Sustainable Development Goals Interface Ontology

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Note: This abstract is for a 15-minute talk during the plenary session on Semantics for Sustainability.

Keywords—Ontology, Integration, Doctrine, UN Sustainable Development Goals, SDGIO, Monitoring, OBO Foundry

I. Introduction

Ontologies are built in a variety of circumstances, for different applications. Some are quite small and built with minimal consideration (or need) for extensibility. Others, such as many of the large-scale efforts in the OBO Foundry, have a team of developers, domain specialists and collaborators actively engaged in interactive development [1-2]. The size of the ontology, or the complexity of the domain, aren't necessarily indicators of the development methodology and to what extent efforts are made to integrate the ontology with existing ontologies or other semantic resources. The use of ontologies by large organizations and government agencies is growing. For example, the Common Core ontologies by the US Army, the Joint Doctrine ontology, Untied States Geological Survey [3-4]. Within the context of integrating ontologies with sizable agencies, problems arise over harmonizing current vocabularies, agency doctrine and standards, while still attempting to build a useful tool that still adheres to best practice in developing modular and extensible realism-based ontologies.

II. Semantics for Sustainable Development

The United Nations Environmental Programme (UNEP) has commissioned the development of the Sustainable Development Goals Interface Ontology (SDGIO) for use in their knowledge discovery platform UNEPLive [5]. The UN's Sustainable Development Goals (SDG) initiative prescribes 17 broadly thematic goals for transformative global change [6]. Each goal prescribes a set of target endpoints for development processes within individual nation member states. See Table 1 for an example of one Goal and its Targets. In addition, a set of indicators have been adopted to facilitate the monitoring of progress towards reaching these targets. The data needed to compute the indicators cuts across the three pillars of sustainability: Social, Economic and Environment [7]. Integration of data and enhancing access to knowledge from these three domains is a key goal of the SDG process [8]. Doing so requires addressing several key problems: ambiguity of definitions for terms appearing across multiple sources from diverse agencies within such a large heterogeneous agency as the UN, integration of existing semantic resources, coordination the insolvent of domain specialists, and fostering the development of new ontologies in under-represented domains.

Goal 6: Ensure availability and sustainable management of water and sanitation for all	
Targets	Indicators
6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1: Proportion of population using safely managed drinking water services
6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1: Proportion of population using safely managed sanitation services, including a handwashing facility with soap and water
6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1: Proportion of wastewater safely treated 6.3.2: Proportion of bodies of water with good ambient water quality
6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1: Change in water use efficiency over time 6.4.2: Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1: Degree of integrated water resources management implementation (0-100)
6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1: Change in the extent of water-related ecosystems over time
6.A: By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	6.A.1: Amount of water- and sanitation-related official development assistance that is part of a government coordinated spending plan
6.B: Support and strengthen the participation of local communities in improving water and sanitation management	6.B.1: Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

Table 1. Sustainable Development Goal 6, its eight Targets and ten Indicators.

III. Ontology

In my talk I will describe the development cycle and build process of SDGIO, how we are addressing these problems of integration, as well as the ontology's high level structure and its implementation in UNEPs knowledge repository. I will include examples of how were are modeling key social

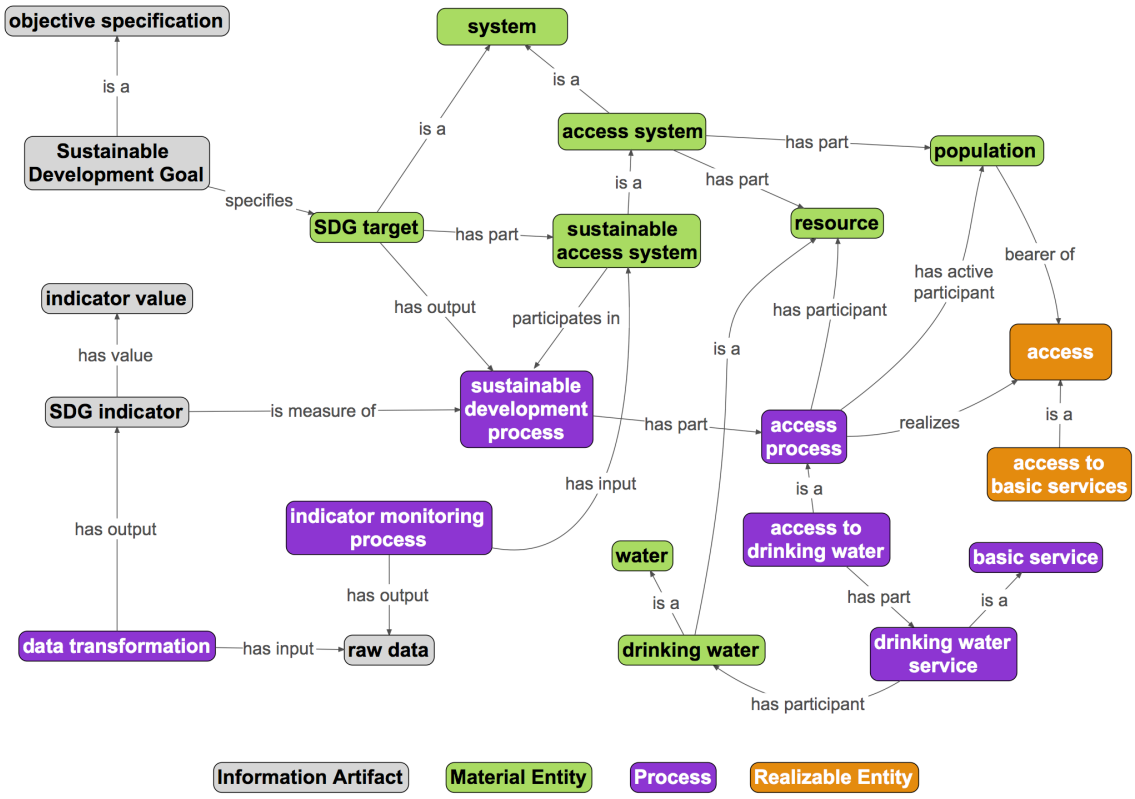

Figure 1. Linkages in SDG Interface Ontology Core

Illustrates how the Sustainable Development Goals, Targets and Indicators link together. Access to drinking water is shown as part of the diagram for example since access and water are such common themes throughout the SDGs.

phenomena, such as access to basic services, or safely treated water. For example, see Figure 1 for an illustration of how we model the Goals, Targets and Indicators in SDGIO.

I will also discuss our technique for addressing the sometimes vague and ambiguous definitions found in existing UN vocabularies when incorporating these in SDGIO classes. In doing so we have encountered a need to maintain connection to established resources allowing for reuse of existing metadata, thus building on established sets of semantic resources, while still adhering to best practices in ontology development. In this sense, while the content of the ontology should derive from a strong need to represent current scientific understanding of the domains invloved, the dissemination and implementation of the ontology itself as a tool (a representational artifact) has to respect user needs.

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