

Ecosystem for New International
Decommissioning Services

risk ontology methods in decommissioning

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Need for a risk ontology in nuclear decommissioning

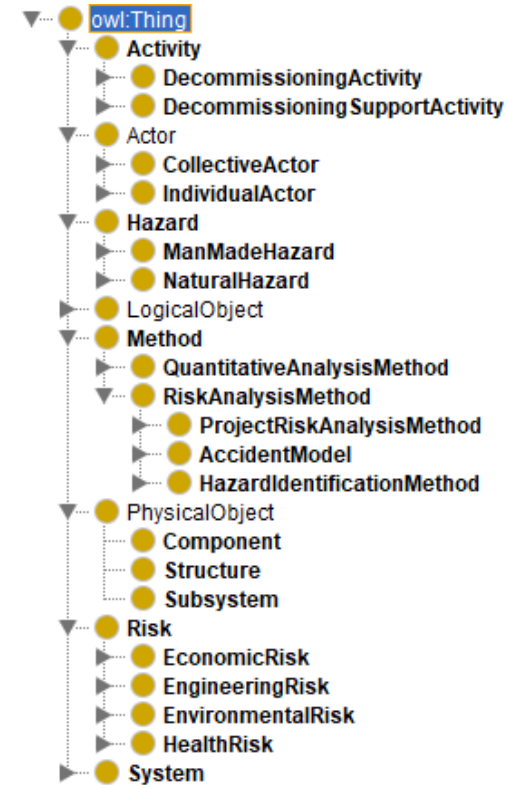
- Decommissioning is complex
 - Work methods, personnel and the plant change as the decommissioning is carried out
 - Hazards and risks change by decommissioning phase
- A common vocabulary is needed between different actors concerning risks
 - Decommissioning companies
 - Licensee
 - Regulators

Ontologies

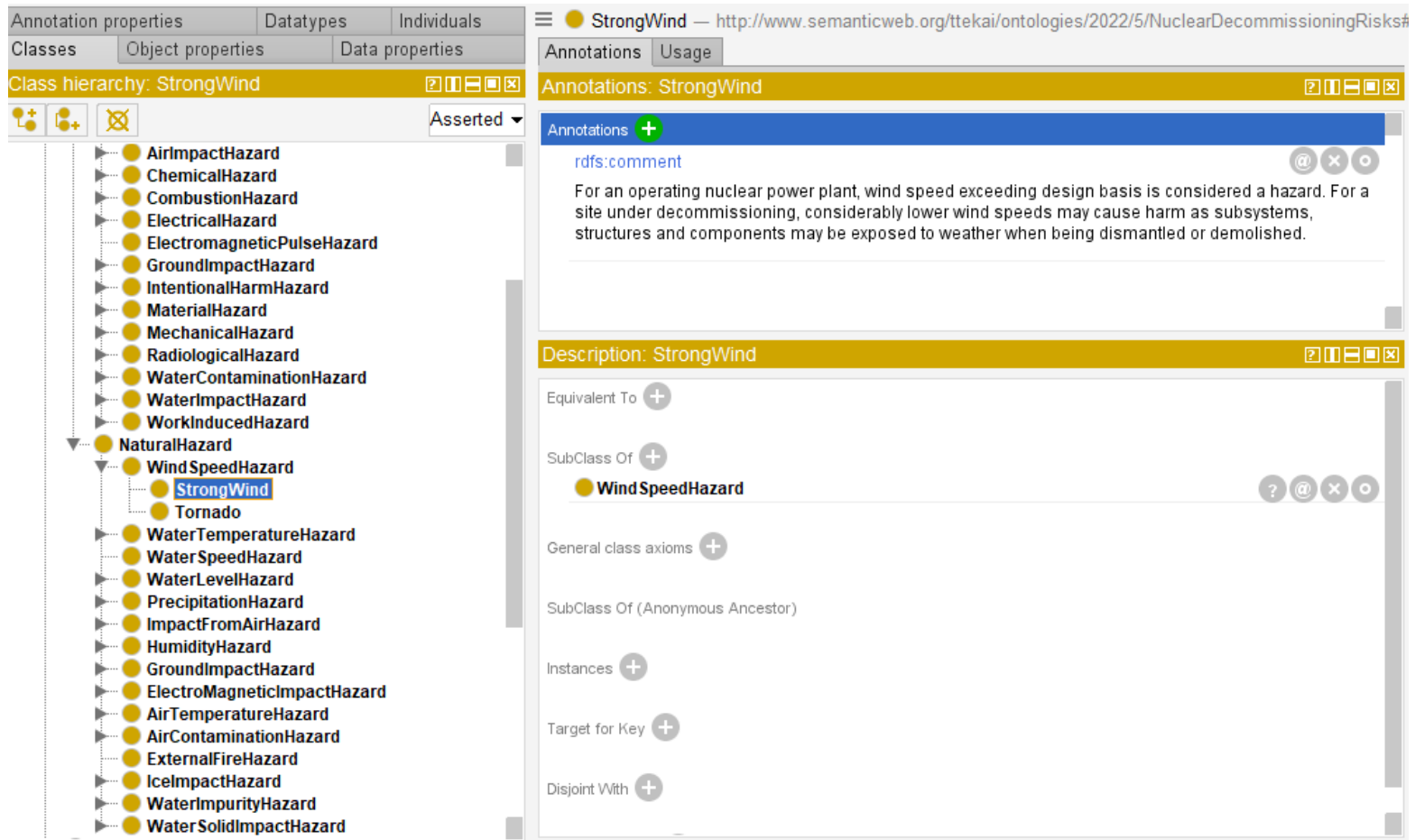
- Definition
 - a representation of knowledge about a domain as a set of concepts and relations between these concepts
- Benefits
 - Simplify complex data management
 - Promote interoperability
- State of the art
 - Ontology languages such as Web Ontology Language (OWL)
 - Upper level ontologies such as DOLCE and Basic Formal Ontology (OWL)
 - Ontology development software such as Protege

A nuclear decommissioning risk ontology

- A taxonomy consisting of
 - Decommissioning hazards
 - Decommissioning risks
 - Methods applicable for decommissioning risk analysis
 - Supporting concepts (activities etc.)
- Relationships between the concepts
 - E.g. part-of between components and systems



An example concept: strong wind hazard



The screenshot displays a Semantic Web browser interface with the following components:

- Annotation properties:** Datatypes, Individuals
- Classes:** Object properties, Data properties
- Class hierarchy: StrongWind**
 - AirImpactHazard
 - ChemicalHazard
 - CombustionHazard
 - ElectricalHazard
 - ElectromagneticPulseHazard
 - GroundImpactHazard
 - IntentionalHarmHazard
 - MaterialHazard
 - MechanicalHazard
 - RadiologicalHazard
 - WaterContaminationHazard
 - WaterImpactHazard
 - WorkInducedHazard
 - NaturalHazard
 - WindSpeedHazard
 - StrongWind**
 - Tornado
 - WaterTemperatureHazard
 - WaterSpeedHazard
 - WaterLevelHazard
 - PrecipitationHazard
 - ImpactFromAirHazard
 - HumidityHazard
 - GroundImpactHazard
 - ElectroMagneticImpactHazard
 - AirTemperatureHazard
 - AirContaminationHazard
 - ExternalFireHazard
 - IcelImpactHazard
 - WaterImpurityHazard
 - WaterSolidImpactHazard

- Annotations: StrongWind**
- Annotations:** +
 - rdfs:comment**
 - For an operating nuclear power plant, wind speed exceeding design basis is considered a hazard. For a site under decommissioning, considerably lower wind speeds may cause harm as subsystems, structures and components may be exposed to weather when being dismantled or demolished.
- Description: StrongWind**
- Equivalent To: +
- SubClass Of: +
 - WindSpeedHazard
- General class axioms: +
- SubClass Of (Anonymous Ancestor)
- Instances: +
- Target for Key: +
- Disjoint With: +

Ontology implementation



Developed with Protege



Implementation language: Web Ontology Language OWL



Not (yet) integrated with any standard upper ontology

Basic Formal Ontology considered

Ontology uses in decommissioning risk assessment

- Facilitate the use of risk analysis methods across domains
 - E.g. risk analysis methods developed in process industry applied to analysis of occupational hazards
- Help in recommending risk analysis methods for a particular application
 - e.g. find a method/methods for risk analysis in environmental impact analysis
- Serve as a compact representation and repository of decommissioning risk related knowledge
 - E.g. generation of checklists
- Reuse earlier hazard and risk analyses

Thank you!
