# Breaking down the silos for national SDG planning

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## Abstract

It is well recognized that effective and efficient planning for national SDG attainment must recognize the interconnected nature of the SDGs. This entails identifying policies that favorably impact more than one SDG, while minimizing trade-offs in which attainment in one SDG diminishes performance in others. To achieve the SDGs planners and policy makers in different government institutions must stand ready to dispense with siloed decision-making and cooperate for integrated planning. The 17 SDGs with their 169 associated targets and 230 indicators, however, form a highly complex dynamic system that poses an impediment to consensus building and policy design. Recognizing this problem, the Integrated Sustainable Development Goal (iSDG) model has been developed by the Millennium Institute to allow planners, policy makers, or researchers from different disciplines to experiment with policy mixes for SDG attainment (primarily, but not limited to, government budget allocation decisions for SDG investment) and to test SDG outcomes through computer simulation. The model covers all 17 SDGs as well as inter-linkages and feedback loops that connect the SDG sectors. The model is developed using System Dynamics, a methodology for simulating complex systems that explicitly models the effects of feedback loops, time lags and nonlinearities over medium to long time horizons. The model features an intuitive user interface so that planning and policy specialists do not have to have in depth training in System Dynamics to use the model. The iSDG is designed to support shared learning and policy design by making it possible for users to recursively run alternative policy scenarios of their own choosing, ideally in a facilitated group setting. In this manner policy makers and planners are encouraged to think and act beyond their traditional silos to seek fully integrated policies for SDG attainment. In addition to SDG status, the model tracks SDG expenditures, meaning that users can compare scenarios on the basis of both SDG performance and cost effectiveness. A unique synergy analysis tool allows users to observe the effects of policies across all 17 SDGs and to assess the synergies that emerge from various policy combinations. The iSDG thus offers planners and policy makers from all disciplines an experimental platform and bundle of analytical tools to further consensus building and integrated planning for SDG attainment. Currently the iSDG model is being used to develop integrated national and regional SDG policies in more than a dozen countries in sub-Saharan Africa.

## Key words

Sustainable Development Goals, integrated model, iSDG, System Dynamics

## Introduction

Across the world and within countries there are silos of decision making, in agriculture, health, education, natural resources, finance and other sectors where groups of people largely disassociated with those in other groups make decisions. From the inception of the Agenda 2030 it has been widely agreed that an integrated approach to country and regional planning is necessary to attain the SDGs. This implies breaking down traditional institutional silos and adopting more cross-sectoral decision-making (ECOSOC 2016). However, even given the willingness to cooperate across silos, it is very difficult for policy makers in different institutions to know just how to coordinate policy initiatives for better SDG outcomes.

The SDGs are part of a complex dynamic system characterized by interwoven feedback loops, time delays between causes and effects and non-linear relationships. Such systems are known to impede conventional decision-making and often lead to perverse outcomes (Sterman 1994). This makes for a very challenging learning environment in which to design coherent policies. Policy makers need an analytical tool to help them work out the impacts of policies across their ministries sectors. An overarching perspective is needed on the SDGs in order to identify policy mixes that are high performing and cost effective.

To address this need the Millennium Institute has developed the Integrated Sustainable Development Goal (iSDG) model. The iSDG is based on the System Dynamics method for complex system analysis first developed at MIT by Forrester (1968). The purpose of the iSDG is to help policy-makers and planners make sense of the complex and interwoven SDG system, and to help them design efficient pathways to their goals. The iSDG supports shared learning and policy design by making it possible for users to recursively run alternative policy scenarios of their own choosing, ideally in a facilitated group setting. In this manner policy makers and planners are encouraged to think and act beyond their traditional silos to seek fully integrated policies for SDG attainment. In addition to SDG attainment, the model tracks SDG expenditures, meaning that users can compare scenarios on the basis of both SDG performance and cost effectiveness.

**The Integrated Sustainable Development Goal (iSDG) Model**

The Integrated Sustainable Development (iSDG) model has been developed from the Millennium Institute's Threshold-21 modeling framework. Threshold-21 has been applied for over 30 years in over 40 countries for national sustainable development planning (Barney 2002); areas of special focus have included sustainable agriculture and food security, green economy planning, and the Millennium Development Goals among others. The iSDG model is specifically designed for SDG planning at the national scale. The iSDG takes the perspective of national or regional planning and simulates the impacts of policy decisions on SDG attainment across the full time horizon of the SDGs (until year 2030). The iSDG is able to simulate concurrently any number of policies and demonstrates the impacts of policy mixes on all 17 SDGs as well as synergetic effects created between policies. Most, but not all, policies are implemented in the model through budget allocations. The model can keep account of the total budgetary cost of a given policy mix. Also, it can simulate the performance of SDG policies under a predetermined budgetary constraint.

The iSDG has been subjected to standard validation tests for system dynamics models (Barlas 1996) and has been vetted by experts in System Dynamics and sustainable development within and outside of the Millennium Institute. The iSDG has been or is being used as an aid for SDG planning at the national scale in 5 Sub-Saharan countries and at regional scale with 10 countries in the Sahel region.

*iSDG model structure*

The core iSDG model is divided into 30 interacting sectors, or sub-models (Figure 1). The model integrates economic, social, and environmental dimensions, and represents the key components of dynamic complexity, i.e., the positive and negative feedback loops, non-linear relationships, and time lags that are fundamental to sustainable development problems (Pedercini et al. 2018, Collste et al. 2017). Detailed information about the model structure and individual sectors can be found at the iSDG model website (MI 2016). The iSDG model is developed in Vensim DDS software (www.vensim.com), with user interface developed in Sable (http://www.ventanasystems.co.uk/).

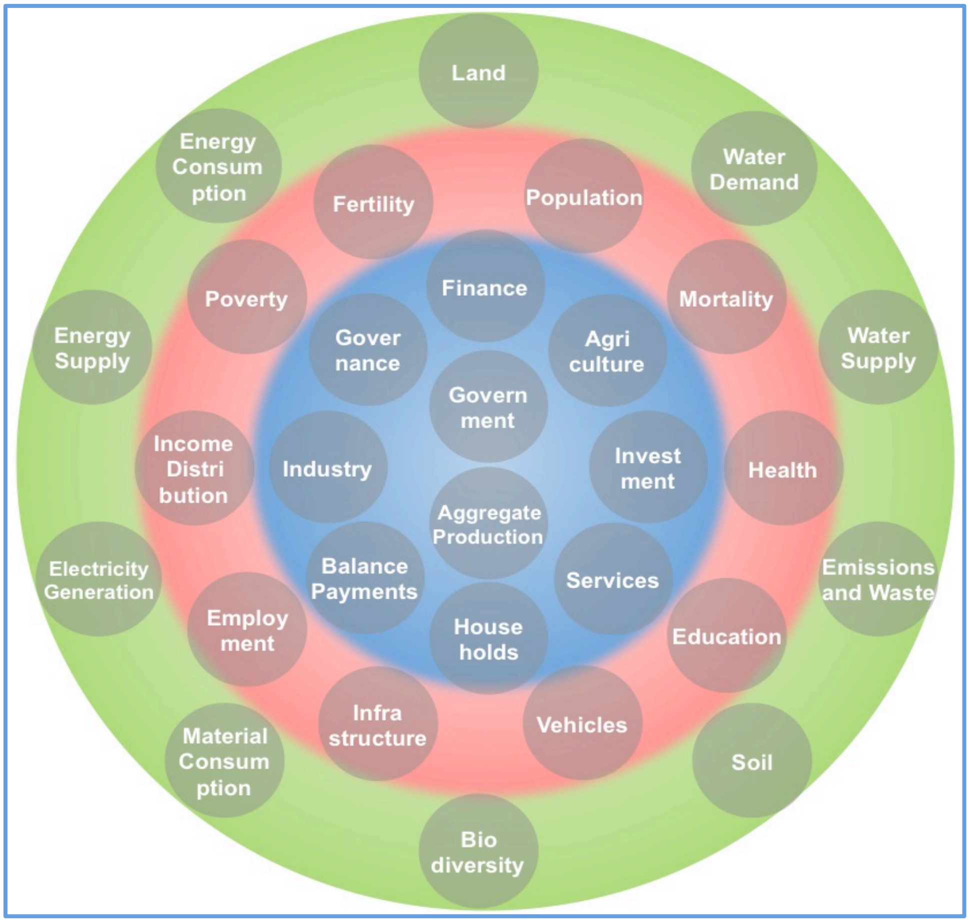

Figure 1. Organization of core iSDG model (Pedercini et al. 2018). Green indicates the environmental dimension, red the social dimension, and blue the economic dimension. Sectors are indicated by the small circles within the dimensions. Inter-linkages and feedback loops occur within and between sectors and across dimensions.

The model traces causal pathways from policy interventions to approximately 75 SDG indicators across all 17 SDG sectors. When simulated the model calculates the performance of the available indicators for each SDG target. The performance of the targets in terms of percentage attainment are then averaged to give percentage performance for each SDG.

The core iSDG model is customized to the specific circumstances of the client country. This involves calibration with country specific data and refinement of the model structure. A series of workshops are held in country to guide model structural refinement to accommodate the circumstances of the country and to identify the clients' policy priorities.

A user-friendly interface has been developed for the model. This enables users who are not experts in system dynamics modeling to easily perform policy experiments and learn from their interactions with the model. The modeling simulates in near real-time, demonstrating the effects of policies on SDG attainment and facilitating the learning process. Also, causal diagrams show the pathways of effects emanating from policy interventions, helping establish a link between model structure and behavior. The interested reader can refer to www.isdgs.org to view the user interface in detail and to download a demonstration model.

*The iSDG modeling process*

All iSDG projects involve model customization, stakeholder engagement and in-country capacity building. Typically the core iSDG is calibrated with data available from international sources. In the early stages of the project an in-country modeling team is assembled. Team members are usually from diverse ministries such as national planning, finance, environment, agriculture, health etc. The team members receive training in systems thinking, system dynamics, and in the iSDG itself. Trainings are conducted in country and sometimes with an international university that offers programs in system dynamics. One of the first activities for team members is to refine the model database with data from local institutions. Over time and with increasing experience the team members are able to run their own simulations and make appropriate changes to the model structure.

The model structure and business-as-usual simulations (simulations with no policy changes) are reviewed in stakeholder workshops. On the basis of these reviews necessary adjustments to the model structure are made. Further workshops engaging representatives from different ministries and institutions are held to prioritize SDG policies and to experiment with simulations to find effective policy mixes. The end product of the project is a set of recommendations for SDG investments that are incorporated into the national planning process. These investments fall under the various line ministries and demonstrate how integrated planning can lead to better SDG outcomes. Longer run products are a core of trained in-country modelers and a refined iSDG model that can be used in years to come.

*iSDG outputs*

Scenario analysis

Three separate categories of simulations are run in the iSDG modeling projects. The first is a business-as-usual (BAU) scenario in which there are no policy changes. This provides a frame of reference for policy scenarios. The second is simulation of the national plan currently under design. This involves a process of mapping policy interventions in the plan to SDG indicators. The third is the “SDG” simulation. For the SDG simulation many experimental iterations of the model are run to determine a policy mix that is an improvement for SDG attainment over the current national plan. The cost of the SDG policy mix is also estimated in the SDG simulation.

Figure 2 shows an SDG “wheel” that gives the results for this set of simulations in Côte d’Ivoire (Pedercini et al. 2018). For each SDG the column on the left indicates BAU attainment. The center column represents the results for the national plan at its current stage of development (here called the NPS scenario which stands for “National Prospective Study”), and the column on the right represents the SDG scenario, i.e., the result of the iterative SDG policy simulations. Note that SDG attainment under the BAU is very low at only 21% of attainment. The SDG scenario was able to improve SDG attainment over the National Prospective Study by 17%. The explorative scenarios should not be considered as point predictions– which is infeasible over the time horizon– and are not meant as final. Rather, their purpose is to inform a process of comprehensive policy design process through identification of coherent strategies for improving SDG performance (Pedercini et al. 2018).

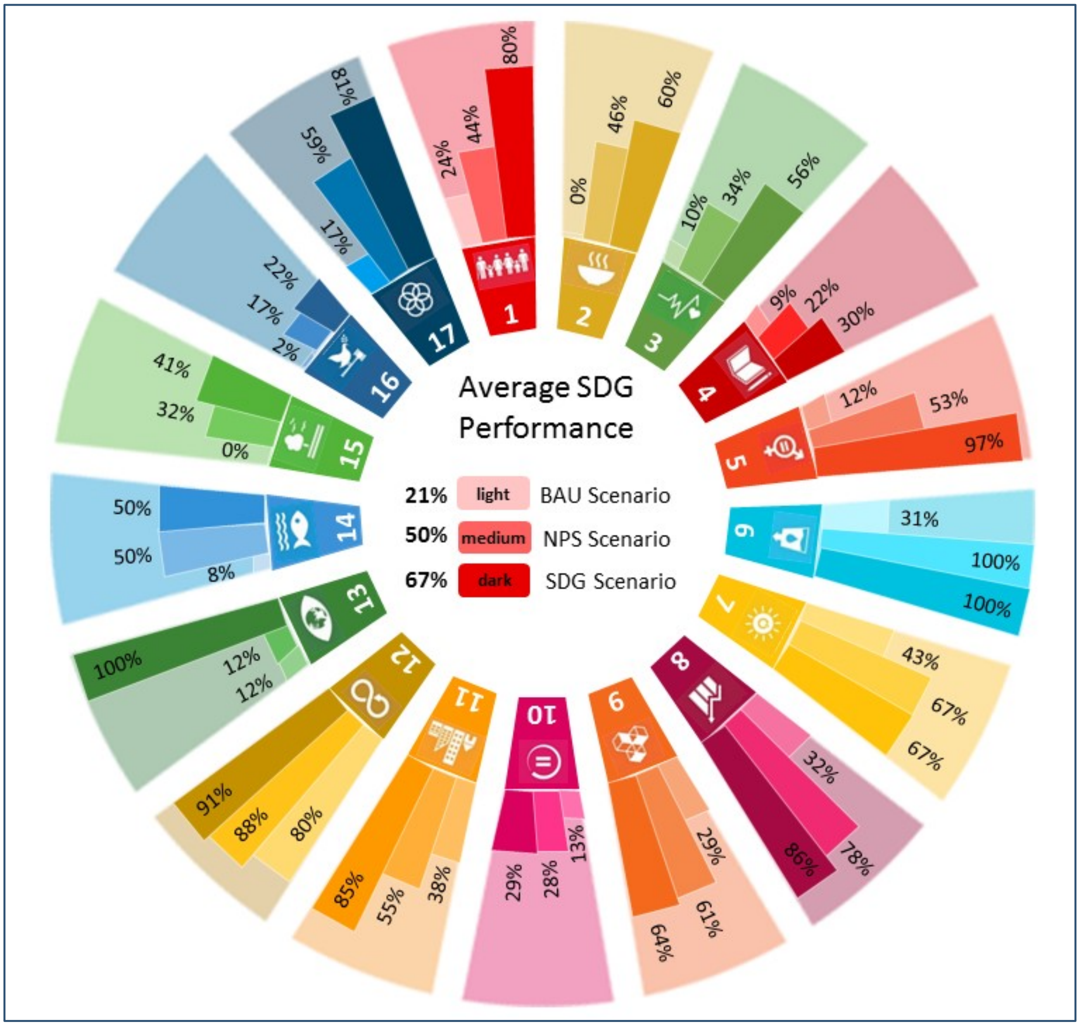


Figure 2. SDG wheel showing estimated SDG attainment at year 2030 in Côte d’Ivoire under business-as-usual (BAU), National Prospective Study (NPS), and SDG scenarios (Pedercini et al. 2018).

Synergy analysis

The iSDG features a unique “synergy tool” makes possible the analysis of synergies produced from the interactions of policies across sectors. Certain combinations of policies may result in SDG performance that is higher (a greater percentage attainment) than the sum of the policies individually; this is considered a positive synergy. Some combinations of policies may result in SDG attainment that is lower than the sum of the policies when simulated alone; this is considered a negative synergy.

Figure 3 shows the results of a synergy analysis conducted in Côte d’Ivoire. The black line with dots indicated SDG attainment under the SDG scenario. All the policies simulated are color-coded and their respective influences appear in the vertical bars for each SDG. This demonstrates the effects of policies across the SDGs. For example the climate change adoption policy (listed as “adoption” and colored dark green in the legend for Figure 3) affects not only SDG 13, but SDGs 1, 8, and 11 also. Synergies are shown in lavender. A positive synergy is seen for SDG 5, where the level of attainment (almost 100%) is higher than the combined influences of the individual policies impacting that SDG. A negative synergy is seen for SDG 6. This is caused by over-shooting the targets for SDG 6 and indicates that resources for policies impacting SDG 6 might be more efficiently allocated elsewhere.

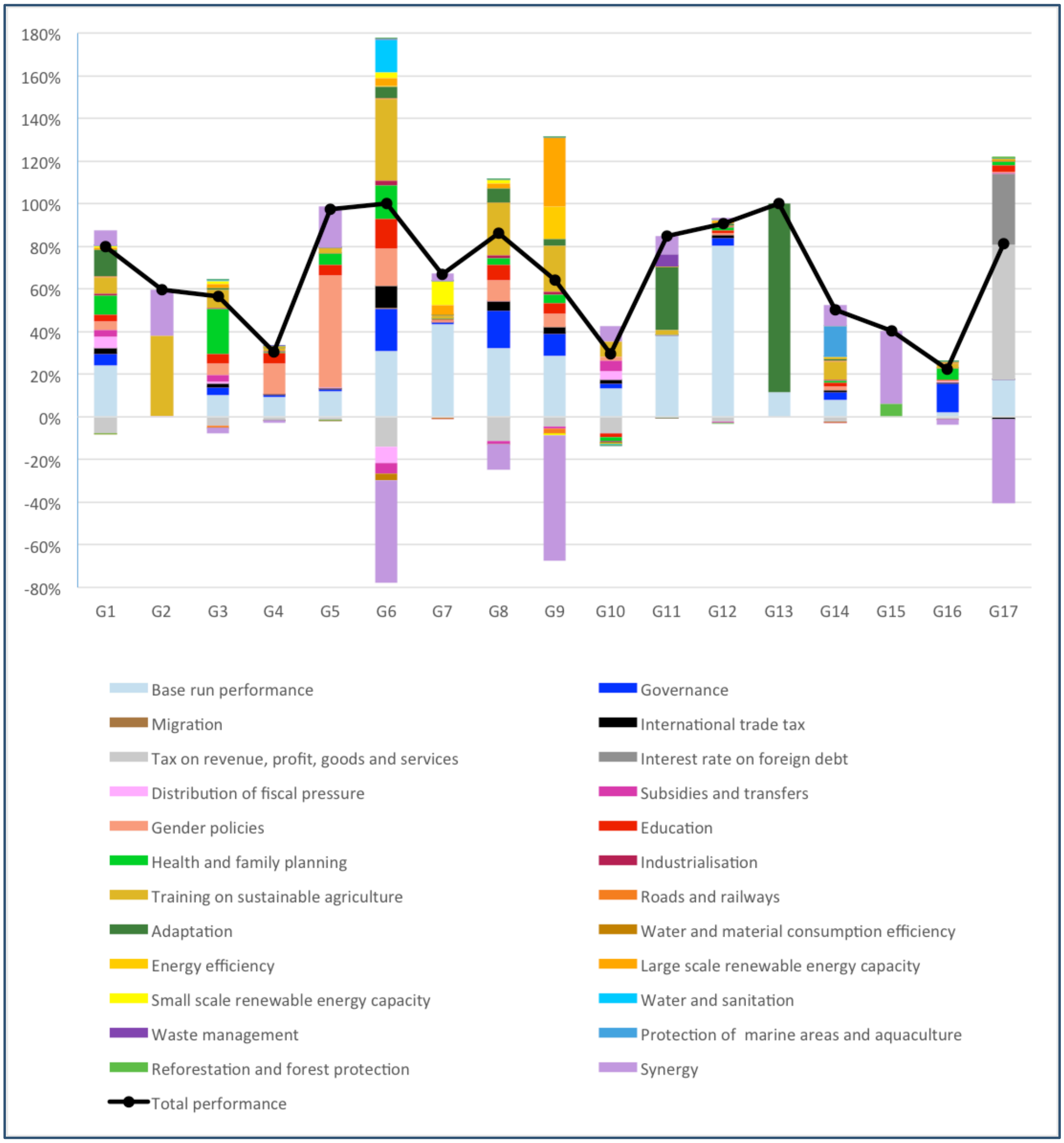


Figure 3. Results of synergy analysis undertaken for Côte d'Ivoire. Impacts of policies across the 17 SDGs are indicated in color. Positive and negative synergies are indicated in lavender (Pedercini et al. 2018).

The synergy tool can help planners find cost efficiencies and improved SDG performance by seeking out combinations of policies that maximize positive synergize and minimize negative synergies.

## Discussion

While there cannot be a full and in-depth understanding by everyone in each social or economic sector by every other sector, it is possible to do better. Recognizing inter-relationships and the potential they hold, both positive and negative, is the first step to improving policies. The scenario and synergy analysis approaches described above provide powerful tools for policy makers and planners to work across silos. Only through simulation with a model such as the iSDG can policy makers and planners perform experiments to deepen their understanding of the complex SDG system and test the systemic behaviors of policy mixes for improved performance across the entire SDG spectrum. Furthermore, the model is an explicit statement of assumptions, open for participants to challenge and change as need be. Model assumptions and the simulated behaviors those assumptions produce provide a framework for debate and broad consensus building. The iSDG "model" is better thought of as an iSDG "modeling process," involving capacity building, model refinement, and iterative scenario simulation to promote shared learning. Such a process coupled with diverse participation can help free decision-makers from the bounds of their erstwhile silos.

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