The UNEP Ontologies and the OBO Foundry

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I. INTRODUCTION

It is now generally accepted that wherever we need to address multiple different kinds of data deriving from multiple different kinds of sources, a strategy is required to ensure interoperability across the various systems involved. The United Nations Environmental Program (UNEP) is developing an ontology for use in their knowledge management platform—the Sustainable Development Goals Interface Ontology (SDGIO). The UNEP approach to achieving interoperability is modeled on the OBO (Open Biomedical Ontologies) Foundry, an initiative of ontology developers working in a range of life science domains who have been working since 2004 to develop a suite of ontologies which would work together consistently in such a way as to advance the integration of data [1]. To serve such integration the OBO Foundry members formulated and tested an evolving set of principles for ontology development which are now being used by ontology developers also in other areas, including manufacturing, geology, transport and security.

II. OBO PRINCIPLES[1]

1. OPEN: Each ontology in the Foundry must be openly available to be used by all without any constraint other than (a) its origin must be acknowledged and (b) it is not to be altered and subsequently redistributed in altered form under the original name or with the same identifiers.

2. COMMON FORMAT: The ontology is made available in a common formal language in an accepted concrete syntax, for example OWL.

3. IDENTIFIER SPACE: Each class and relation (property) in the ontology must have a unique URI identifier. The URI should be constructed from a base URI, a prefix that is unique within the Foundry (e.g. GO, CHEBI, CL) and a local identifier (e.g. 0000001). The local identifier should not consist of labels or mnemonics meaningful to humans. The ID-space / prefix must be registered with the OBO library in advance.

4. VERSIONING: The ontology developers must institute and document procedures for identifying distinct successive versions, including provision of metadata describing changes. Changes may arise for example because errors have been identified in previous versions, because of advances in scientific knowledge, or because of the need to incorporate content from other ontologies in the formulation of definitions.

5. CLEARLY DELINEATED CONTENT: The ontology should provide coherent natural language definitions of the top-level term(s) incorporating cross-product links to other OBO Foundry ontologies. As a corollary, we would strive for community acceptance of a single ontology for one domain, rather than encouraging rivalry between ontologies. The background to this principle is the idea that each ontology must be orthogonal to (in other words not overlap with) other ontologies already lodged within the Foundry. This principle allows two different ontologies, for example anatomy and process, to be combined through additional relationships. These relationships could then be used to constrain when terms could be jointly applied to describe complementary (but distinguishable) perspectives on the same biological or medical entity.

6. TEXTUAL DEFINITIONS: The ontology developers must provide definitions for a substantial and representative fraction of terms in the ontology, plus equivalent formal definitions for at least a substantial number of terms. For terms lacking textual definitions, there should be evidence of implementation of a strategy to provide definitions for all remaining undefined terms. Text definitions should be unique (i.e. no two terms should share a definition)

7. DOCUMENTATION: The owners of the ontology should strive to provide as much documentation as possible. The documentation should detail the different processes specific to an ontology life cycle and target various audiences (users or developers). Central to the issue of ontology documentation is ensuring transparency and traceability of artefact development. For each of the development steps, clear procedures should be made available. Documentation availability will be used to assess the quality of the resource. The following itemized list provides a core checklist, distinguishing general ontology documentation (general information about the resource) and local ontology documentation (documentation at artefact level itself and representational

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[1] http://obofoundry.org/principles/fp-000-summary.html

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unit level (class and relations)). Documentation assessment with the purpose of assessing Ontology soundness, will cover updates and revision to the documentation. As ontology evolve, so should the documentation, for example by including a release documentation file.

8. PLURALITY OF USERS: The ontology developers should document that the ontology is used by multiple independent individuals or organizations. For purposes of documentation, the ontology developers should provide links/citations to evidence of use (publication, external ontology; see examples below) as input to the review process.

9. COMMITMENT TO COLLABORATION: OBO Foundry ontology development, in common with many other standards-oriented scientific activities, should be carried out in a collaborative fashion. The benefits of collaboration are threefold: (1) avoid duplication of work; (2) increase interoperability; and (3) ensure that ontology content is both scientifically sound and meets community needs.

10. CONTACT PERSON: There should be a single person who is responsible for communications between the community and the ontology developers, for communicating with the Foundry on all Foundry-related matters, for mediating discussions involving maintenance in the light of scientific advance, and for ensuring that all user feedback is addressed.

11. MAINTENANCE IN LIGHT OF SCIENTIFIC ADVANCE: OBO is an open community and, by joining the initiative, the authors of an ontology commit to its maintenance in light of scientific advance and to working with other members to ensure the improvement of these principles over time.

III. DEFINITIONS IN SDGIO

OBO Foundry member and candidate ontologies (such as OBI, CHEBI, ENVO) serve as an important input to the SDGIO development process. In my presentation I shall focus on principle 6, TEXTUAL DEFINITIONS, and show how the definition practices used in the OBO Foundry are being applied to definitions for many upper-level terms needed to build the SDGIO, such as 'access', 'right', 'resilience', and 'vulnerability', as illustrated in Figure 1.

IV. ACKNOWLEDGMENT

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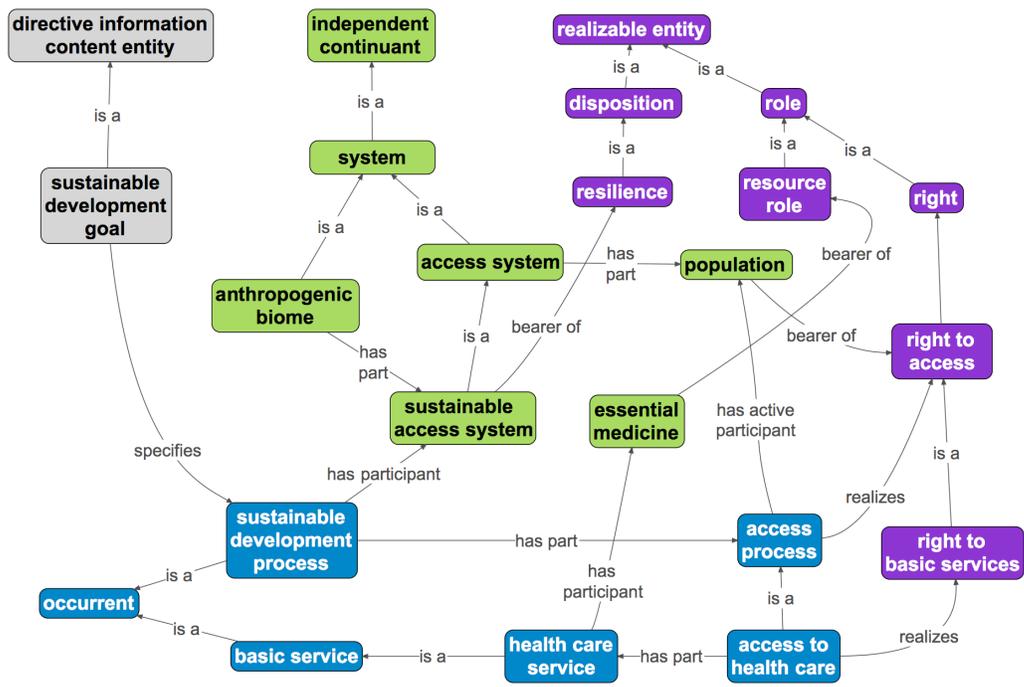

Figure 1. Illustrates how classes in SDGIO relevant to social processes, rights, access, and basic service relate to one another.