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SDG Target Interactions: The Philippine Analysis of Indivisible and Cancelling Targets

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Abstract

The United Nations developed the 17 Sustainable Development Goals (SDGs), with 169 targets, to help solve the world's problems and achieve a more sustainable future. This is modelled as a graph with the targets as nodes and the interaction between targets as the edges of the graph. An exhaustive binary comparison is made to analyse the intra- and inter-goal target interactions, entailing over 14000 comparisons. The task is to assign a 'color' to an edge: positive (indivisible), zero (consistent), or negative (cancelling). This is done via a panel of experts who will evaluate the target interactions through a developed web application for coloring the edges.

The current data contains 1256 colored edges. Of this, only 36 are cancelling (negative), or 2.86%; more than 97% are positive interactions. The 'most negative' interactions involve: 'Climate Action'; 'Life below Water'; 'Peace, Justice and Strong Institutions'; and 'Decent Work and Economic Growth.'

The 'Ugly Targets' feature might be most beneficial for planning, which lists all the negative or cancelling interactions flagged so far, and the suggested mitigation measures which could guide planners. This ongoing study contains helpful information for researchers who analyse correlations between data sets. We see how targets enable or constrain each other, what mitigation can be done to avoid conflicts, and what can be configured for a sub-national or regional study. This paper contributes to an ongoing study which extends the datasets to include more participants from different expertise.

Keywords: *SDG, SDG Interactions, SDG Targets, SDG Philippines*

Introduction

Background of the Study

In 2015, participant countries of the United Nations General Assembly crafted the 2030 Development Agenda which includes all aspects of sustainability, ending world hunger and poverty, and protecting the planet from further degradation. This agenda states that all countries who are signatories to this international agreement pledged to achieve a better future for the world.

It was the 2030 Development Agenda that shed light on the 17 Sustainable Development Goals encompassing 169 targets which were to be achieved by the year 2030. The SDGs aim to

balance the economic, social, and environmental necessities present in the world. Regardless of a country's development status, the SDGs act as a blueprint to achieve prosperity and sustainable growth for future generations to come.

Statement of the Problem

Using the 3-fold criteria of economics, environment and human rights, various international development agencies have mentioned the Philippines as a country with a declining economic development status due to the COVID-19 pandemic (ADB, 2020). This becomes coupled with a history of unequal wealth distribution, a lack of access to social services and education, and corruption.

In the 2030 Development Agenda, the 17 Sustainable Development Goals served as a universal guide for all countries regardless of their development status. The researchers of this paper aim to closely examine the interaction of the 169 targets in the Philippine context, with the data gathered from the experience and insights of professionals in various disciplines around the country. The data gathered in this research identifies and analyses the reinforcing, neutral, and conflicting targets' relationships, be it inter or intra-goal. The mitigations of the targets that have conflicting relationships is studied to determine the necessary actions that could be shared to different sectors in their work towards achieving the 2030 Development Agenda. The ideas and learnings from the SDG target interactions will allow decision makers and practitioners to better understand the application of chosen development strategies, programs and projects.

Objectives

This study aims to present the SDG target interactions based on Philippine development practice, stimulating new discussions and debates on these interactions. We have long noted that most (at least 97% of interactions) are scored positively, and it could very well be the less than 3% cancellations that will thwart our progress towards the SDGs. Thus, policymakers, planners, and researchers on SDG will be aware of the cancelling target interactions and potential mitigation. Admittedly, a 'negative' answer, this fact remains the study's contribution to research - i.e., to anticipate the implications of target cancellations.

A study of goal (as opposed to target) interactions, following Pradhan et al. (2017), may might give a positive answer to the question of 'priorities' for the Philippines. This paper remains an initial section of an ongoing study. With that study, we recommend starting with the most synergistic goals with the minor trade-offs, although our warnings concerning cancelling targets would still hold.

This paper's specific objectives include:

- An analysis of the SDG target interactions,
- Identifying negative target interactions and their mitigations; and
- Ranking the SDG targets based on the number of negative interactions

Significance of the Study

An analysis of SDG target interactions can help the country efficiently achieve these development goals by utilizing the potential of positive SDG target interactions and mitigating the problems of negative SDG target interactions. The analysis' focus on the Philippine context highlights a more suitable and country-specific method for implementing SDG projects.

Scope and Limitations

The contributing experts include social development practitioners and researchers of wide networks of the (1) College of Social Work and Community Development and (2) National College of Public Administration and Governance, both in the University of the Philippines Diliman. The data acquired up until June 2021 will be analysed in this research. With the implementation of the system required for the study already completed, this paper will focus more on improvements made on the existing implementation and the results and discussion based on the current data.

Methodology

Many have attempted to evaluate SDG target interactions through experts' judgment (International Science Council (ISC), 2017). Using the same method and scoring system for evaluating SDG target interactions, this study continues to evaluate all the target interactions (Abaja, Concepcion, and Bongolan, 2019; Fernandez and La Rosa, 2020). We model the 169 targets as nodes in a graph, while the target interactions are the edges connecting all the nodes: $169 \times 168 / 2$ or 14,196 of them. A web application was developed to facilitate the process of constructing this graph. Experts becomes the program user and must choose the SDGs aligned with their respective fields through the program developed. After, the system generates a series of SDG target pairs from their selected SDGs. The expert/user must score the interaction using the 7-point scale (International Science Council, 2017). The goal is to be able to score all 14,196 target interactions.

Front-End Development: React

The researchers used React (Abramov, D.) for the front-end development of the project. This JavaScript library makes user interfaces on mobile and web applications. Utilised to manufacture and design user views, admin views, and functionalities, the library remains essential to the project. Some functionalities involve submitting the survey, reviewing answers, choosing goals, etc., depending on whether the person is an admin or a user. Here we consider the consulted pool of experts as users. The researchers became the administrators of the website. Only the developers/researchers were allowed to view certain pages, implementing a strict level of authority to maintain necessary privacy measures. The developers also used **Reactstrap** to integrate the necessary components from **Bootstrap**. **Axios** was also used to be able to connect to the database. It is a Promise-based HTTP client that is widely used on the web.

The developers used **react-d3-graph** library to render, create and tweak the graph for the project and application. The following table shows the user stories for the users and developers, with new functionalities highlighted:

Table 1

User Stories for Users and Developers

<i>As an Admin I can</i> <i>As a User I can</i>
Confirm pending users Add my goals
View Dashboard View Front Page
View Graph Log In
View Menu Bar View Menu Bar
View All Answers Review Answers
View Users View Settings

Sign Up
View Survey
View Tabs
View Ugly Targets
View Beautiful Targets
Select Specialist Goal

Back-end Development: Flask

The system's backend serves up an API and collects, saves, and processes the data. The backend is developed on top of Flask. The API requests handle user creation and data gathering. The researchers/developers used PostgreSQL for the Database system, interfaced with the Python SQL toolkit, SQLAlchemy. Four models exist in the system: (1) the User model, (2) the SDG

model, (3) the User to SDG model, and (4) the Survey Answers model. All necessary information of the users or the consulted experts is stored in the User model. Besides their login credentials, it contains information to check if the qualifications of the experts, and ensure they can participate in the study. These include questions on educational attainment and years of experience. The user/expert may only start answering the survey upon the approval of an administrator. The corresponding curator in the administrative team, stored in the database as the user/expert's contact person, will be notified of their sign-up. The user/expert can then be approved to access the website. The other information stored concerns additional information about the users including affiliations and their preferences, such as preference for acknowledgement for participation in the research. The SDG model stored the target descriptions for the reference of the users; The User to SDG model stores the users' chosen SDGs based on their expertise. The SDG target interaction pairs are generated and linked to their user from chosen SDGs, and these are stored in the Survey Answers model. The APIs were created to handle the processes to be discussed in Data Gathering.

Data Gathering

The web application developed remained the avenue for data gathering. The experts were required to have at least five years of experience in their field to ensure the credibility of the SDG target interaction scores. Each participating expert created an account on the web application to score the SDG target interactions. The study's curators brought in most of the experts. These experts' accounts needed to be approved before they accessed logins, further ensuring their credibility. Figure 1 shows the sign-up interface where all this information is required. Upon logging in, the system asked users to choose the SDGs of their expertise. The system generated SDG target pairs from the users' chosen SDGs.

Each SDG target pair represents the interaction between the two SDG targets. The users/experts scored each pair positive or negative using the 7-point scale. They were given the option to explain their score; If a negative score was given, the explanation was required and mitigations to avoid the negative interaction. Users could skip specific SDG target interactions that they do not wish to answer at the moment. But this did not remove the option to answer all questions. The system bound SDG target pairs to their user/expert, and they were not reassigned to a different user/expert. Each SDG target pair could only be scored once, making the score given by the users is final. The scores were saved in the database upon submission of the answers.

The current progress of the data gathering become viewable even without an account on the website. Users select at most two SDGs, and a graph will be generated showing the target interactions as edges of each SDG target as nodes. Figure 4 shows a sample of the network of SDG target interactions. The nodes are color-coded based on their SDG color. They are labelled with their SDG and target number. The positive target interactions are the blue edges, the negative is the red edges, and the neutral ones are black. The gray edges are the target interactions yet to be colored by the experts.

Ugly and Beautiful Targets

The 'Ugly Targets' button perhaps gives us the best 'negative' information, as it warns us of the cancelling target and their scores. Respondents suggest the mitigation measures we can take.

The 'Beautiful Targets' show us the targets that do not have any adverse interactions anywhere.

Graph of Non-Negative Interactions

Currently, this function shows all non-negative interactions (positive/ indivisible or zero/ consistent).

In the future, we might render the 'Longest Path of Beautiful Targets' on the website, which is the longest path that only consists of positive target interactions and avoids nodes or targets that conflict with other targets. This can be obtained using a streaming longest path algorithm (Kleimann, L., Shielke, C. and Srivastav, A., 2016). We convert our undirected graph into a directed acyclic graph, already available as a graph. Another project is being developed to sort the topological, which will allow us to obtain and render the longest path in a reasonable amount of time (linear).

Results and Discussion

The network of SDG target interactions currently has 1256 colored edges. Of the 1256 colored edges, 983 are positive, 36 are negative, and 237 are neutral. Considering that only 1256 edges out of the 14196 total edges have been colored, the researchers note that this research is an evolving initiative.

Based on the ISC’s 7-point scale, each SDG target interaction pair was given a score by the experts. We now look at the ‘Ugly Targets’ function. In the context of our study, 'Ugly' means targets that have a conflicting or a negative (red) ‘edge’ emanating from them. At present, Ugly Targets lists only 36 such edges. Currently, 13.1, 'Climate Action,' hits two other targets negatively. May we might call it a 'very ugly' target? We also note that, at present, the most negative interactions involve: 'Climate Action'; 'Life Below Water'; 'Peace, Justice and Strong Institutions'; and 'Decent Work and Economic Growth'.

Table 2
Ugly Targets

Ugly Targets		
← Back to home		
Score	Target 1	Target 2
-3	Show Info 13.1 Climate Action	14.C Life below Water
-2	Show Info 13.1 Climate Action	14.B Life below Water
-3	Show Info 16.B Peace, Justice, and Strong Institutions	16.A Peace, Justice, and Strong Institutions
-3	Show Info 8.4 Decent Work and Economic Growth	16.B Peace, Justice, and Strong Institutions
-3	Show Info 8.2 Decent Work and Economic Growth	13.3 Climate Action
-2	Show Info 8.1 Decent Work and Economic Growth	11.B Sustainable Cities and Communities
-2	Show Info 3.A Good Health and Well being	16.1 Peace, Justice, and Strong Institutions
-2	Show Info 12.5 Responsible Consumption and Production	17.15 Partnership for the Goals
-2	Show Info 5.3 Gender Equality	10.6 Reduced Inequalities
-2	Show Info 8.2 Decent Work and Economic Growth	12.3 Responsible Consumption and Production
-2	Show Info 1.5 No Poverty	5.A Gender Equality
-2	Show Info 5.A Gender Equality	16.A Peace, Justice, and Strong Institutions
-2	Show Info 3.1 Good Health and Well being	3.6 Good Health and Well being
-2	Show Info 5.8 Gender Equality	16.2 Peace, Justice, and Strong Institutions
-2	Show Info 5.1 Gender Equality	13.1 Climate Action
-1	Show Info 5.8 Gender Equality	5.2 Gender Equality
-1	Show Info 4.B Quality Education	4.7 Quality Education

Table 3
Beautiful Targets

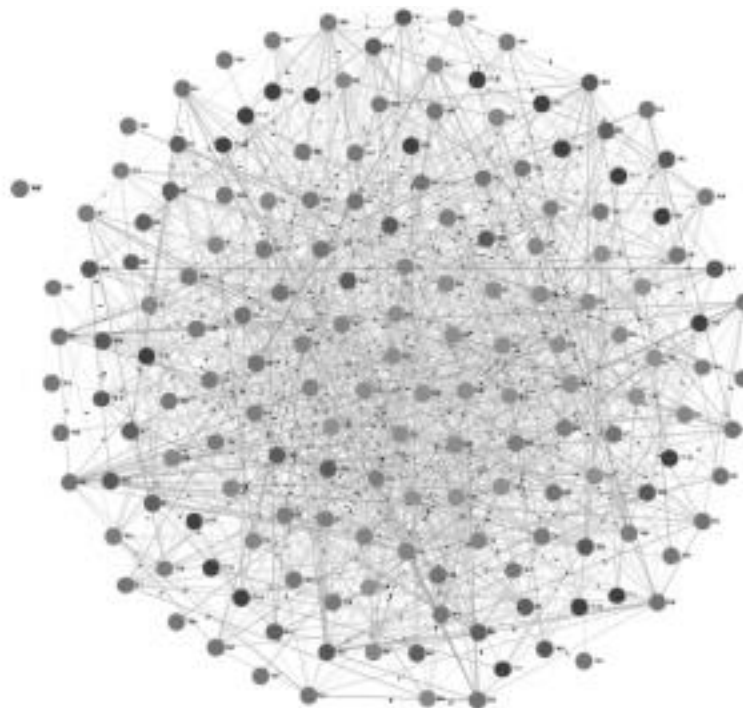
Beautiful Targets

[← Back to home](#)

Score			
3 Show Info	9.4 Industry, Innovation and Infrastructure	9.5 Industry, Innovation and Infrastructure	
3 Show Info	4.C Quality Education	4.A Quality Education	
3 Show Info	8.9 Decent Work and Economic Growth	9.3 Industry, Innovation and Infrastructure	
3 Show Info	2.A Zero Hunger	5.A Gender Equality	
3 Show Info	1.2 No Poverty	3.4 Zero Hunger	
3 Show Info	1.1 No Poverty	10.4 Reduced Inequalities	
3 Show Info	12.4 Responsible Consumption and Production	12.6 Responsible Consumption and Production	
3 Show Info	12.4 Responsible Consumption and Production	12.5 Responsible Consumption and Production	
3 Show Info	2.B Zero Hunger	2.3 Zero Hunger	
3 Show Info	1.2 No Poverty	1.5 No Poverty	
3 Show Info	1.3 No Poverty	2.3 Zero Hunger	
3 Show Info	7.2 Affordable and Clean Energy	16.A Peace, Justice, and Strong Institutions	
3 Show Info	1.B No Poverty	2.2 Zero Hunger	
3 Show Info	1.A No Poverty	1.4 No Poverty	
3 Show Info	1.4 No Poverty	3.C Zero Hunger	
3 Show Info	1.A No Poverty	2.B Zero Hunger	
3 Show Info	1.1 No Poverty	2.B Zero Hunger	

In contrast to the 'Ugly Targets,' the 'Beautiful' targets list is a lot longer. Since there are very few 'ugly' targets currently being flagged, this is to be expected.

Figure 1
Graph of Non-negative Interactions



The Graph of Non-negative Interactions is shown above. Work is in progress on extracting

the 'Longest Path of Beautiful Targets' from this graph.

Points for Further Research

We state earlier that the paper presents initial findings in from a larger study. With related future research, we recommend starting with the most synergistic goals with the minor trade-offs, although our warnings concerning cancelling targets would still hold. We recognize the need to capture more responses from a larger group of experts. Such data will enable findings on target interactions to be more credible, enriched and grounded as practitioners share their knowledge in the relevant fields of the 2030 Development Agenda.

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