Modeling Resource Allocation for the Achievement of Sustainable Development Goals

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Abstract. In 2015, the United Nations Member States adopted the 17 Sustainable Development Goals (SDGs). Implementation of the SDGs faces political, social, economic, environmental and technological challenges. Moreover, each nation needs to translate and evaluate the SDG's in relation to its own national context. As a budget is the most basic reflection of government plans and policies, it is essential to prioritize and evaluate the SDGs in the course of budgeting. To enhance this process, the authors propose and test a novel tool, merging multiple criteria decision analysis and values modeling. A case study in Bangladesh is then used to illustrate how this approach can support judicious decision-making for resource allocation. One outcome of this research is a framework and supporting software to aid decision-makers in allocating resources for SDGs within their national budgets. The results of this study will help decision-makers to strategically monitor and evaluate their SDG achievement.

Keywords: SDG, Resource allocation, Decision-making, Values, MCDA

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1.0 Introduction

The Sustainable Development Goals (SDGs) were launched in 2015 to guide and monitor sustainable development at both national and global scales [1]. Consisting of 17 overall goals with a total of 169 associated targets, which are in turn informed by 230 indicators [2], decision-making and monitoring progress in achieving sustainable development is a complex task. The SDGs touch upon aspirational visions of a sustainable future, thereby interacting with values and ideals. They are enabled and constrained by fiscal realities, such as budgetary concerns, and practiced amidst differing national contexts and priorities [1] [3]. Adding to this complexity, while each SDG can be considered distinct, they are highly interconnected. Finally, while each nation has its own unique starting point, set of objectives, and local context, the cumulative impacts of reaching or falling short of the SDGs manifest at the global level. Investment planning and monitoring efforts related to achieving the SDGs must account for these complexities and interconnections if coherent policy is to be developed and if progress is to be effectively evaluated and communicated [1].

Evaluative and decision-aiding tools developed to assist in the achievement of SDGs need to account for the nuances of national-level realities and still be relevant to the global scale. Effectiveness at both scales is critical for conducting cross-national comparisons, negotiation, conflict management, and strategy development. Decision-aiding tools should also capture and make explicit the synergies and trade-offs of the SDGs, as these interconnections are critical inputs when comparing competing investment proposals.

Within this context, the authors propose a hybrid decision support system (DSS) merging multiple criteria decision analysis (MCDA) [4] and values-modeling approaches [5] [6] [7]. This novel technique is specifically designed to facilitate assessment of the SDGs at the national level and translate those national level assessments into a coherent global framework. The authors propose and operationalize a conceptual framework for the methodology and illustrate its use with a case study in Bangladesh. This work will be of interest to scholars and practitioners on topics including sustainable development, conflict management, strategy, and decision support systems.

2.0 Evaluating Progress Towards Sustainable Development Goals.

Operationalizing the assessment of sustainability, and particularly the SDGs is a multi-faceted effort. A range of approaches have been proposed and implemented, including goal-specific (evaluating one SDG) methods and approaches capturing several goals, such as SDGs related to environmental, economic, and social wellbeing. For example, [8] point out that there exist over one hundred assessment tools addressing food and agricultural sustainability alone, each with their own advantages and drawbacks. Efforts to capture SDG synergies across sectors have been conducted using network analysis [9] [10], correlation coefficients [11], and qualitative interviews [12]. [1] also developed a framework merging qualitative and quantitative approaches to evaluate synergies and trade-offs for a set of interrelated SDGs. Herein, the authors propose a method that accounts for synergistic relationships and trade-offs between SDGs. This approach provides an evaluation of SDG progress connecting local objectives and broad global values to enhance budgetary decision-making, strategic thinking and communication.

3.0 Proposed Research.

3.1 Research Contribution.

The authors propose and develop a decision support system merging the structuring benefits of MCDA with the values-based modeling tool P2P-DSS [7]. The authors first develop a conceptual framework for combining these approaches. Next, a prototype software program is developed to operationalize the MCDA/P2P approach. The technique is then tested using a case study in Bangladesh. The unique contribution of this approach is the capacity to integrate national level context into a set of core values that can then be compared at the global scale.

3.2 Research Area.

This study will focus on evaluating SDG achievement in Bangladesh. Bangladesh has made progress in relation to several SDGs. For example, there has been a reduction in the proportion of the population living in poverty and in maternal mortality rates [13]. In response to their progress, the UN Committee for Development Policy has announced that Bangladesh is eligible to graduate from a status of least developed country. Nonetheless, Bangladesh ranks last among the BIMSTEC countries (India, Bangladesh, Bhutan, Nepal, Myanmar, Sri Lanka, and Thailand) in a global report of the SDGs. SDG progress in Bangladesh is constrained by significant gaps in needed investment for basic infrastructure, a lack of policy integration, and threat multipliers associated with climate change, with specific concern over projected sea level rise [14].

3.3 Proposed Methodology.

The first step in this study is to develop a national picture of perspectives and priorities for allocating resources to SDGs. Data will be collected through literature review, grey literature[1], and interviews with a range of stakeholders and decisionmakers including government entities, financial and administrative officers in Bangladesh, planning professionals, political leaders, and individuals and groups with a professional expertise in Bangladesh. This data will then be structured using a novel and flexible MCDA framework previously applied by [8] to develop sustainability scores for various agricultural systems.

While assessment of SDGs at the national level captures and communicates local priorities and constraints, connecting such assessments across nations requires a shared language and set of criteria. In this research, the authors propose that a values-modelling decision support system, P2P-DSS provides the flexibility needed for this task [7]. With P2P-DSS, users can connect specific inputs, such as goals, targets, and actions, with broad social values. The software interface then guides the user in creating proposals and ranking them by preference. Visual feedback in the form of a pie chart indicates how much each social value is being achieved in relation to the other values, from the users' perspective. The algorithms governing P2P-DSS output explicitly capture the synergies and trade-offs of the prioritized inputs and translate the local priorities into broad values-based goals that can be compared across nations. In this project P2P-DSS is adapted to facilitate the evaluation and communication of Sustainable Development Goals investment preferences.

[1] "Grey Literature is any literature that has not been published through traditional means" (https://guides.library.utoronto.ca/c.php?g=577919&p=4123572).

With minor adaptations, P2P-DSS proposals can integrate the local perspective captured and structured using MCDA, and the social values feedback then provides a shared set of criteria for communication and comparison at the global scale.

4.0 Proposal Summary.

In this contribution, the authors propose a novel tool merging the MCDA framework with values-based modeling to enhance SDG strategy and evaluation. This technique aims to capture national contexts and priorities in the modeling parameters using MCDA, and then provide a values-based output that can facilitate evaluation at the global scale. Facilitating sound decision-making and communication in difficult multiple participant multiple objective decisions, such as SDG prioritization and evaluation, has implications for decision-making and conflict management at local and global scales.

References

1. Mainali, B., Luukkanen, J., Silveira, S., Kaivo-oja, J.:Evaluating Synergies and Trade-Offs among Sustainable Development Goals (SDGs): Explorative analyses of development paths in south asia and sub-saharan Africa. J. Sustainability. 10, 25p (2018).
2. United Nations Statistical Commission.: Report of the Inter-agency and expert group on sustainable development goal indicators. (2016). *unstats. un. org/unsd/statcom/47th-session/.../2016-2-IAEG-SDGs-Rev1-E. pdf (accessed Dec. 7th 2016)*.
3. Schmidt-Traum, G. Investments needs to achieve the sustainable development goals: understanding the billions and trillions. Working Paper; Sustainable Development Solutions Network (SDSN). New York. (2015).
4. Hipel, K.W., Radford, K.J., Fang, L.:Multiple participant-multiple criteria decision making. Trans. Syst. Man Cybern. 23, 1184--1189 (1993).
5. Brown, G.: Mapping landscape values and development preferences: a method for tourism and residential development planning. Intern. J. Tour. Research. 8, 101-113 (2006).
6. Hosack, B., Paradice, D.: Increasing personal value congruence in computerized decision support using system feedback. Axioms. 3, 84--108. (2014).
7. Philpot, S.L., Johnson, P.A., Hipel, K.W. Analysis of a below-water aggregate mining case study in Ontario, Canada using values-centric online citizen participation. J. Environmental Planning and Management. 63, 352--368. (2020).
8. Talukdar, B., Blay, Plamer A., Hipel, K.W. vanLoon, G.W.: Elimination method of multi-criteria decision analysis (MCDA): A simple methodological approach for assessing agricultural sustaiability. J. Sustainability. 9, 287. (2017).
9. Weitz, N., Nilsson, M., Davis, M.: A nexus approach to the post-2015 agenda: Formulating integrated water energy and food SDGs. SAIS Rev. Int. Aff. 34, 37--50. (2015).
10. Blanc, D.L.: Towards integration at last: The Sustainable Development Goals as a network of targets. Working Paper No. 141; United Nations Dept. Economics and Social Affairs (UNDESA). (2015).

11. Landuyt, D., Broekx, S., Goethals, P.L.M.: Unite Bayesian belief networks to analyze trade-offs among ecosystem services at the regional scale. Ecol. Indic. 71, 327--335. (2016).
12. Hicks, C.C., Graham, M.A., Cinner, J.E.: Synergies and tradeoffs in how manager, scientists, and fishers value coral reef ecosystem services. Global Environmental Change. 23, 1444--1453. (2013).
13. SDG Country Profile, https://country-profiles.unstatshub.org/bgd#
14. Social Watch: poverty eradication and gender justice, http://www.socialwatch.org/node/18086