



INFLUENCE OF ECONOMIC STRUCTURES ON THE SDGs

EFFECTS FROM, TO AND WITHIN THE ANDEAN REGION

“The journey towards sustainability finds sustainable production and consumption at its very heart”

(UNEP, 2009, p. 5)



***Influence of Economic Structures on the SDGs
Effects from, to and within the Andean Region***

An initiative of the SDSN Andes Secretariat, Yachay Tech University, with the collaboration of the Integrated Sustainability Analysis (ISA) Research Team, School of Physics, The University of Sydney

Project Concept Note

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Foreword

In the last decades, economic activity has put enormous pressure on Earth systems around the globe. It has also, on the one hand, resulted on increasing social inequalities and cases of labour exploitation, while on the other it has reduced poverty and improved the quality of life for a large number of people. It is thus clear that the way we produce goods and services and our consumption patterns have a direct effect on socio-environmental realities, locally, regionally, and even globally.

The important initiative that we have embarked on, with the vital collaboration of the Integrated Sustainability Analysis (ISA) research team from the University of Sydney, aims first at understanding how economic structures, encompassing supply chains and trade in globalized economies, influence aspects of the Sustainable Development Goals (SDGs) agreed on September 2015 and adopted by all member states of the United Nations. Then, it seeks to devise and implement measures to reduce negative effects and increase positive ones.

Thus, this work applies and builds on a number of academic studies that deal with the assessment of economic, social, and environmental impacts within complex economic systems. It also looks at the recently released SDG Index and Dashboards Report by the SDSN and Bertelsmann Stiftung, which deals with Global Responsibilities with the important consideration of international spillover effects in achieving the SDGs. Finally, it also considers the global framework developed by the Inter-Agency and Expert Group on SDG Indicators, adopted at the 47th session of the UN Statistical Commission.

While we will focus on impacts from, to and within the countries covered by the Andean Region: Argentina, Bolivia, Chile, Colombia, Ecuador, Peru, and Venezuela, this initiative may be scaled up and/or replicated elsewhere. In addition, for it to succeed we will require the involvement and collaboration of many stakeholders, both from inside and outside the region, which we highly welcome. Such is the spirit of taking on the global responsibility of achieving the SDGs by 2030.

Dr. Jorge Gómez-Paredes
Director
SDSN Andes

1. Background

With the intensification of specialized production, commodities are nowadays the result of dense multi-sector production networks across countries. Simultaneously, consumption is taken place in a growing global market. This means that production and consumption taking place in one part of the world is often linked to socio-economic and environmental impacts in another part (or in the global commons). This phenomenon, of one economy affecting another, has been referred to as economic “spillover effects” (“externalities”), being these effects either positive (desirable) or negative (undesirable).

In the world’s attempt to meet the SDGs by 2030 it has then been further recognized that:

Only if such positive and negative spillovers across countries are managed carefully can the promise of Agenda 2030 be fulfilled, particularly since negative effects tend to flow from rich to poor countries. It is therefore critical to understand spillover effects and to measure them as part of SDG monitoring.

(Bertelsmann Stiftung and SDSN, 2017, p. 5).

Such is the task embraced by the organizations undertaking the initiative laid out in this document.



The Sustainable Development Solutions Network for the Andean Region (**SDSN Andes**), was created on September 2015 as a regional chapter of the United Nations (UN) SDSN commissioned by the UN Secretary General in 2012. The SDSN Andes covers the countries of Argentina, Bolivia, Chile, Colombia, Ecuador, Peru and Venezuela.

The Secretariat of the SDSN Andes is currently being hosted by Yachay Tech University in Ecuador.

Aligned with the SDSN, the SDSN Andes is an interdisciplinary and international network of organizations, from different sectors of society, linking local leaders and specialists with interest, experience, and competence to work on the realization of the SDGs in the countries of the Andean Region.



The **ISA** research team at the University of Sydney - Australia, is composed of academics with expertise on economics, as well as social and environmental sciences.

The team is focused on developing and applying leading-edge research tools for comprehensive assessments on a wide range of sustainability issues. For instance, they created and host the Eora Multi-Region Input-Output (MRIO) database, which provides time series data on transactions between 15,909 economic sectors across 189 countries (including those in the Andean Region). Such model maps interrelations in the global economy and is coupled with data on a variety of environmental and social indicators (Lenzen et al., 2012, 2013). Furthermore, the ISA team is currently leading the development of the Global MIRO Lab (Lenzen et al., 2017).

2. Purpose and objectives

The purpose of this project is to reduce or eliminate negative economic effects on the SDGs, as well as to increase positive effects, from, to and within the countries of the Andean Region.

To do so, this project:

- First, aims at understanding how economic structures in the global economy affect aspects related to the SDGs in different countries, and
- Second, aims at devising and implementing targeted solutions to address these negative and positive effects.



All of the above is considered within the larger objective of meeting the SDGs by 2030



3. Framework

Assessing the remote impacts of local consumption has traditionally been done via “footprint” studies; a practice that commonly applies Input-Output (IO) models (e.g., Lenzen and Murray 2001; Munksgaard et al., 2005; Yu et al, 2010; Feng et al. 2014). IO Analysis (IOA) is a macroeconomic tool designed to account for total (direct and indirect) effects in complex economic settings. Thus, IO models have been “extended” in order to account for a number of economic, social, and environmental issues related to global production and consumption. In light of the fact that many of such issues are related to the SDGs (Fig. 1), it has been suggested that IO-based footprints can be used to assess progress on the SDGs (Xiao et al., 2017).

This project will apply IOA to assess countries’ performance on the SDGs, considering positive and negative spillover effects.

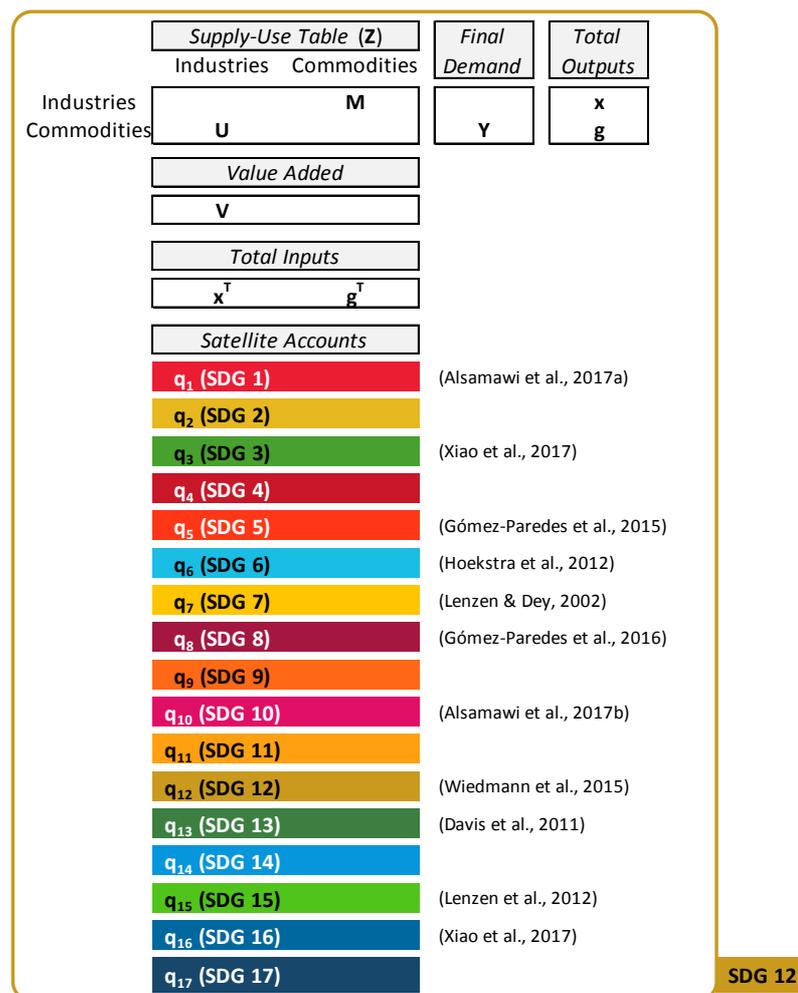


Figure 1. Schema of an Input-Output model extended to account for effects on the SDGs

(citations corresponds to published works related to aspects considered in the SDGs)

3. Framework

The study of the impacts associated with a product during its life cycle; namely through the “consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal” (ISO 14040, 2006, p. 2), is commonly done by means of Life Cycle Assessments. Environmental LCA (E-LCA) consists of the “compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle” (*Ibid*), while a social and socio-economic LCA (S-LCA) is concerned with social and socio-economic consequences (UNEP, 2009). Then, life cycle costing (LCC), is the “compilation and assessment of all costs related to a product, over its entire life cycle” (*Ibid*). Combining E-LCA, S-LCA, and LCC results in life cycle sustainability assessments (Kloepffer, 2008). Common LCA softwares and databases are SimaPro, Umberto, GaBi, Ecoinvent, and the SHDB. Given the complementarity between LCA and IOA, hybrid methods (combining IOA with process-based LCA) have been developed (Haes et al., 2004; Suh et al., 2004; Suh and Huppel, 2005) and are commonly used in order to take advantage of the strengths of both approaches.

This project will apply Hybrid LCA to evaluate the impact of products and refine results on the impact of commodities and related spillover effects.

Lastly, following its mission, the SDSN Andes Secretariat will mobilize SDSN member organizations, local specialists, volunteers, and stakeholders, and will assemble work teams, in order to tackle identified opportunities to improve the performance of products at various points of their life cycle. These will be targeted projects on different aspects of sustainable production. The SDSN Andes will also work to mobilize support for these projects from involved consumers. Ultimately, these projects will seek to improve the impact of production on the SDGs, reducing or eliminating negative spillover effects, as well as increasing positive spillover effects.



4. Phases

This initiative is structured in four phases:

- Overview
- Disaggregation and prioritization
- Differentiation and refinement
- Solution initiatives
- Progress



The following is a brief description of these consecutive phases.

The process described by these phases is abbreviated with the partial acronym "ODDS for Progress"

Phase 1 - Overview

This phase consists of assessing selected national economies' performance in terms of the SDGs. Selected economies will include the countries in the Andean Region (Argentina, Bolivia, Chile, Colombia, Ecuador, Peru, and Venezuela) as well as other economies relevant in terms of trade with the aforementioned countries and/or with significant economic activity globally (e.g. the United States of America, China, India, European countries).

These assessments, seemingly similar than the ones included in the recently published SDG Index and Dashboards Report (Bertelsmann Stiftung and SDSN, 2017), will in fact reflect the influence of economic consumption on the SDGs, analogous to the concept of "footprint", which reflects impacts related to domestically consumed production, plus that of imports minus exports. Therefore, these assessments will consider economic spillover effects, both positive and negative (e.g. Fig. 2).

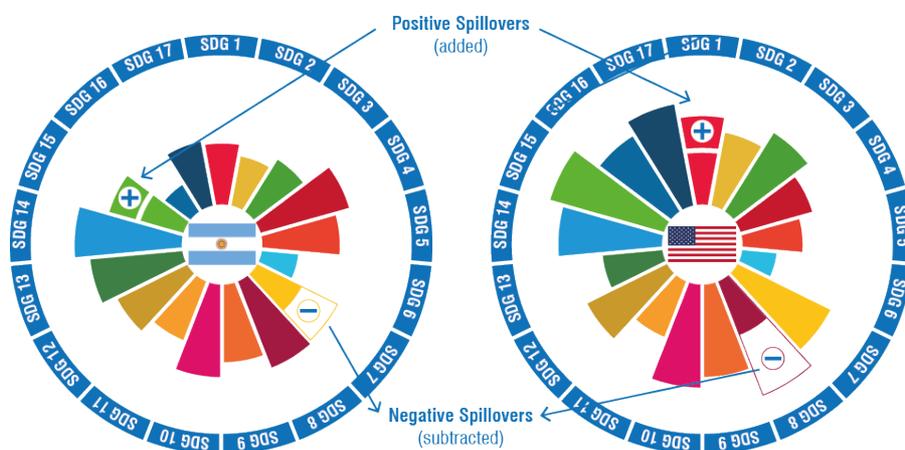


Figure 2. Hypothetical example for Argentina and USA

This phase also includes mapping spillover effects; namely, identifying the influences of one country onto another (e.g. Fig. 3).

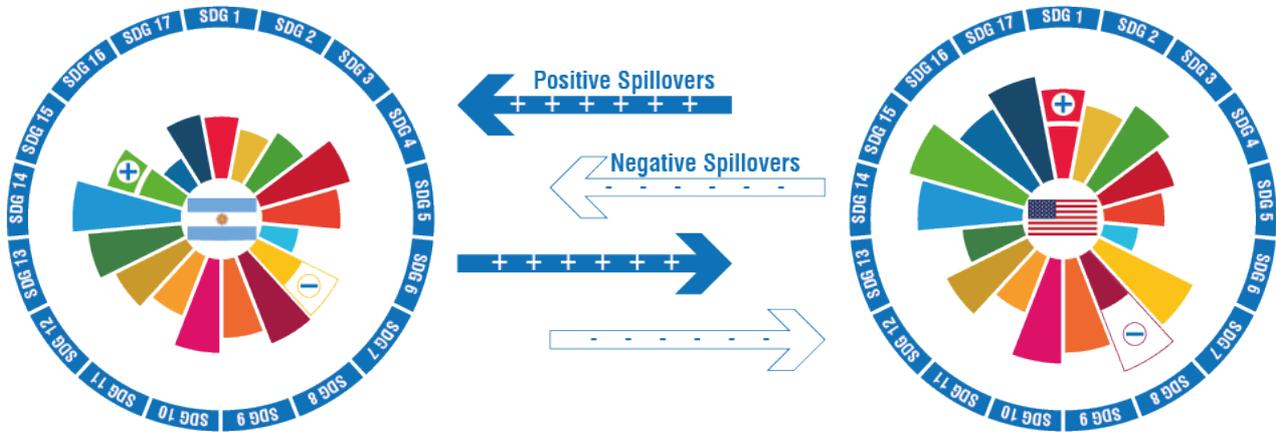


Figure 3. Mapping spillover effects from one country to another (e.g. Argentina ↔ USA)

Phase 2 - Disaggregation and Prioritization

This phase looks at the specific commodities that are responsible for the positive and negative spillover effects identified in the previous phase. This step of breaking up spillovers into the involved commodities (disaggregation) is then followed by the selection of those top commodities that encompass the bulk of these effects (prioritization) (Fig. 4).

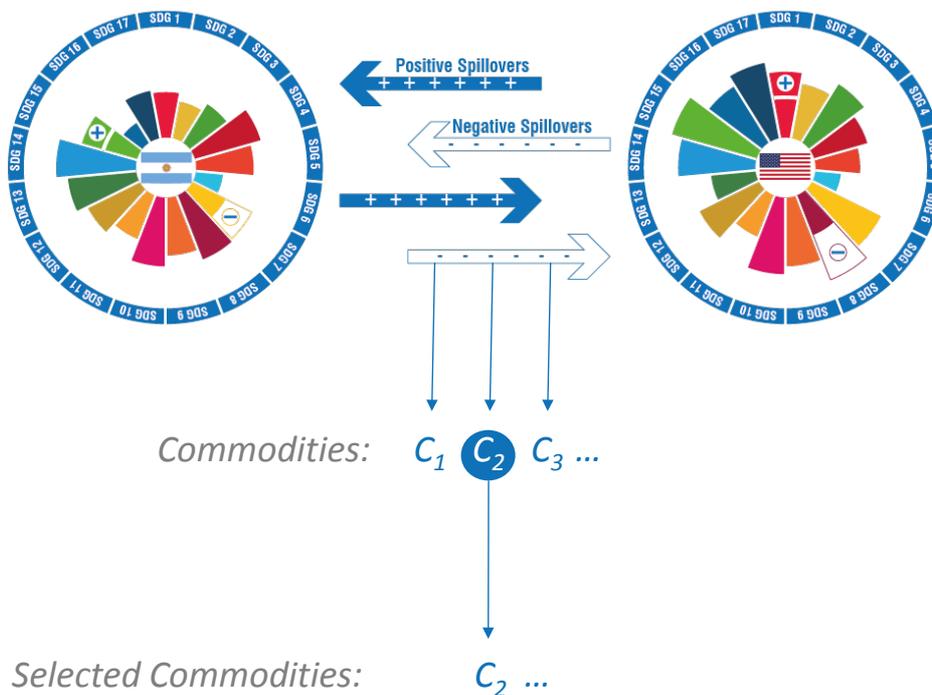


Figure 4. Disaggregation and prioritization of involved commodities

Phase 3 - Differentiation and Refinement

This next phase identifies specific products (differentiation) within the previously selected commodities. Next, data on these different products will be gathered by local work teams assembled by the SDSN Andes Secretariat, which will be composed by researchers, specialists, and volunteers from SDSN member organizations, as well as other stakeholders. Depending on the type of product and concerning SDG-related issue, this may involve looking at databases such as the ones linked to SimaPro, Umberto, GaBi, Ecoinvent, and SHDB. Such data will be used to identify points of action (opportunities for improvement) as well as to perform hybrid LCA that allow for the re-assessment of spillover effects of the involved countries (refinement of previous results) (Fig. 5).

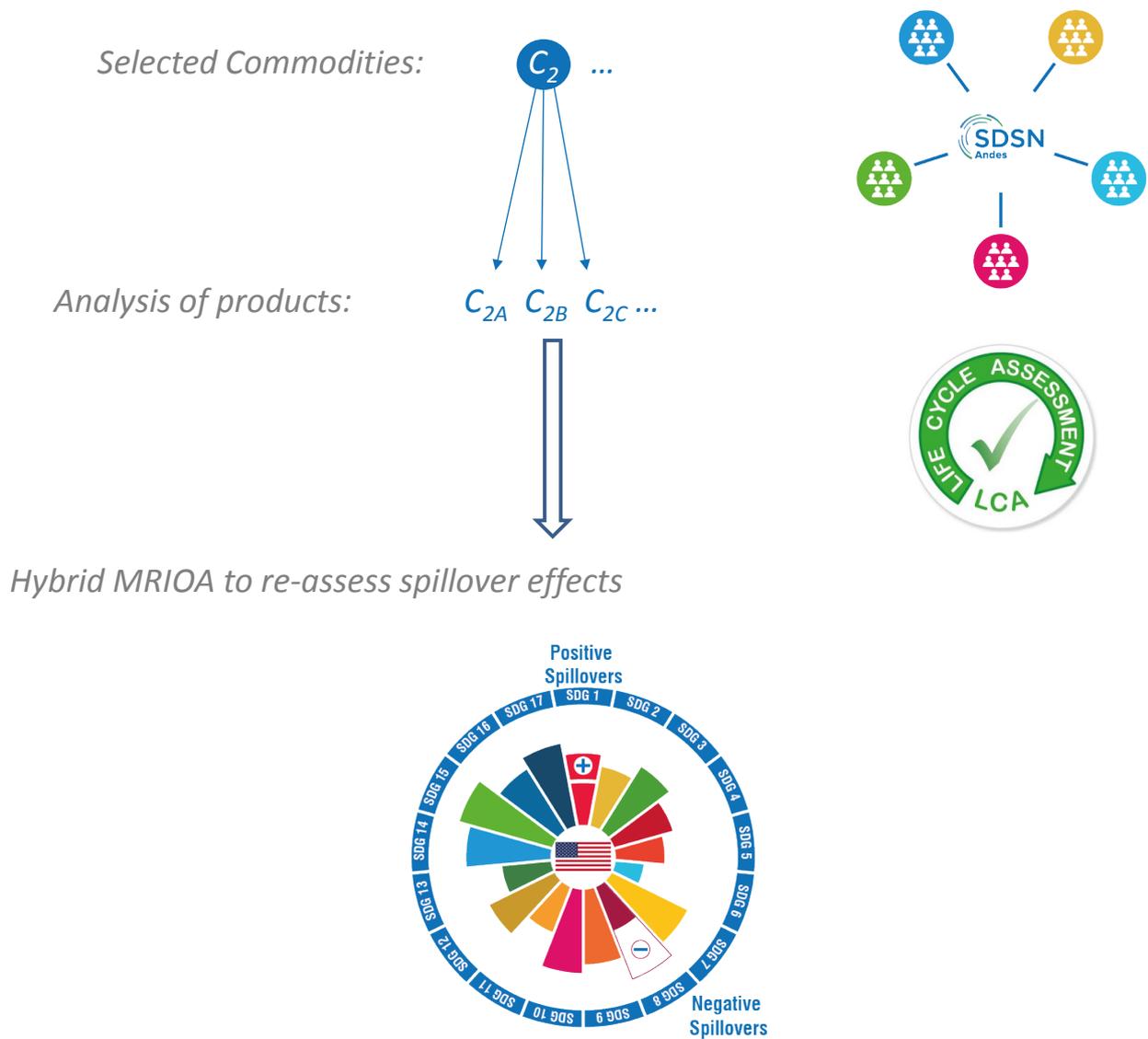
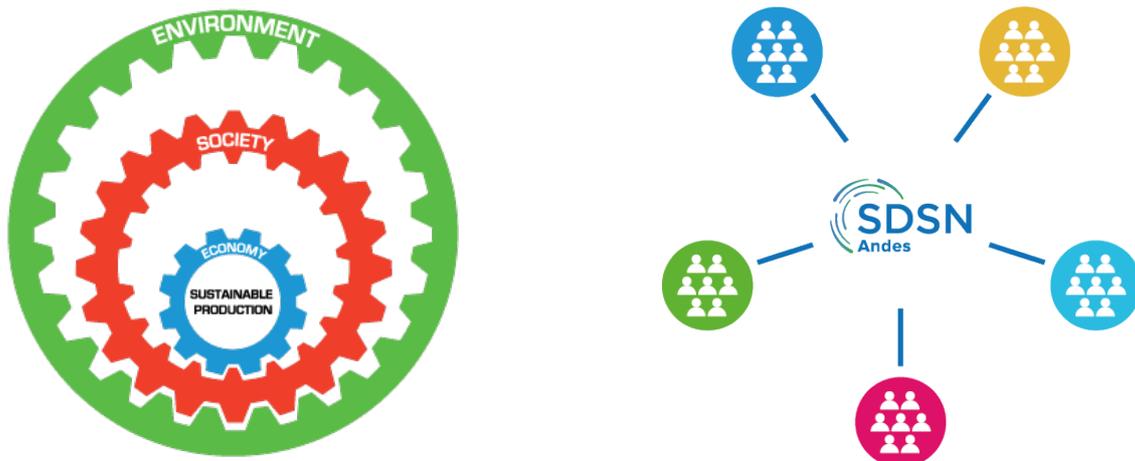


Figure 5. Differentiation of products and refinement of national performance results

Phase 4 – Solution initiatives

This phase consists of implementing specific projects to improve the impact of production on the SDGs, reducing identified negative spillover effects, as well as increasing positive spillover effects. This therefore implies solution initiatives of different natures, which will also be performed by local work teams assembled by the SDSN Andes Secretariat, composed of researchers, specialists, and volunteers from SDSN member organizations as well as other stakeholders. The connections to national and international consumers will be used to try to mobilize their support for such specific projects.



Phase 5 - Progress

Lastly, this final phase consists of assessing again countries' overall performance, in order to compare results and determine the progress made (Fig. 6).

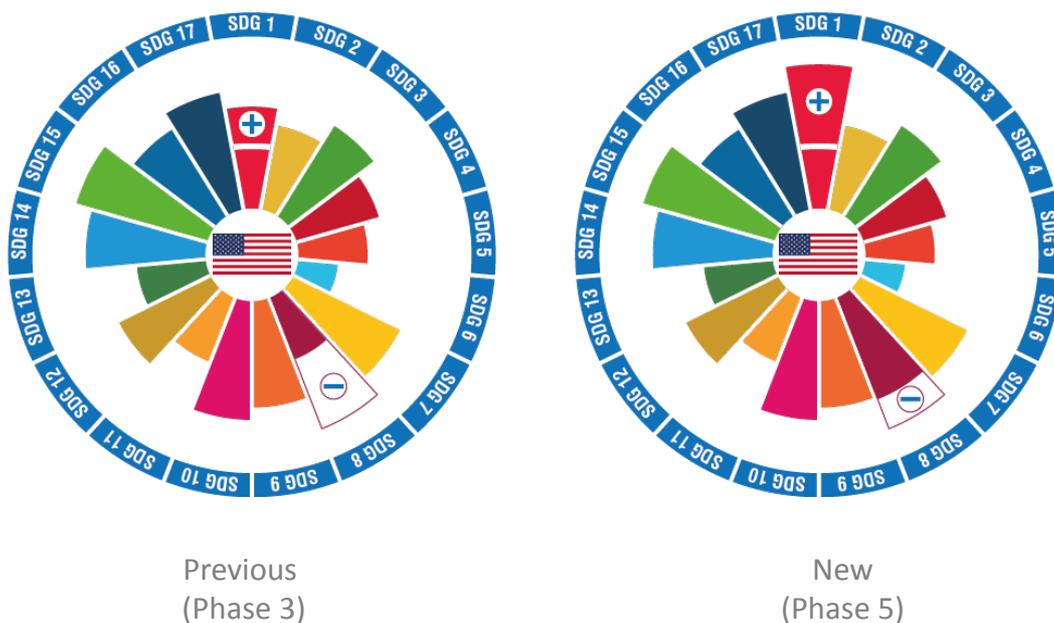


Figure 6. Re-assessment and comparison of national performance

5. Concluding remarks and open invitation

Achieving the SDGs by 2030 is a global commitment that will require partnerships across sectors of society and across national borders. Understanding how one country's economic activity influences other countries' SDGs is not only important for more accurate performance evaluations but also to mobilize support and tackle the challenge posed by the SDGs from a framework of *global responsibility*.

This initiative that has "set sail" will require partnerships beyond the organizations that are now leading it (particularly in phases 3 and 4). The SDSN Andes Secretariat is already mapping the expertise of its member organizations, as well as others. We thus welcome academics, LCA practitioners, and interested stakeholders to be part of this ambitious project.

Join the work on the global goals and enhance the ODDS for Progress.



For more information please contact us at info@unsdsn-andes.org

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References

- Alsamawi, A., McBain, D., Murray, J., Lenzen, M., & Wiebe, K. S. (2017a). Raising the International Poverty Line—A Comparison of Necessary Adjustments of Final Demand Spending in OECD and Non-OECD Countries. In *The Social Footprints of Global Trade* (pp. 59-67). Springer Singapore.
- Alsamawi, A., McBain, D., Murray, J., Lenzen, M., & Wiebe, K. S. (2017b). The Inequality Footprints of Nations; A Novel Approach to Quantitative Accounting of Income Inequality. In *The Social Footprints of Global Trade* (pp. 69-91). Springer Singapore.
- Bertelsmann Stiftung and Sustainable Development Solutions Network (SDSN). 2017. *SDG Index and Dashboards Report 2017 - Global Responsibilities, International spillovers in achieving the goals*. Gütersloh, Germany.
- Davis, S. J., Peters, G. P., & Caldeira, K. (2011). The supply chain of CO₂ emissions. *Proceedings of the National Academy of Sciences*, 108(45), 18554-18559.
- Feng, K., Hubacek, K., Sun, L., & Liu, Z. (2014). Consumption-based CO₂ accounting of China's megacities: the case of Beijing, Tianjin, Shanghai and Chongqing. *Ecological Indicators*, 47, 26-31.
- Gómez-Paredes, J., Alsamawi, A., Yamasue, E., Okumura, H., Ishihara, K. N., Geschke, A., & Lenzen, M. (2016). Consuming childhoods: An assessment of child labor's role in Indian production and global consumption. *Journal of Industrial Ecology*, 20(3), 611-622.
- Gómez-Paredes, J., Yamasue, E., Okumura, H., & Ishihara, K. N. (2015). The labour footprint: A framework to assess labour in a complex economy. *Economic Systems Research*, 27(4), 415-439.
- Haes, H. A. U., Heijungs, R., Suh, S., & Huppes, G. (2004). Three strategies to overcome the limitations of life-cycle assessment. *Journal of industrial ecology*, 8(3), 19-32.
- Hoekstra, A. Y., & Mekonnen, M. M. (2012). The water footprint of humanity. *Proceedings of the national academy of sciences*, 109(9), 3232-3237.
- ISO 14040 (2006). *Environmental management – Life cycle assessment, principles and framework*. International Standard, Second edition.
- Kloepffer, W. (2008). Life cycle sustainability assessment of products. *The International Journal of Life Cycle Assessment*, 13(2), 89.
- Lenzen, M., & Dey, C. J. (2002). Economic, energy and greenhouse emissions impacts of some consumer choice, technology and government outlay options. *Energy Economics*, 24(4), 377-403.
- Lenzen, M., Geschke, A., Abd Rahman, M. D., Xiao, Y., Fry, J., Reyes, R., ... & Moran, D. (2017). The Global MRIO Lab—charting the world economy. *Economic Systems Research*, 29(2), 158-186.
- Lenzen, M., Moran, D., Kanemoto, K., Foran, B., Lobefaro, L., & Geschke, A. (2012). International trade drives biodiversity threats in developing nations. *Nature*, 486(7401), 109-112.
- Lenzen, M., Kanemoto, K., Moran, D., & Geschke, A. (2012). Mapping the structure of the world economy. *Environmental science & technology*, 46(15), 8374-8381.
- Lenzen, M., Moran, D., Kanemoto, K., & Geschke, A. (2013). Building Eora: a global multi-region input–output database at high country and sector resolution. *Economic Systems Research*, 25(1), 20-49.
- Lenzen, M., & Murray, S. A. (2001). A modified ecological footprint method and its application to Australia. *Ecological economics*, 37(2), 229-255.
- Munksgaard, J., Wier, M., Lenzen, M., & Dey, C. (2005). Using Input-Output analysis to measure the environmental pressure of consumption at different spatial levels. *Journal of Industrial Ecology*, 9(1-2), 169-185.
- Schmidt-Traub, G., Kroll, C., Teksoz, K., Durand-Delacre, D., & Sachs, J. D. (2017). National baselines for the Sustainable Development Goals assessed in the SDG Index and Dashboards. *Nature Geoscience*, 10(8), 547-555.
- Suh, S., & Huppes, G. (2005). Methods for life cycle inventory of a product. *Journal of Cleaner Production*, 13(7), 687-697.
- Suh, S., Lenzen, M., Treloar, G. J., Hondo, H., Horvath, A., Huppes, G., ... & Munksgaard, J. (2004). System boundary selection in life-cycle inventories using hybrid approaches. *Environmental Science & Technology*, 38(3), 657-664.
- UNEP (United Nations Environmental Programme) 2009. *Guidelines for social life cycle assessment of products*. Milan, Italy.
- Wiedmann, T. O., Schandl, H., Lenzen, M., Moran, D., Suh, S., West, J., & Kanemoto, K. (2015). The material footprint of nations. *Proceedings of the National Academy of Sciences*, 112(20), 6271-6276.
- Xiao, Y., Norris, C. B., Lenzen, M., Norris, G., & Murray, J. (2017). How Social Footprints of Nations Can Assist in Achieving the Sustainable Development Goals. *Ecological Economics*, 135, 55-65.
- Yu, Y., Hubacek, K., Feng, K., & Guan, D. (2010). Assessing regional and global water footprints for the UK. *Ecological Economics*, 69(5), 1140-1147.

