

COST C21

Urban Ontologies for an improved
communication in urban civil engineering
projects

TOWNTOLOGY Project

Jacques Teller
LEMA Université de Liège

Objectives of the COST C21 Action

The main objective of the Action is to **increase the knowledge** and **promote the use of ontologies** in the domain of Urban Civil Engineering projects, in the view of facilitating the communications between information systems, stakeholders and UCE specialists at a European level (Groupware).

Definition of ontologies

From ontos (being) and logos (discourse/science) - theory of objects and their relations.

Ontologies determine what can be represented and what can be said about a given domain through the use of information techniques.

"an engineering artefact, constituted by a specific vocabulary used to describe a certain reality, plus a set of explicit assumptions regarding the intended meaning of the vocabulary words.." (Guarino, 1998)

"ontology designers have to make conscious and explicit choices of what they admit as referents in a particular system or language." (Kuhn)

The way to make these choices is an important subject of research given their practical implications over the long-term.

Main applications of ontologies

Knowledge sharing and reuse

A body of formally represented knowledge is based on a **conceptualization**: the objects, concepts, and other entities that are assumed to exist in some area of interest and the relationships that hold among them (Genesereth & Nilsson, 1987)

Integration of data and system interoperability

"The ability of two or more systems or components to **exchange information** and to use the information that has been exchanged" (IEEE)

Revealing the logical structure of existing conceptualisations

"Conceptualizations are often tacit. They are often not thematized in any systematic way. But tools can be developed to specify and to clarify the concepts involved and to establish their logical structure, and thus to **render explicit the underlying taxonomy**." (Smith, 2003)

Ontologies in the urban domain

Improve the communication between Urban Information Systems

How can we share information/knowledge between different UIS ? Raises issues of communication between **domains** (cadaster, population, planning, environment etc.), **scales** (nation, city, district), **purposes** and **qualities** (2D/2.5D/3D, topologically correct/incorrect, precision).

Improve the communication between experts and decision-makers

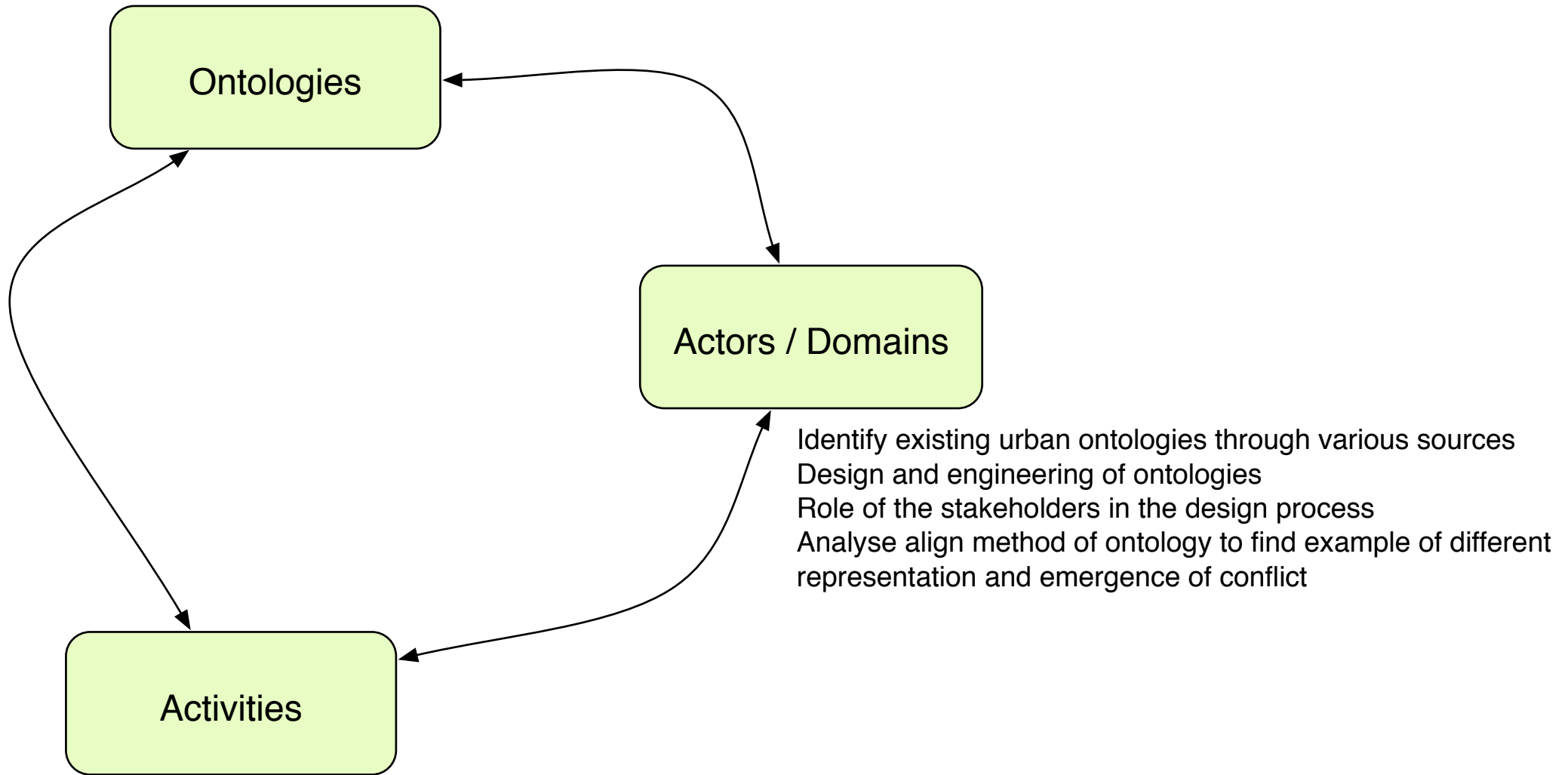
How can ontologies help us to build a **common culture** between experts, stakeholders and decision-makers ? Argumentation, negotiation and conflict resolution require a common vocabulary, shared by the different partners.

Improve the communication between domain experts

How can ontologies help us to identify and describe elements of convergence/divergence between **European urban planning systems** ? Neologisms and "planning revisions" have been flourishing throughout Europe to cope with the evolution of urban systems. Example of sprawl or planning gains.

Prospect for ontologies in the urban domain

What is an ontology and what are the goals of ontologies ?
Description of ontologies for non expert of computer science
Ontologies of space and process (high-level)



Identify existing urban ontologies through various sources
Design and engineering of ontologies
Role of the stakeholders in the design process
Analyse align method of ontology to find example of different representation and emergence of conflict

Case studies of ontologies "in action"
Categorisation of problems/ uses cases
How the context is treated in existing methods

Relevant experiences (not ontologies...)

Formalisation

Urban

	Construction sector classification	AEC Modelling	GIS Ontologies	Urban knowledge bases
Examples	ISO 12006 - 2 ISO 12006 - 3 ISO 18629 - Process Specification Language	IFC - Industry Foundation Classes IFG - Industry Foundation Classes for GIS	Open GIS initiative GML 3.0	EUKN - European Urban Knowledge Network COST C20 URBANET, HEREIN
Main Purpose	Standardisation Entire life cycle	Software Interoperability	Domain Interoperability	Exchange of experience Cataloguing
Leadership	Normalisation bodies	Internation Alliance for Interoperability: AEC & software industry, Public bodies	Research organisations Private agencies	European Networks Public/Private bodies
Scale	Focused on building entities (buildings, bridges) and construction complexes (motorways)	Buildings and Sites	Street networks to satellite img processing	From public spaces to urban regions
Formalism	EXPRESS bcXML taxonomy	EXPRESS ifcXML	XML, GML, OWL	Taxonomy ISO 5964 (multilingual thesauri)

ISO 12006-2 and 12006-3

International Standardisation Organisation

Concepts for describing construction entities, their design, production, use and management, as well as people using and experiencing the built environment. Covers the entire life cycle of the building. **Coordinate national and regional classification systems**. Adopted in 2001 (Part I), 2002 (Part II). Follow-up of SfB, Swedish classification system (1950).

Content of the standard

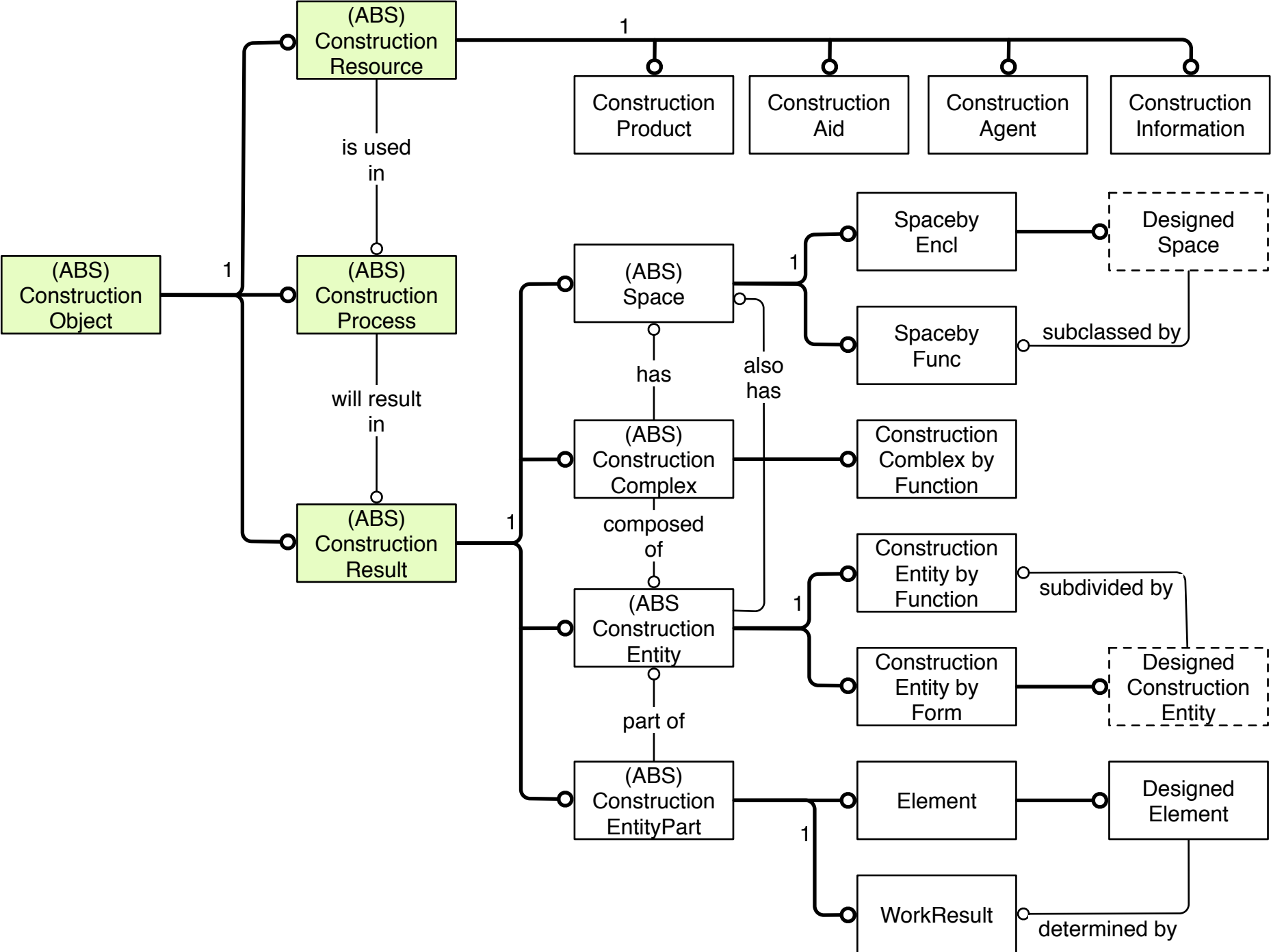
Provides a framework and a set of recommended table titles supported by definitions, but not the detailed content. ISO 12006-2 not expressed in a formal definition language. ISO 12006-3 defined in EXPRESS (object oriented, construction domain independent). Tables that adhere to the principles laid out in the standard are assumed to be similar and possible to translate between. Supports multilingual taxonomies.

Main Challenge: Integrate different "views" in the same schema

Construction Entities defined by main construction method (girder bridge, arch bridge, or truss bridge), or by function-or-user activity (railroad bridge, motor vehicle bridge or pedestrian bridge). Similar subdivision possible for "Space" (kind of enclosure vs. living room or kitchen).

Respect the design process (defining design objects, representing building parts by geometry, and incrementally determines technical solution). Allow multiple applications (cost calculations, visualisation).

ISO 12006-2 and 12006-3



Industry Foundation Classes (IFC)

Interoperability between AEC software

Defined for modeling of building products. Increase the productiveness of design, construction, and maintenance operations within the life cycle of buildings. Available in most CAD editors (Autodesk, Graphisoft, Nemetschek). Proposed IFG extensions for interoperability with GIS and urban regulation. Mostly **file based exchanges**, though designed for server-based and software-based exchanges.

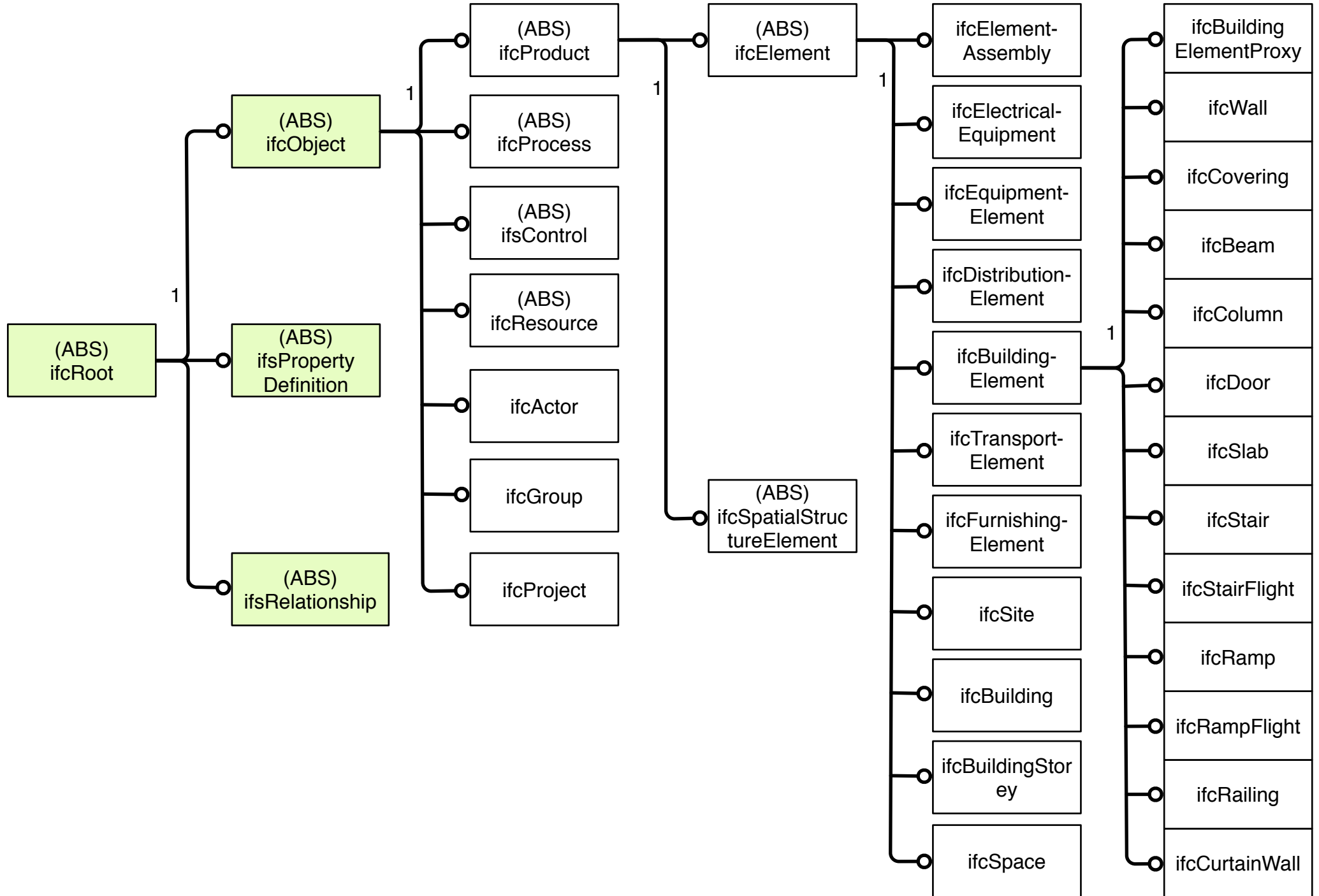
Content of the standard

IFC Classes not defined in an explicit model (no ontology). Not sure that selection is complete and classes are mutually exclusive. Formalised in EXPRESS then in ifcXML. Common kernel + open extensions. Based on three main classes: objects, relations and properties. Objects includes tangibles (walls, beams, etc.), intangibles (processes, controls, resources and actors) and conceptual (grids, ...).

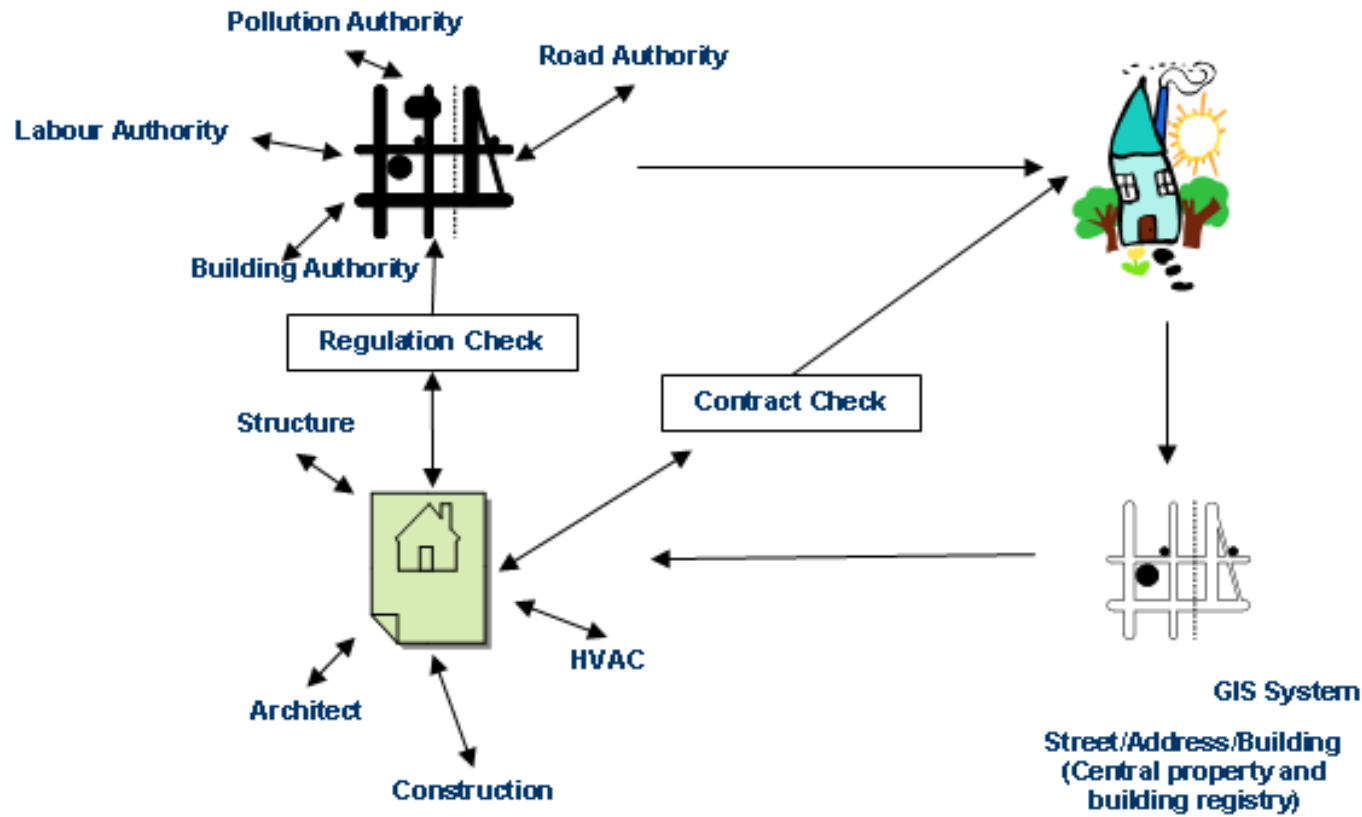
Main Challenge: Interoperability vs. "Capacity to evolve"

Two releases since 1995, third release on its way. From IFC 2x release (October 2000), part of the model has been protected against change (ISO PAS 16739). Evolution, extensibility and customisation. Object-oriented approach though some heritage of ER (EXPRESS). Strong interaction with "Software Implementers".

Industry Foundation Classes (IFC)



Industry Foundation Classes (IFC)



Ontologies for GIS

Interoperability between GIS and application software

Partly addressed in COST C4 (Management and information application development in urban civil engineering). Few "urban oriented" researches. Exploratory work in INSA-Lyon (2002-2003).

Content of the ontology

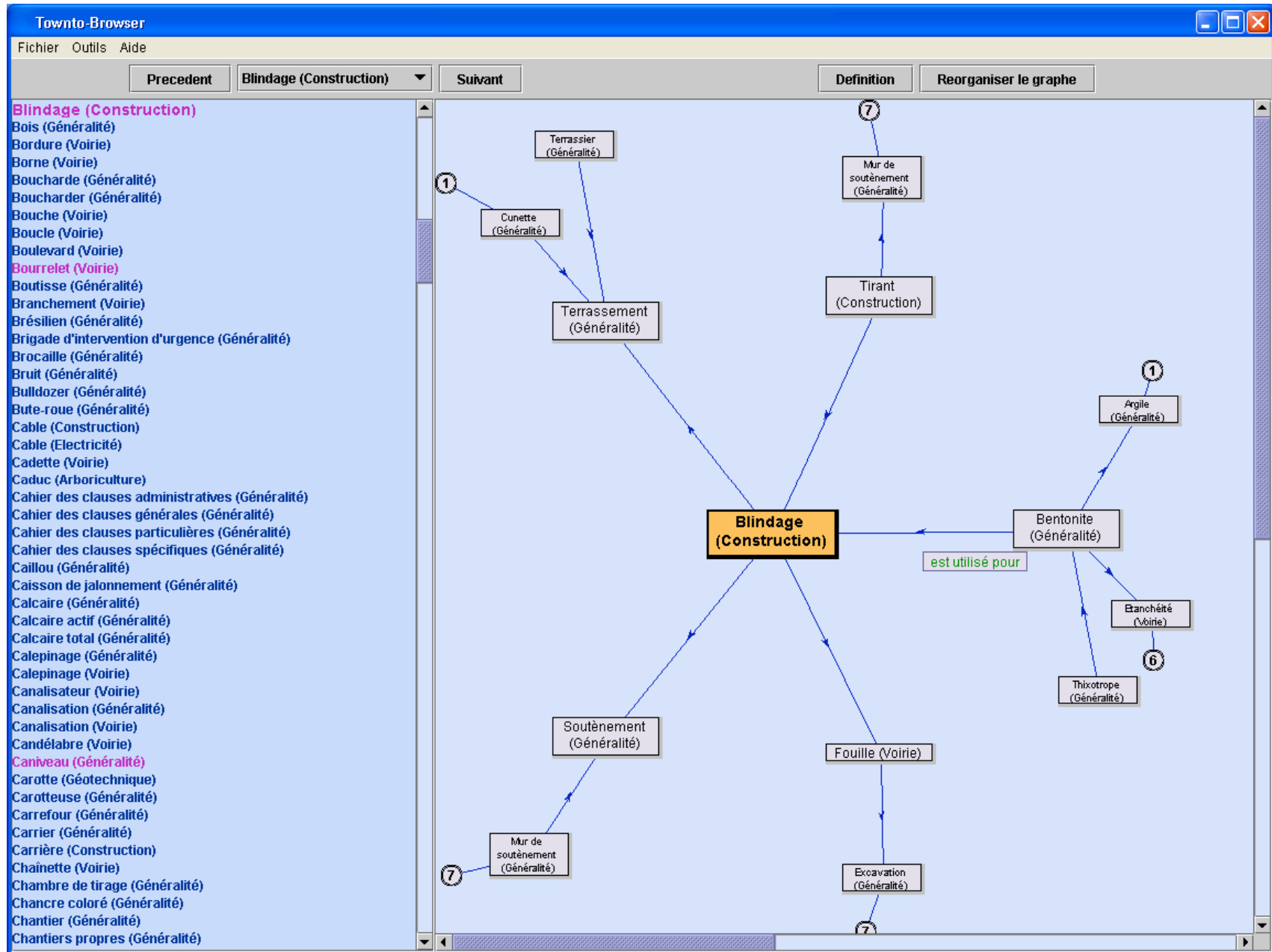
Ontology for street planning and mobility. Dynamic tool for developing semantic networks.

Description based on an extension of XML. 800 terms (more concepts as several definitions for a given term). Available on <http://lisi.insa-lyon.fr/~townto/>

Main Challenge: Bottom-up approach

No ontology engineer. Ontology developed by end-users in collaboration with computer scientists. Started from a glossary of street planning, extended with analysis of more complex terms (e.g. public space). Identification of both **concepts** and **relation types** ("is a", "is made of", "is located in", "is used for", "is a subset of").

Ontologies for GIS



Ontologies for GIS

Townto-Ontology Editor

Cancel all Generate Ontology

Global Informations Relation types Domains **Concepts** Relations Hints Statistics Connex Graphs

Entered in domain **Généralité** with identifier 300 016

Related Terms Definitions Resources

Entred on 2003/06/15 by Caroline BEAULIEU et Yohann TARDY

Definition Text	Authors
<p>Ensemble constitué par une ville et ses banlieues.</p> <p>Jusqu'à la fin du XVIII^e siècle, les villes occidentales différaient par leur taille, mais toutes présentaient les mêmes caractères morphologiques généraux : elles étaient articulées autour d'un centre, prolongé par des faubourgs, une banlieue urbanisée, maraîchère, de loisir et de villégiature avant qu'on n'arrive à la campagne proprement dite. Aujourd'hui, la complexité est plus grande : l'INSEE distingue les villes " lorsqu'il s'agit d'une seule commune, dont la population agglomérée compte au moins 2 000 habitants ", et les agglomérations urbaines, composées " de deux ou plusieurs communes, c'est-à-dire d'une ville-centre et de sa banlieue (exceptionnellement, de plusieurs villes-centres) ".</p> <p>La définition de la population agglomérée s'est faite à la fois plus souple et plus complète: "On doit considérer comme agglomérée la population rassemblée dans des maisons contiguës ou réunies entre elles par des parcs, jardins, vergers, chantiers, ateliers et autres enclos de ce genre, même si les habitations ou enclos sont séparés l'un de l'autre par une rue, une route, une rivière, un canal, une promenade, une voie de chemin de fer ou des remparts. " L'apparition, dans la nomenclature urbaine, du terme d'agglomération traduit les transformations profondes qui sont liées à l'urbanisation généralisée, au développement des transports modernes et à l'apparition de centres commerciaux ou de centres directionnels à la périphérie des cités les plus importantes. Le terme convient bien pour saisir une réalité où les formes sont moins clairement ordonnées que par le passé : il traduit la généralisation d'espaces suburbains, souvent très monotones, et où il est difficile de lire dans les paysages une organisation claire : seule l'analyse des flux et des espaces d'activité en fait comprendre la vie.</p> <p>Les agglomérations ont reçu un statut à travers la loi Voynet du 25 juin 1999 qui a prévu que les établissements publics de coopération communale des agglomérations de plus de 50 000 habitants comportant au moins une ville-centre de plus de 15 000 habitants établissent un projet d'agglomération qui détermine les orientations de l'agglomération et les mesures nécessaires en matière de développement économique et de cohésion sociale, d'aménagement et d'urbanisme, de transport et de logement, de politique de la ville, de politique de l'environnement et de gestion des ressources. Dans le même temps, la loi Chevènement du 12 juillet 1999 encourageait la création d'établissements publics de coopération intercommunale, notamment pour les agglomérations en créant, à côté des communautés de communes et des communautés urbaines, des communautés d'agglomération réservées à celles qui atteignent les seuils de population ci-dessus. Enfin, dans le cadre de la quatrième génération de contrats de plan (2000-2006), les agglomérations ayant constitué une telle communauté pourront signer un contrat d'agglomération avec l'État et la région.</p>	Paul Claval

Reference : Dictionnaire de l'urbanisme

<=> OK Delete =>

OK Cancel Clear

European Urban Knowledge Network

Intergovernmental initiative.

Launched in 2004 during Dutch presidency. 15 countries participating. Annual budget of 1 Million EURs (funded by Objective II). Action plan for 2007-2013. Coordinated by the KCGS in Amsterdam (independent organisation).

Content of the e-library.

Four types of entries: research, networks, practices and policies. Templates defined for each type of entry. **1500 entries at the moment. Expected to reach 5.000 at the end of 2006.** Taxonomy established for classification purposes (604 nodes). Six main entries: 1) urban environment, 2) housing, 3) transport and infrastructures, 4) economy, 5) knowledge and employment, integration and social cohesion, 6) security and crime prevention. Opportunity to further specify by keywords.

Main Challenge: Validation of Knowledge.

Performed by National Focal Points (NFPs). According to common model (largely formal until now).

European Urban Knowledge Network


Safari Fichier Édition Présentation Historique Signets Fenêtre Aide

EUKN - European Urban Knowledge Network

http://www.eukn.org/eukn/themes/index.html

smile Dictionary of Smile PC banking Université de Liège Dictionnaire EUKN SNCB CERMA CERMA outils CPAM EspacesTemps.net

BE CY DE DK ES FI FR GB GR HU IT LU NL PL PT



European Urban Knowledge Network

- E-library
- Newsletter
- News
- Meetings
- About EUKN
- Partners
- Contact
- FAQs
- Share your knowledge!

Home > E-library

Urban Policy 49

Economy knowledge & employment 9	Security & crime prevention 6	Transport and infrastructure 9
Digital services 14	Anti-crime policy 2	Public transport 20
Internet access 6	Anti-social behaviour & vandalism 4	Community transport 2
Broadband 2	Burglary & theft 3	Train services 2
Research & innovation 14	Cross-border crime 3	Trams & light rail 1
Implementation & production 4	Drug crime 8	Roads and road transport 7
Knowledge & technology transfer 15	Extremism 1	Cycle routes 1
Universities & spin-offs 5	Gender & domestic violence 3	Parking 1
Support for spin-offs 1	Race crime & harassment 1	Pavements 1
University research environment 4	Riots 3	Road charging 2
Training 3	Transport & vehicle crime 2	Road safety 3
Coaching 1	Youth crime 14	Traffic management 15
Lifelong learning 1	Crime prevention 6	Services & amenities 6
Training for new professions 1	Camera surveillance 8	Amenities 1
Vocational training 11	Designing out crime 8	Community centres 14
Urban economy 18	Mediation 1	Health services 11
Business support 10	Risk management	Leisure centres 17
Business advice 5	Civil disorder 1	Libraries 8
Business parks 12	Industrial disasters 2	Shops 5
Economic opportunity zones 5	Natural disasters 1	Social services 4
Encouraging entrepreneurship 22	Terrorist attacks 1	Public space 33
EU-Funding 4	Sense of insecurity 6	Children's play areas 3
Government aid 2	Crime hotspots 0	Parks 21

→ Search site

go

Advanced search →

Topics in alphabetical order

A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z

Language and institutional differences

EuroWordNet experience

Multilingual database with wordnets for several European languages (Dutch, Italian, Spanish, German, French, Czech and Estonian). Based on WordNet synsets (166 000 words, 90 000 senses). Completed in 1999.

Limitations of WordNet from Falquet (2006)

In Wordnet, a concept cannot exist without an english term to denote it. Ex. FR:Fleuve (large rivers that flows into a see or ocean). No difference between instantiation and heritage. Directed acyclic graph (not a tree). Meronymy holds for "part of" and "made of" relations

Applications to urban planning

No interest for direct synonyms but for **differences in meaning and "institutional value"** of proximate concepts. Exploratory work of Ventura and Calderón for Italian and Spanish planning systems (very proximate and dynamic).

Urban glossaries from Ventura and Calderón

1st Level	Inquinamento ambientale	Degrado che subisce un dato ambiente per l'azione di uno o più elementi inquinanti. Può essere acustico per i rumori prodotto dal traffico o da lavorazioni industriali; fisico per l'accumulo di rifiuti; atmosferico per la dispersione nell'aria di sostanze nocive; o anche visuale per l'inserimento di elementi di disturbo quantitativo o qualitativo nel panorama dell'insediamento.	Contaminación Ambiental	Degradación que soporta el ambiente por la acción de uno o más elementos contaminantes. Puede ser contaminación acústica (tráfico, industria, etc.), contaminación física (acumulación de basuras, etc.), contaminación atmosférica (dispersión en el aire de sustancias nocivas) o contaminación visual (por la presencia de elementos que disturbán cualitativa o cuantitativamente el paisaje).
2nd Level	Impatto ambientale	Insieme degli effetti che un'opera edilizia o urbanistica, produce sul territorio circostante, provocando alterazioni o perturbazioni dell'ambiente.	Impacto Ambiental	Efecto que una determinada acción produce en los elementos del medio o en las unidades ambientales; efecto que puede ser beneficioso, es decir, positivo, o perjudicial, esto es, negativo.
3rd Level	Piano regolatore generale (P.R.G. o P.R.G.C.)	Il piano regolatore generale (P.R.G.) e' costituito dal complesso degli atti di pianificazione territoriale con i quali il Comune disciplina l'utilizzazione e la trasformazione del territorio comunale e delle relative risorse. Il P.R.G. e' composto dal piano strutturale, dal regolamento urbanistico, dal programma integrato di intervento.	Plan General de Ordenación Urbana	El Plan General, si bien con matización en las denominaciones, es el principal instrumento de planeamiento urbanístico municipal. Es un instrumento de ordenación integral del término municipal completo. Establece los elementos fundamentales de la estructura general del territorio (sistemas generales de comunicaciones, espacios libres y equipamiento comunitario); la clasificación del suelo y la calificación del suelo.

Ontologies vs. Folksonomies

Existing classification systems

Designed for specific purposes. Object-oriented rather than experience-oriented. Generally too complicated for anyone without specialised training. Require strict control over the creation of new entities and branches. Become fixed and inflexible.

Folksonomies or ethnoclassification (Tweed, 2006)

User-generated metadata in the form of tags or keywords. Tags exist in a flat namespace with no hierarchy. It is a bottom-up as opposed to a top-down approach. **A folksonomy is more about categorisation than classification**

Limitations of Folksonomies

The same tag may be used in different ways. Different tags may be used for the same concept. Acronyms not differentiated from actual words, e.g. ANT. Lack of controlled vocabularies allows great inaccuracies. Lack of structure creates possibility of chaos.

Ontologies vs. Folksonomies

 **del.icio.us / search**

[popular](#) | [recent](#)

 [your bookmarks](#) | [your network](#) | [subscriptions](#) | [links for you](#) | [post](#)

logged in as **jacquesteller** | [settings](#) | [logout](#) | [help](#)

Search results for **urban**



sponsored results

Your bookmarks

No results found

Everyone's bookmarks → related tags: [urban design art architecture photography blog shopping culture urbanism cities](#)

showing 1 - 10 of 34147

« [previous](#) | [next](#) »

[Urban Dictionary: Define Your World](#) [save this](#)

to dictionary reference slang language culture ... [saved by 5515 people](#)

[Urban Fonts. Download Free Fonts and Free Dingbats for PC and MAC](#) [save this](#)

to fonts free design typography font ... [saved by 1205 people](#)

[Urban Dictionary](#) [save this](#)

to dictionary reference slang search culture ... [saved by 915 people](#)

[Urban Dead - A Massively Multi-Player Web-Based Zombie Apocalypse](#) [save this](#)

to games mmorpg zombies game web ... [saved by 769 people](#)

[Welcome to blik. Wall graphics for the urban dweller.](#) [save this](#)

to design home art decor shopping ... [saved by 680 people](#)

[Urban Legends Reference Pages](#) [save this](#)

to reference urbanlegends legends humor fun ... [saved by 536 people](#)

[Urban Legends Reference Pages](#) [save this](#)

to reference urbanlegends rumors legends fun ... [saved by 421 people](#)

[Karmalooop.com - Urban Clothing / Global Streetwear Culture](#) [save this](#)

to shopping clothing fashion clothes urban ... [saved by 409 people](#)

[Download Free Fonts - Urban Fonts](#) [save this](#)

to fonts free design font webdesign ... [saved by 419 people](#)

Ontologies of visual artifacts

Significant part of urban knowledge conveyed through graphics

Maps, plans, conceptual schemes, aerial/site photographs (observatories). Urban representations designed for both information and action. Computer representations often miss the semantics of drawings. Images are **non-sequential and ambiguous** by nature.

Ontologies of "non textual" artifacts

Classification based on annotations of graphics (example Flickr): user based tagging of photographs. Ontologies of urban representations addressing mereological and heritage relations. Spatial relations for instance. Chain of documents from design ideas to legally binding-plans.

Conclusions and Future Developments

Ontologies are key to knowledge management

Various experiments in different domains. Important efforts in the construction sector (interoperability, costs and risk management). Urban ontologies hardly formalised. Largely based on taxonomies.

Common issues to different ontologies.

Stakeholder's views. Issues of scale and versatility. Design, engineering and validation of ontologies.

Urban domain raise specific questions

Various domains characterized by a variety of approaches (security, urban tourism, urban civil engineering, etc.). Validation of knowledge. Public participation. Urban decision-making and policies. Role of visual artifacts. **More during the conference...**

Next Steps in the COST C21 Action

First workshop in Geneva (November 2006) - focused on Ontologies and Actions/Domains.
Next workshop in Torino (end of 2007) - focused on Activities (Ontologies in Action).
Development of an urban ontology server + case studies.