policies based on insights from the impact matrix to help ensure that policies remain effective and relevant.

3.3 PRESCRIPTIVE USE

The third use of the matrix aims at supporting the definition of initiatives of digital transformation in relation to each of the SDG 13 target indicators. In this use case, the matrix does not require the analysis of a data set, but instead functions as a framework to support decisions that should be influenced by the data analysis carried out in the use of the matrix as both descriptive and correlation analysis tool. Table 4 provides an example of how a prescriptive use of the matrix would look like, using hypothetical digital transformation initiatives in a country for illustration.

Table 4: Prescriptive use of the impact matrix: An example

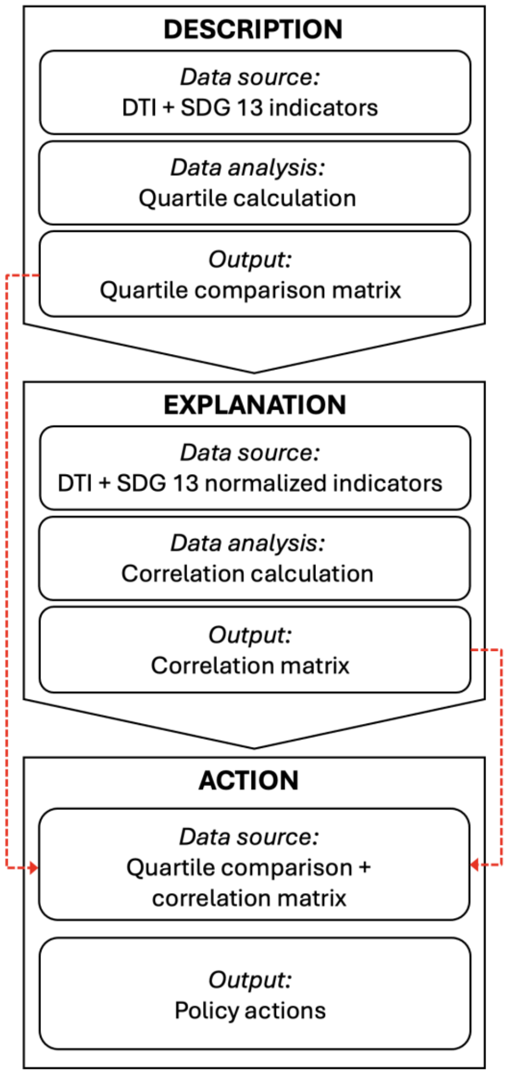
Target	**Indicator**	*Network/Infrastructure*	*Government*	*Business*	*People*	*Ecosystem*
13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	**Establish early warning systems** that include seismic sensors for earthquakes, water level monitors for floods and satellite imaging for approaching storms.	**Standardize digital emergency protocols** across sectors, to ensure that systems are interoperable and can work in concert during emergencies.	**Offer tax incentives or subsidies** for research and development in disaster-related digital technologies.	**Establish community-based training programmes** in schools, libraries and local government buildings where citizens can learn how to access and use digital disaster management tools.	**Engage in international agreements** to share knowledge, technology and best practices for disaster risk reduction, leveraging the expertise of global leaders in digital technology.

This prescriptive use of the impact matrix lends itself to different uses by governments. These include using the matrix for policy formulation, by identifying priority areas for digital transformation initiatives that can contribute to SDG 13; for international cooperation, by sharing best practices and lessons learned to enhance the effectiveness of digital transformation initiatives in achieving SDG 13; and for institutional capacity building, by training staff, investing in data infrastructure and establishing processes for using the matrix.

3.4 A PROCESS MODEL FOR MEASURING IMPACTS

The three uses of the impact matrix – descriptive, explanatory and prescriptive – are logically linked to each other. Figure 2 provides an illustration of the linkages between each of the uses, in the form of a process model.

Figure 2: Operationalization of the impact matrix: Three stages



Each use can be considered as a step informing the following one. In the first stage, the impact matrix supports the **description** of how a country performs in terms of digital transformation and, in parallel, in terms of degree of achievement of SDG 13 indicators. The DTI and the SDG 13 indicator values are used as data sources, which are then analysed as quartiles. The output of this step is a quartile comparison matrix, as shown in Table 2.

After the description of a country's situation, the next step consists of an **explanation** of the relationship between digital transformation and SDG 13 performance. Here the data source consists of the normalized indicators of the DTI and SDG 13, analysed through the calculation of correlation coefficients. The output of this step is the correlation matrix shown in Table 3.

Both the steps of description and explanation should then inform the use of the impact matrix by a country's policymakers, in the final step of **action**. In this final step, the input comes from considering both the quartile comparison of the description step and the correlation matrix of the explanation step. These data sources should inform the policy initiatives that can be framed using the impact matrix, as shown in Table 4.

3.5 PILOTING THE IMPACT MATRIX

Each of the three uses of the impact matrix needs to be piloted to assess its usability and effectiveness. The following three steps to be taken in the piloting activities by governments in the Asia-Pacific are recommended:

1. For descriptive use, governments should establish robust data collection and reporting mechanisms to track progress on both digital transformation and SDG 13 indicators. Regarding progress on digital transformation, the methodology provided for the DTI developed by ESCAP (Park, Jun, and Kim, 2022) should be followed. Regarding progress on the SDG 13 indicators, governments should tap into available data from the SDG global database.[2] For missing indicator datapoints in the database, each government should establish resources and processes to systematically collect and store data.
2. For explanatory use, to carry out the correlation analyses indicated in Section 3.2, governments should draw on the existing technical expertise within their national statistical offices.
3. For prescriptive use, governments should embed personnel with statistical competencies within teams that inform policymaking on digital transformation aimed at climate change mitigation and adaptation. These multidisciplinary teams should ensure a data-driven approach to policy actions formulated following the impact matrix.

[2] United Nations, "SDG Indicators Database". Available at https://unstats.un.org/sdgs/dataportal.

4. Policy and Regulatory Recommendations to Drive Positive Net Impacts

Based on the rationale of the proposed impact matrix, five policy and regulatory recommendations are provided to drive positive net impacts of digital transformation on climate change mitigation and adaptation. Each recommendation focuses on an area that corresponds to a pillar of the DTI framework developed by ESCAP (Park, Jun, and Kim, 2022), namely, Network/Infrastructure, Government, Business, People and Ecosystem.

Recommendation 1 (Network/Infrastructure Pillar): Devise and enforce data centre efficiency standards

Governments should work with industry experts to develop guidelines and regulations for data centres that encourage the adoption of energy-efficient technologies, cooling systems and server optimization techniques. Implementing standards for data centres can significantly reduce their carbon footprint and enhance the overall sustainability of digital infrastructure.

This recommendation focuses on impacts of digital transformation on SDG indicator 13.2.2.

Recommendation 2 (Government Pillar): Establish standards for collecting, sharing and managing open government data on climate change mitigation and adaptation

Governments should establish standards for collecting, sharing and managing open government data on climate change mitigation and adaptation to ensure interoperability among different digital platforms. This can facilitate seamless information exchange between government agencies, businesses, non-governmental organizations and other stakeholders involved in digital transformation actions.

This recommendation focuses on impacts of digital transformation on SDG indicators 13.1.3, 13.2.1 and 13.b.1.

Recommendation 3 (Business Pillar): Provide incentives for business investments in research and development for climate change mitigation and adaptation

Governments can create incentives, such as grant programmes and tax credits, to increase business expenditures on research and development on digital transformation for climate change mitigation and adaptation. Examples of emerging technologies that should be targeted by research and development include generative AI, Internet of Things, advanced robotics and carbon capture technologies.

This recommendation focuses on impacts of digital transformation on SDG indicators 13.1.1, 13.2.2 and 13.a.1.

Recommendation 4 (People Pillar): Foster lifelong educational programmes on digital transformation for climate change mitigation and adaptation

Governments should foster lifelong educational programmes for key stakeholders on digital transformation for climate change mitigation and adaptation. This should happen by offering subsidies, setting standards mandating updated competency certifications for businesses and fostering the development of a regional market for educational offerings.

This recommendation focuses on impacts of digital transformation on SDG indicator 13.3.1.

Recommendation 5 (Ecosystem Pillar): Promote public-private partnerships in digital transformation for disaster risk reduction

Governments can promote public-private partnerships to drive digital transformation in disaster risk reduction systems and processes. Effective tools include geographic information systems, remote sensing and early warning systems to enhance preparedness, response and recovery efforts.

This recommendation focuses on impacts of digital transformation on SDG indicators 13.1.1, 13.1.2 and 13.1.3.

5. Conclusion and Way Forward

In this paper, a matrix to measure the impacts of digital transformation on climate change mitigation and adaptation in Asia and the Pacific has been presented. Digital transformation plays an important role in addressing multiple challenges related to climate change mitigation and adaptation and accelerating climate action in the region. However, the linkages between digital transformation and climate change mitigation and adaptation are complex. Therefore, the ability to conceptualize, measure and act on these linkages will be key in the years to come.

The matrix proposed in this paper aims to serve as a descriptive, explanatory and prescriptive tool to support governments in the region. The three uses of the matrix are logically linked in a sequence, where each stage informs the following. The underlying assumption of the paper is that governments should not act in isolation but need to create synergies with the vast array of stakeholders in the ecosystem, including businesses, non-governmental organizations and citizens.

The matrix draws on work previously carried out by ESCAP in the area of digital transformation and aims at devising a methodology to better measure, monitor and understand the impacts of digital transformation on climate change mitigation and adaptation, especially on the achievement of SDG 13 targets.

Moving forward, it is important to build on the groundwork presented here to refine the methodology, drawing on the expertise of both the research and the policy community in the Asia-Pacific region. Seven possible pathways are suggested in further developing and implementing the impact matrix. These pathways concern the structure of the impact matrix, its uses and its implications for policymaking, as follows:

1. Expand the matrix to include additional dimensions beyond the five proposed areas (Network/Infrastructure, Government, Business, People and Ecosystem). For example, consider including cultural and social dimensions that may impact climate change resilience.
2. Explore linkages between digital transformation and other SDGs beyond SDG 13. For example, consider how actions in one area may impact multiple SDGs that are closely related to SDG 13 – e.g., SDG 7 (affordable and clean energy), SDG 11 (sustainable cities and communities) and SDG 12 (responsible consumption and production).
3. Incorporate a time dimension to track changes in impact over time. This could involve analysing historical data and projecting future impacts.
4. Define thresholds for each impact level, for values that indicate a critical impact level requiring urgent action.
5. Expand visualizations of impacts (e.g., heatmaps and trend graphs). This can help policymakers identify priority areas for intervention.
6. Involve relevant stakeholders (e.g., policymakers, researchers and practitioners) in refining and validating the impact matrix. Their insights can enhance its robustness and relevance. Establishing a feedback mechanism to gather insights from users of the impact matrix can inform iterative improvements.
7. Promote capacity building among policymakers to effectively interpret and use the impact matrix, for example, through training sessions and workshops.

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