# Data Innovation Deploying the SDG indicators for Change: "The Future we Work For!"

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## Abstract

The UN system attracted countries of the world to the SDGs process and incentivized related tracking for the last 8 years. National reviews and fancy visualization platforms have been developed and promoted. However, the Covid 19 global stressor questioned the indicators' truthfulness and energized the discussion on a best utilization of the SDG indicators. This manuscript touches on the SDG tracking and proposes further applications of data innovation tools based on AI and Big Data towards closing the implementation loop for the SDGs using measured and proxy indicators. It also recommends keeping the human in the loop of policy making and selectively deploying data science tools for effective planning and changing performance curves of the various stagnated Goals.

## 1. Introduction

The interlinkages and integrated nature of the SDGs are of crucial importance. The agenda has been evolving and resulted in major reported progress across the SDGs reaching a respectful milestone in 2021 marking the first 5 of the 15 years 2030 journey. During 2020, a destructive pandemic Covid19 shocked all systems and countries. Environmental concerns were ignored facing priority to human health, economic meltdown yielded stagnation and social isolation, millions of victims incurred, nationalist interests and selfishness took over common shared values and multilateralism, invasive tracking ignored the privacy rights, medical data analytics unmasked personal records, governmental emergency actions sidelined governance and human rights, massive plastic protective gears ignored pollution to oceans and nature, AI and smart applications invaded homes and workplace, cyberwars replaced conventional weapons, migration reached historic levels, and isolation pushed mental state across generations and societies.

The pandemic has been a unique, once in a century, global crisis that affected everyone and every country irrespective of the labeling and classification from LDCs to the most developed countries. The performance and readiness of critical infrastructure especially health systems as depicted by the SDG indicators is evaluated across a diverse group of countries that experienced a disproportional devastating impact causing unexpected deaths in record numbers surprisingly among developed infrastructure countries and the opposite was also true in less developed infrastructure countries. In "A Critical Review of the Role of Indicators in Implementing the Sustainable Development Goals" Handbook of Sustainability Science (2017): *"the indicators, despite their nonperfect nature and critics of their lack of universality and ethical linkages can clarify political views and increase accountability".* In another recent "Global public policy in a quantified world: Sustainable Development Goals as epistemic infrastructure. Oxford *Policy and Society*, 2022: "*The SDGs are powerful levers in the production of new policy directions globally. However, this is not simply a focus on "evidence-making," but rather a complex interplay of material, techno-political, and organizational structures within which (statistical) knowledge is produced, disseminated, and translated into global public policy*." COVID-19 vulnerability across world countries at various development stages showed clearly that Africa data is surprisingly better than that of Europe and North America despite accommodating age pyramid and other impactful factors.

The popular aim to closing the policymaking loop is enforced by the fact that the SDGs' dependence on local context requires the member states to drive the evaluation and promotion of various development policies. Several institutions and experts have been working on deploying modern tools within this continuous improvement process as part of the national planning and sustainable development cycle. For example, the Alan Turing Institute[1] is working on the use of data science and Artificial Intelligence to inform policy making with unprecedented insights ranging from identifying policy priorities by modelling complex systems and scenarios, to evaluating hard-to-measure policy outcomes.

[1] www.turing.ac.uk/research/research-programmes/public-policy

Many attempted to explore ways to "*develop our understanding of how indicators could be successfully used in implementation of the SDGs.*[2]" Despite their non-perfect nature and critics of their lack of universality and ethical linkages, "*Indicators can clarify political views and increase accountability".* Furthermore, "*Indicators facilitate new understandings of complex systems."* Indicator-led analysis should direct and inform a more detailed and context-sensitive analysis. SDG indicators should not be the only basis for developing new policy, rather an ingredient supporting the context determined by the mission and vision of the organization and group values[3].

## 2. Data Innovation for Closing SDG Implementation Loop:

Reached is a realization that SDGs have "*indicators and quantified data to monitor targets and goals—are no longer just tools of governance but rather are emblematic of the new types of political cultures, enabling an interplay of material, techno-political, and organizational structures within which (statistical) knowledge is produced, disseminated, and translated into global public policy*.[4]" These measurements have become proxies for countries' general well-being and prosperity, and the means by which different entities—multilateral and bilateral funding organizations, nongovernmental and philanthropic organizations, and the countries themselves—make priorities about development investments and policy decisions both internationally and domestically.

As they frame issues, link policy instruments, and connect diverse actors, indicators emerge as the central venue for "policy work". SDGs have come to signify a paradigmatic shift in global public policy that shapes and reshapes the very architecture of the transnational governance of sustainability itself. SDGs are powerful levers in the production of new policy directions globally. However, this is not simply a focus on "evidence-making," but rather a complex interplay of material, techno-political, and organizational structures within which (statistical) knowledge is produced, disseminated, and translated into global public policy. Through this complex interdependent dynamical process, unfortunately most countries do not leverage data and science sufficiently for policymaking.[5]

The Integrated Sustainable Development Goals model for medium and long-term national planning towards the SDG dynamic problems was explored in Pakistan in 2021[6]. The large size model, composed of more than a thousand equations and included about 60 stocks variables and several thousand feedback loops. System dynamics models have become reliable tools in developing and accessing robust education policies but the large complexities and SDGs interdependencies among hundreds of variables make the dynamical modeling tool impractical.

On another front, the ability to sense patterns of need, develop evidence-based programs, forecast outcomes, and analyze effectiveness—fall squarely in AI's sweet spot.[7] Keeping humans in the loop serves as a sanity check, improving the overall quality of policies, their cost benefit calculations, and societal value.

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[2] A Critical Review of the Role of Indicators in Implementing the Sustainable Development Goals *Handbook of Sustainability Science (2017), Edited by Walter Leal.* Simon Mair, Aled Jones, Jonathan Ward, Ian Christie, Angela Druckman, and Fergus Lyon.

[3] Association of Flemish Cities and Municipalities (VVSG) Inspiration guide: Integrating the SDGs into your multi-annual plans, 2019

[4] Global public policy in a quantified world: Sustainable Development Goals as epistemic infrastructure. Marlee Tichenor, Sally E. Merry, Sotiria Grek, Justyna Bandola-Gill. Oxford *Policy and Society*, 2022.

[5] Dubai Policy review, Turning the Tide in the Arab Region: How Data-driven Policy Can Accelerate Achieving the SDGs, Mari Luomi, 2022 https://dubaipolicyreview.ae/turning-the-tide-in-the-arab-region-how-data-driven-policy-can-accelerate-achieving-the-sdgs/

[6] Khushik, F., & Diemer, A. (2021). Using the iSDG Model as a Policy-Making Guiding Tool to Achieve SDG 4 in Developing Countries: A Case Study on Pakistan Modern Economy, 12, 227-246. https://doi.org/10.4236/me.2021.121012

[7] AI Brings Science to the Art of Policymaking 2021, Jaykumar Patel, Martin Manetti, Matthew Mendelsohn, Steven Mills, Frank Felden, Lars Littig, and Michelle Rocha, BCG

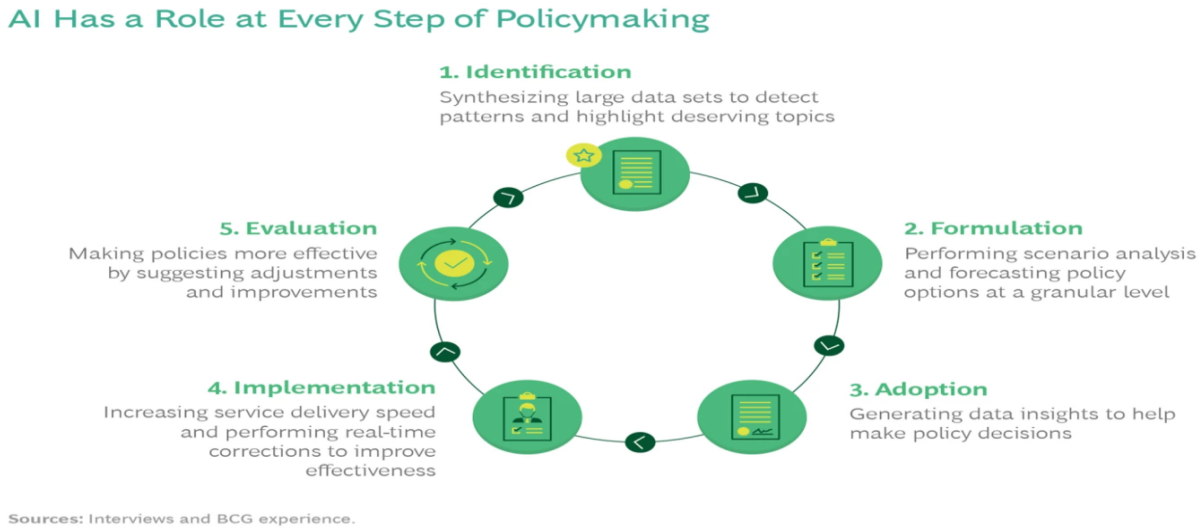


**Figure 1 (BCG):** AI potential roles (patterns, forecasting, evaluation) in the full cycle of policymaking.

The data sources are combining traditional records, measurements and nontraditional digital exhaust, or footprints using Big Data and AI (BDAI) algorithm to offer "vast analytical opportunities for policy makers to assess complex real-time information to track and monitor SDG progress, and to design policies toward SDG advancement [8]".

Applying AI in public policymaking was discussed in 2019 by OECD as a means for "*better understanding project potential, feasibility and potential future issues, the government is in a position to make more informed decisions about what to invest in, and what to avoid*[9]." Regulators could use the vast data already available to them and apply machine learning tools in order to help predict where they should deploy their regulatory efforts. Such tools could be used to identify areas in which to focus regulation, to know who to investigate and inspect, whether citizens and businesses receive financial and other assistance from the government, and to recognize patterns or irregularities in data to improve the accuracy of decision making, better allocate resources, anticipate unmet needs, and spot fraud or safety risks, among many other things. When properly designed and implemented, these capabilities allow AI to make a positive contribution to government activities throughout the policy cycle, from agenda-setting and policy formulation to implementation and evaluation.

In the EU region, ongoing major project (AI4PublicPolicy) to deploy AI in policy making[10] has been building a platform for various tools that have promising benefits in policymaking. Specifically, data sets and methods that are based on making connections coming up with more effective policy-making methods in fields like crime fighting, ensuring health, and protecting the environment. These datasets have been registered to the dataset catalogue component and used to test different ML models that resulted in new policy models. The architecture defines modules and characteristics for Data analytics, Data protection, Data processing architectures, Data management, and Cloud and High-Performance Computing building blocks. Furthermore, it also introduces a guide for integrating and implementing AI-based policies, to assist policy extraction. For tabular data, deployed is a family of highly parallel/distributed algorithms that extract any nonredundant quantitative association rules that hold on the dataset with at least a particular user-defined minimum support and confidence[11].

[8] "Big Data and A.I. for the SDGs: Private corporation involvement in SDG data-driven development, policy and decision-making. Ciarán O'Brien (UCD Centre for Sustainable Development Studies) Science-Policy Brief for the Multistakeholder Forum on Science, Technology and Innovation for the SDGs, May 2022

[9] Berryhill, J., et al. (2019), "Hello, World: Artificial intelligence and its use in the public sector", *OECD Working Papers on Public Governance*, No. 36, OECD Publishing, Paris

[10] Policy Prediction, the Future of Evidence-Based Policymaking? EU. March 2022

[11] I.T. Christou (2019). "Avoiding the hay for the needle in the stack: Online rule pruning in rare events detection", IEEE Intl. Symposium on Wireless Communication Systems (ISWCS), pp. 661-665, Oulu, Finland

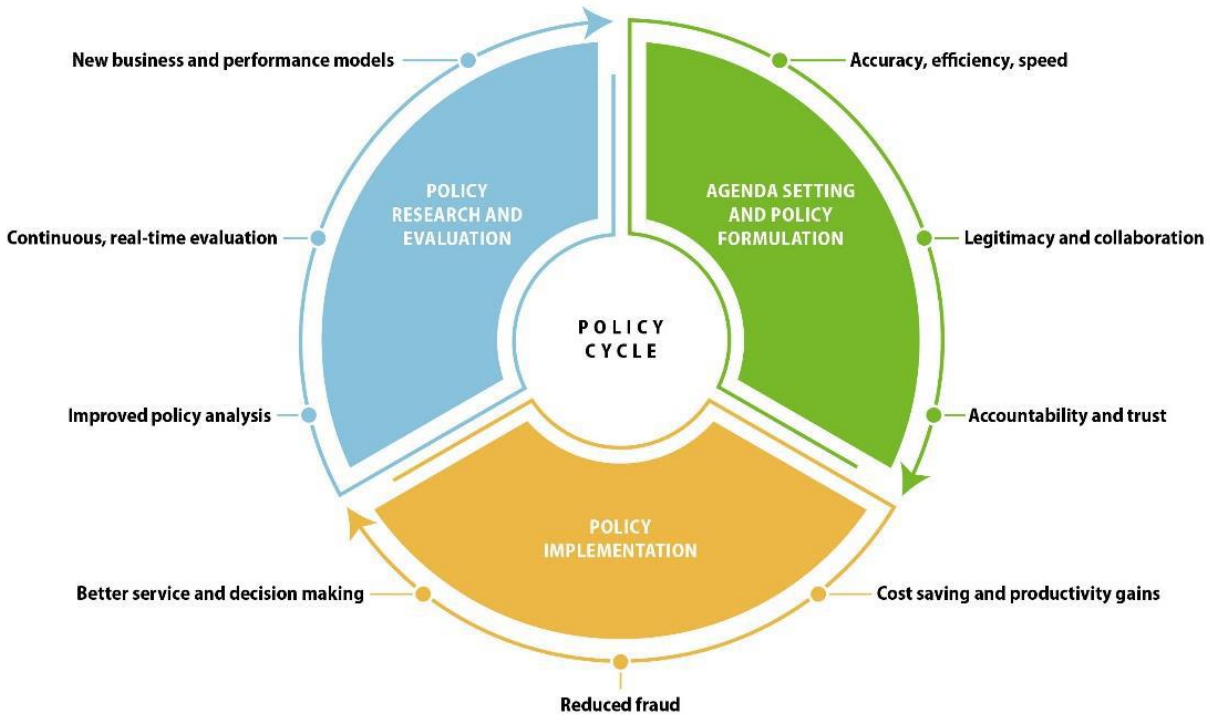


**Figure 2:** Potential contributions of Big Data and AI on the full cycle of policymaking process (OECD 2019)

Several bold attempts are reported for:

- The "Automated Resource Allocation" in 2019 by the Chinese government that began using AI to allocate resources more efficiently.
- The "Automated Risk Assessment" during 2021 by the European Union that began using AI to assess the risk associated with proposed policies and decisions.

## 2.1 Regional Case

The UN ESCWA (20 Arab member states) regional indicators do not reflect national realities due to the heterogeneous nature of the region. However, the lack of data relevant to SDGs indicator measurements is obvious. It will be important to explore the national indicators' directions especially those showing off track trajectories in order to address and explore ways to change course.

Sample Mapping of SDG priorities based on UN ESCWA SDG Monitor platform:

1.1.1 - Proportion of population below international poverty line (%), Somalia 2017 at **64.6%**

2.1.2 - Total population in severe food insecurity (thousands of people), 15+, female, Somalia 2019 at **79.1%**

2.1.1 – Prevalence of undernourishment (%) Somalia 2019 at 59.5%; Yemen 2019 at **45.4%**

3.8.1 - Universal health coverage (UHC) service coverage index, Somalia 2019 at **27%**

3.1.1 - Maternal mortality ratio, female, Somalia 2019 at **829 per 100,000** live births.

4.1.1 - Proportion of children and young people achieving a minimum proficiency level in reading and mathematics (%), Algeria 2015 at **21%**

4.4.1 - Proportion of youth and adults with information and communications technology (ICT) skills, Algeria 2018 at **9.4%**

There is no shortage of AI applications in services and operations in Arab countries, for example:

- Automated Health Care: The 2020 report on AI-enabled healthcare system in Saudi Arabia[12]

[12] https://www.itp.net/news/business-strategy/332599/saudi-arabia-launches-ai-enabled-healthcare-solution

- Automated Traffic Management: The 2019 report on AI-enabled traffic management system in Dubai[13]
- Automated Document Processing: The 2020 report on AI-enabled document processing system in Qatar[14]
- Automated Education: The 2021 report on AI-enabled education system in the UAE[15]

The experience and gained confidence of the practical benefits in such applications formulate a relevant capacity and starting point for applying AI to design, implement, and assess more effective policies for sustainable development in Arab countries.

## 2.2 AI Important Considerations

To develop machine learning (ML) that is useful for policymaking in practice, the following challenges must be addressed: Biased Systems, Explainability and Transparency, and Regulatory Compliance[16]. There is a continuous improvement in data mining framework for the creation of reliable and unbiased systems for public policy making.

The concerns are that BDAI and its utilization in sustainable development programs and decision-making can reinforce and magnify pre-existing inequalities and bias. Whilst also distorting or amplifying real world exclusion and discrimination against marginalized groups, unless diversity and inclusion are factored in. In the same report from UCD center for sustainable development studies, it was reported that an estimated "BDAI positive enabler of over 79% of SDG Targets, it can negatively affect over 35%." Acknowledging the human critical role in the policymaking cycle as more than a link in the chain, rather a client, regulator, and verifier of the various phases' inputs and outputs, governments[17] *will therefore need to determine the appropriate trade-off between strong controls and experimentation and risk, based on the relative costs and benefits*.

## 3 Conclusion

The diversity of data sources, and multiplicity of enabling tools and platforms support the confidence building process in the results and outcomes. Specifically, it is important to assess the effectiveness of various tools such as: scenario planning, simulation platforms, and advanced discovery. It is important to selectively capitalize on the roles that a machine with data and algorithm can outperform humans in the policymaking cycle's various phases. Specifically, AI can provide more accurate forecasts and predictions, tailor public services to user need with GIS information, and simulate complex systems with unlimited data size and number of variables for computing tasks.

It is a fact that public policymakers have unprecedented opportunities to collect and manage digital data from a variety of different channels. This data enables a shift to data-driven, evidence-based policymaking using ML and AI technologies. However, the use of AI in public policy is still in its early stages, as issues such as transparency, explainability, and bias reduction remain unresolved.

Measuring the available SDGs indicators and re-reporting them in dashboards or colorful visualization is good, but insufficient after 8 years of adopting the Goals in 2015. It is critically more important and timely to twist the performance curve of the poorly functioning SDGs towards reaching desired targets using near real time feedback loops and data science tools.

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[13] https://www.zdnet.com/article/dubai-rolls-out-ai-enabled-traffic-management-system/

[14] https://www.albawaba.com/business/pr/qatar-introduces-ai-enabled-document-processing-system-1312994

[15] https://www.thenational.ae/uae/education/uae-launches-ai-enabled-education-system-1.1140730

[16] Thanasis Papadakis, Ioannis T. Christou, Charalampos Ipektsidis, John Soldatos, & Alessandro Amicone. (2022). AI Solutions for Transparent, Explainable and Regulatory Compliant Public Policy Development https://doi.org/10.5281/zenodo.7272425

[17] Pencheva, I., M. Esteve and S.J. Mikhaylov (2018), *Big Data and AI – A Transformational Shift for Government: So, What Next for Research?* https://journals.sagepub.com/doi/pdf/10.1177/0952076718780537