Impact of sustainable goals on social welfare and resilience

STAT4660
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Introduction I

- Our main motivation for investigating the impact of sustainable goals on social welfare comes from the Paris agreement published by the United Nations (UN) in 2015.
  - The Paris Agreement is a legally binding international treaty about climate change.
- Specifically, article 7.5 was of great motivation for this project.
- Additional motivation for our project from articles 8.4 (h) and 11. [1]

Introduction II

- The central focus of our project is social welfare. How we can improve it and make it more sustainable?
- If we want to create a more sustainable world, we must focus on developing sustainability in all areas.
- Importance of our project
  - Organizations have moved/are moving towards making decisions based on the available data.
  - What about making data-based decisions about social welfare?
  - Decision making & policy creation in the future.

Background Information

- **The Sustainable Development Goals (SDGs) were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure all people enjoy peace and prosperity by 2030.** [2]
- 17 SDGs in total
  - Examples: "No poverty", "Zero hunger", "Reduced inequalities", "Life below water", etc.
- Each SDG is made up of targets and indicators.
  - Targets can be thought of as very specific goals within the larger sustainable development goal.
  - Indicators belong to the target goals and describes how the world is progressing to reach that goal.
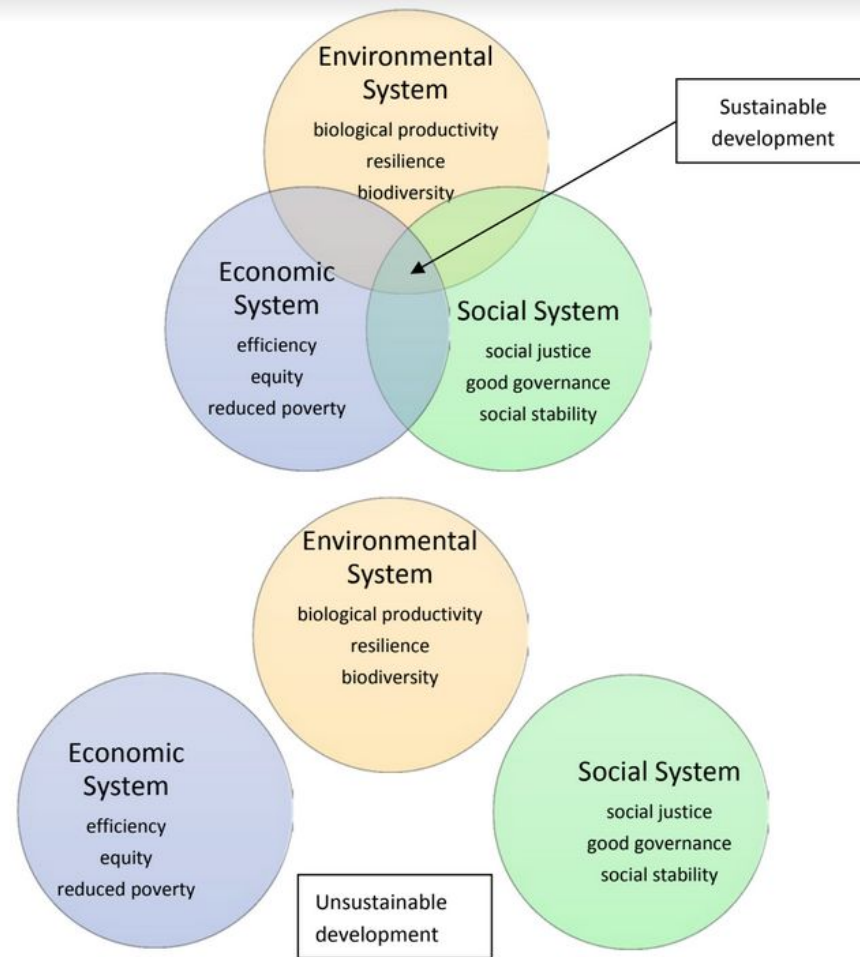
Source: Adapted from Barbier (1987), Figure 1 and Holmberg and Sandbrook (1992), Figure 1.1.

Barbier, E. B., & Burgess, J. C., 2017 [3].

Categorization of Indicators

Instead of going over every indicator, we decided to create three categories of data we will be using in this project.

These categories are [3][4][5]:

- Social indicators
- Environmental indicators
- Economic indicators

United Nations, n.d. [6]

Social Indicators

This category of SDG indicators tracks the social and welfare development of different countries. Each indicator follows the social well-being of different nations to present how they have improved over the years on their path to achieving a fully developed society by the year 2030.

To name a few examples, some indicators within this category track [7][8]:

1. Poverty level.
2. Surplus or lack of food within nations.
3. Education level of different nations' populations.
4. The available workforce within a nation.
5. Gender equality within a nation's education and workforce.
6. Access to proper health care (both physical and mental health) and mortality rates.
7. The effects of disasters on nations from climate change, conflicts, or natural events.
8. Substance abuse within nations.

Environmental Indicators

This category of SDG indicators tracks the environmental sustainability of different countries. This category has many indicators, so we narrowed it down to two aspects directly affecting social welfare. Namely, we used sustainability in the agricultural and energy sectors of different nations.

To name a few examples, some indicators of this category track:

1. Agricultural production levels and yields
2. Meat and dairy production levels and yields
3. Energy consumption mix (fossil fuel-based or green based)

Economic Indicators

This category of SDG indicators tracks the economic development of different countries. Similar to environmental indicators, this category has many indicators, so we narrowed it down to three aspects directly affecting social welfare. We used the income levels, manufacturing capacity, and housing of different nations.

For example, some indicators of this category track:

1. The portion of the population living in highly dense cities and slums
2. The exposure to air pollution with fine particulate matter (and subsequent death rates from air pollution)
3. Gross Domestic Product per capita
4. Gross National Income per capita

Our Data

- We used "Our World in Data" as this project's database. This database has access to three databases of "The World Bank," "The Food and Agriculture Organization of the United Nations (FAOSTAT)," and "The International Energy Agency." This database allowed us to use data for free and without special permission of the three organizations, as long as we reference them in our work. Albeit, the database reference is necessary for any project, so their request makes sense.

- Due to the high volume of indicators, we narrowed it down to 30 indicators for this project. Our goal while selecting these indicators was to cover these categories to the best of our ability and at the same time not overwhelm ourselves with the abundance of indicators.

Objective

- Our objective is to see how indicators are related to one another.
- Essentially, we are aiming to **quantify** exactly how connected one indicator is to other indicators.
- After that we will be looking at which ones are more prominent on social welfare compared to the rest.

Problem Statement

- How can we present a quantitative way to explain relationship between SDG indicators?

- How can we find out which category is more **prominent on social indicators**? How to improve sustainability and greater welfare development?

- Ultimately introduce a quantitative **index** based on indicator prevalence.

- How can we define **Impact** of an indicator?

What's next?

1. Loss - Stochastic Random Variable
   a. Severity (change in value of loss)
   b. Frequency (number of times a loss occurs)
2. Steps:
   a. We defined severity using distance matrices. Distances are going to be in Euclidean space.
      i. Euclidean
      ii. Manhattan
      iii. Chebyshev
   b. Principal Component Analysis (PCA): we reduce dimension of the data.
   c. Principal Component Regression (PCR): we reduce dimensions more!
   d. Define an index based on variation on a **response variable**.
   e. K-means clustering: redefining the "developed" and "developing" groups
   f. Define **Synergy** and **Impact** [9][10].
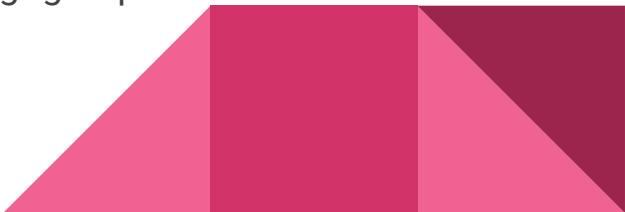
Potential Difficulties

- Data, Data, Data.
- The quality and availability of the data.
- Pre-processing the available datasets.
- The scope of the project. If we are not careful we may lose sight of what we want to accomplish!
- The traditional methods of finding relationships between features are hard to apply in this scenario, ie. Pearson Correlation Analysis.

"You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete." R. Buckminster Fuller

Thank you for listening

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