INSPIRE Conference 2016

Barcelona, 26th - 30th September

Deriving INSPIRE Compliant Land-use Maps from Open Public Sector Information

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Overview

- Approaches to land-use mapping
- Open Public Sector Information
- The register based method
- Examples
- Pros and Cons
- Conclusion

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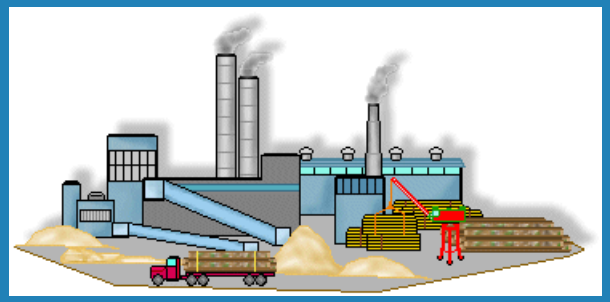
Land-use versus land cover

- Land Cover describes the surface of the earth by its (bio-)physical characteristics
- Land Use defines the use and functions of a territory in terms of its socio-economic and ecological purpose



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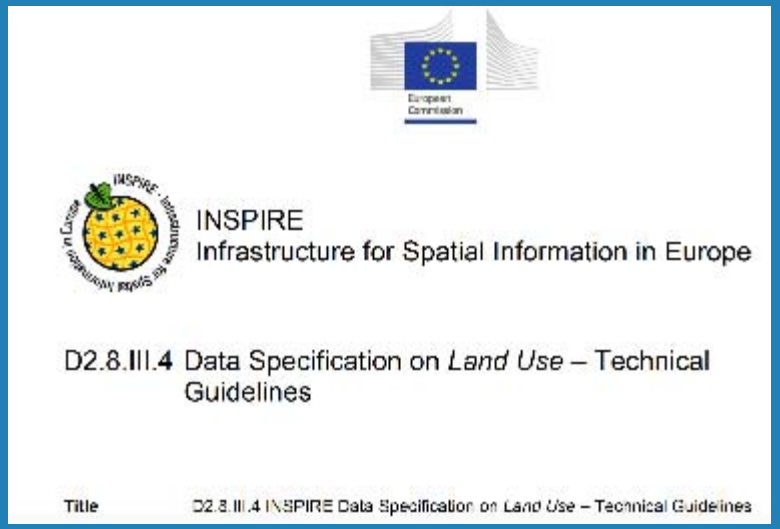
INSPIRE Data Specifications for Land-use

- Land-use belongs to INSPIRE Annex 3
- Land-use data can be represented in vector as well as raster format
- The Existing *Land Use* application schema enables the provision of information on land uses inside one land use object



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Existing versus planned land-use

- The Existing Land Use which objectively depicts the use and functions of a territory as it has been and effectively still is in real life
- The Planned Land Use which corresponds to spatial plans, defined by spatial planning authorities, depicting the possible utilization of the land in the future.

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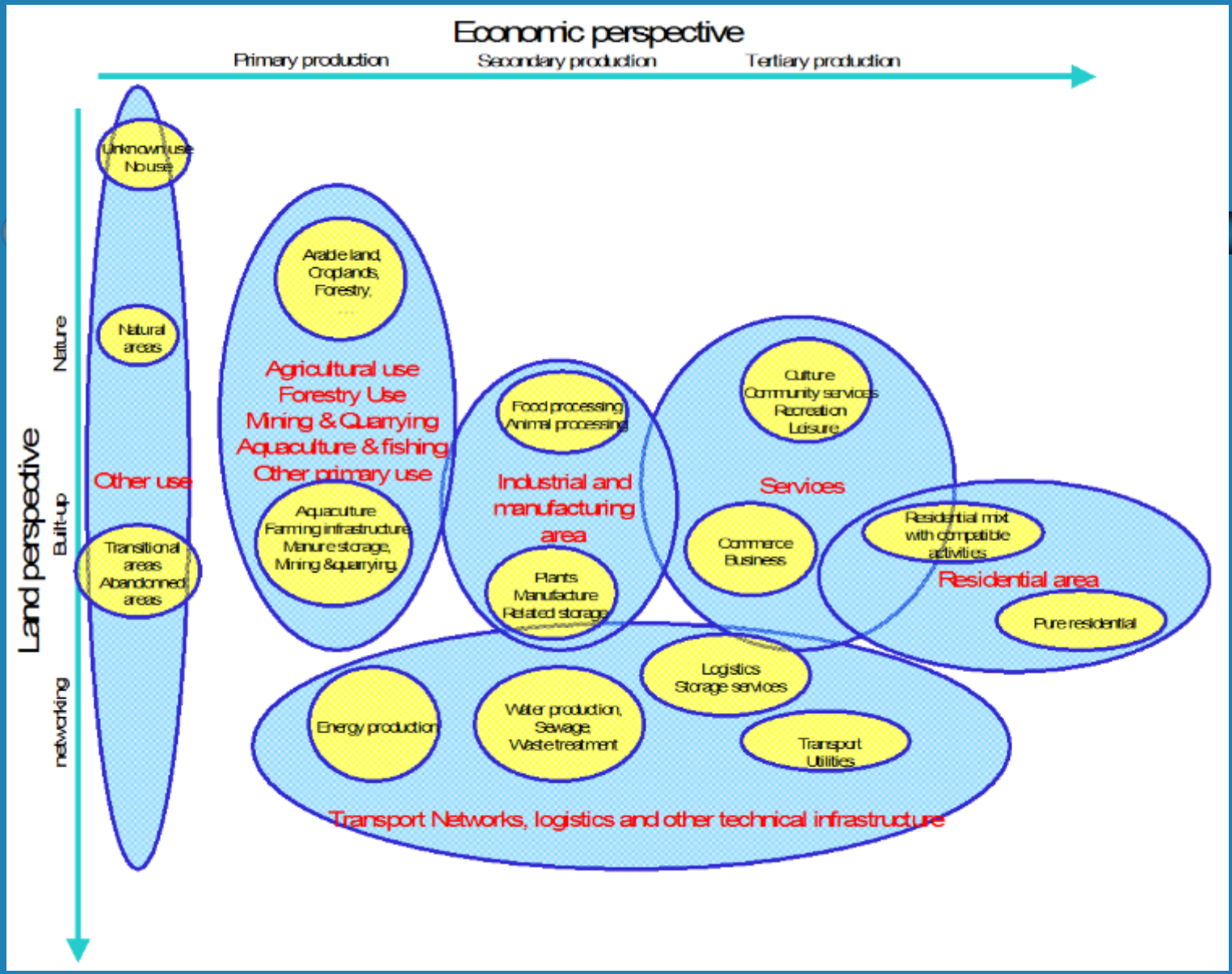

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HILUCS

- The technical guidelines describe a so-called Hierarchical INSPIRE Land-Use Classification System (HILUCS)
- This is a new, multi-level, classification system
- It is general enough for the member states to map their specific classification system to the appropriate level in HILUCS

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Existing methods for land-use data acquisition

Remote sensing

- Traditionally used method for land *cover* mapping
- Very appropriate if land-use can be seen from above – like forestry and agriculture
- Not possible to distinguish different land-uses within urban areas – e.g. between a shop and a public administration building

EuroStat LUCAS

- Land-use often requires in situ observations making creation and update time-consuming and costly
- Thus the LUCAS system by Eurostat has a three-year update frequency and requires a lot of man power about 27000 points distributed among the 28 EU Member States
- The EU area is 4,325,000 km^2 !!!

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Aim of the current project

- The aim of the current project has been to develop a method to create INSPIRE compliant land-use data from existing open public sector information
- The emphasis has been on current and previous land-use applying the gridded land-use option
- The examples shown are agricultural land-use, urban land-use, and land-use for energy production

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New approach

- Public authorities are collecting huge amount of information in their daily administration
- Several surveys have shown that about 90% of this information has a spatial reference and therefore providing information about locations
- This information comprises buildings, infrastructure, agriculture, forests, businesses, plans, nature protection areas, etc.
- ..... and this can also tell us about the use of land 😀

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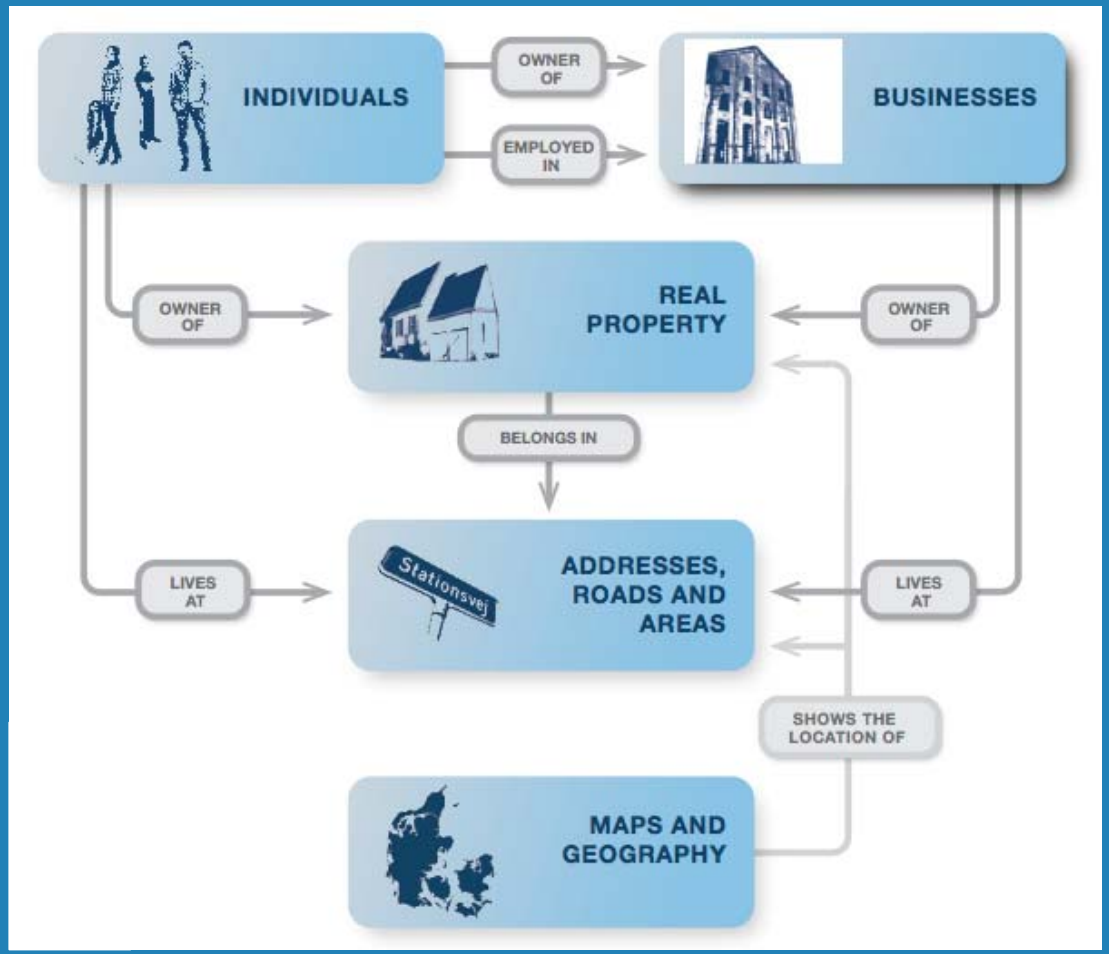
The Basic Data Concept



Land-use categories and data sources

HILUCS	Name	Datasource
1-1	Agriculture	Field maps
1-2	Forestry	CORINE LC
2-1 – 2-3	Industry	BBR & Business Register
2-4	Energy	Field maps, emission point sources, wind turbine register
3-1 – 3-2	Commercial services	BBR & Business Register
3-4	Community services	BBR
3-5	Cultural services	BBR
4	Transport	Topographic maps
5	Residential areas	BBR
6	Nature and other areas	CORINE LC

Land-use for agricultural production

Main data sources:

- National field map
  - Contains more than hundred different use of land
  - Represented by polygons
- Central Register for Domestic Animals
  - Contains information about each livestock regarding type, size, and location
- Managed by the Danish AgriFish Agency

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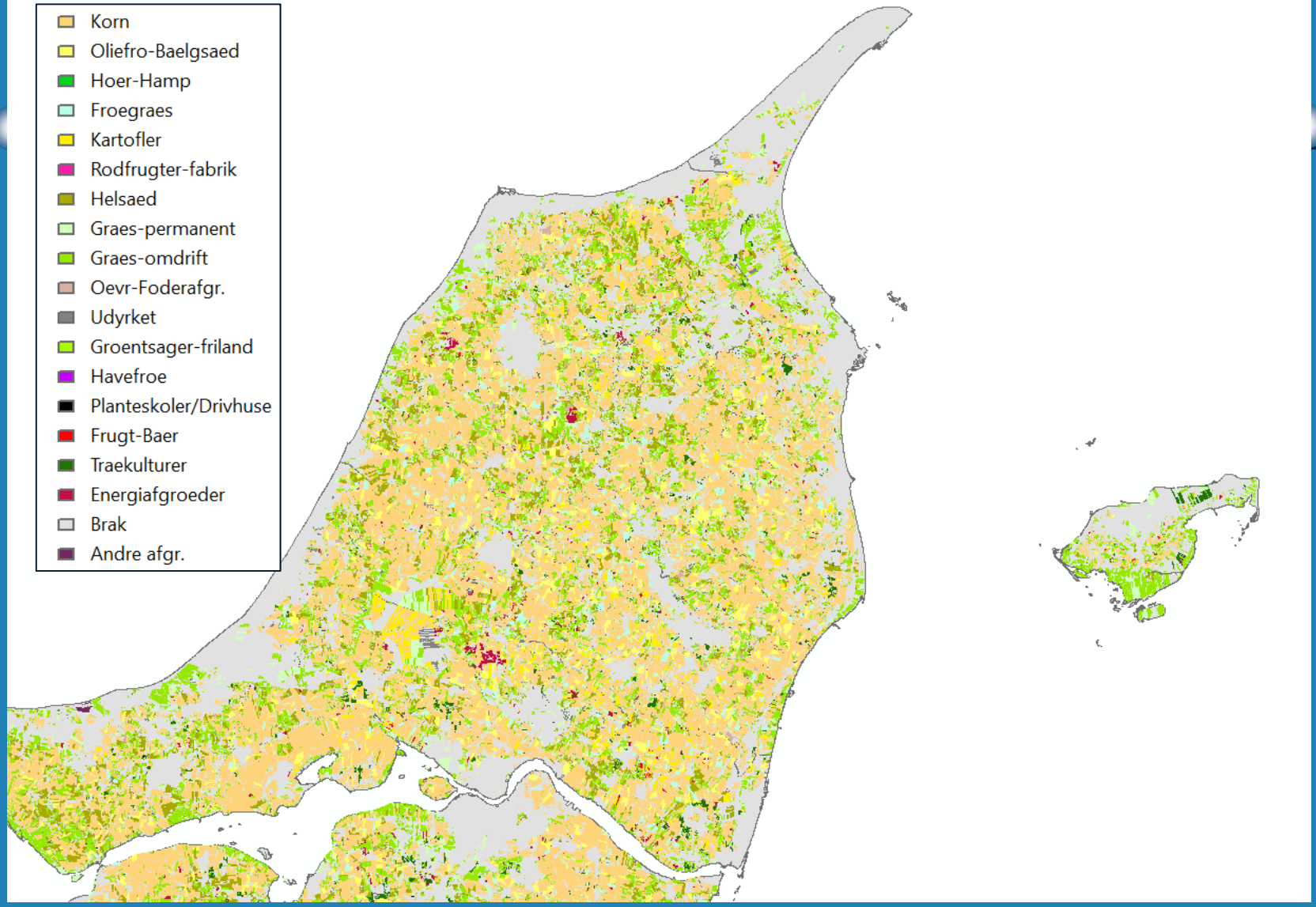

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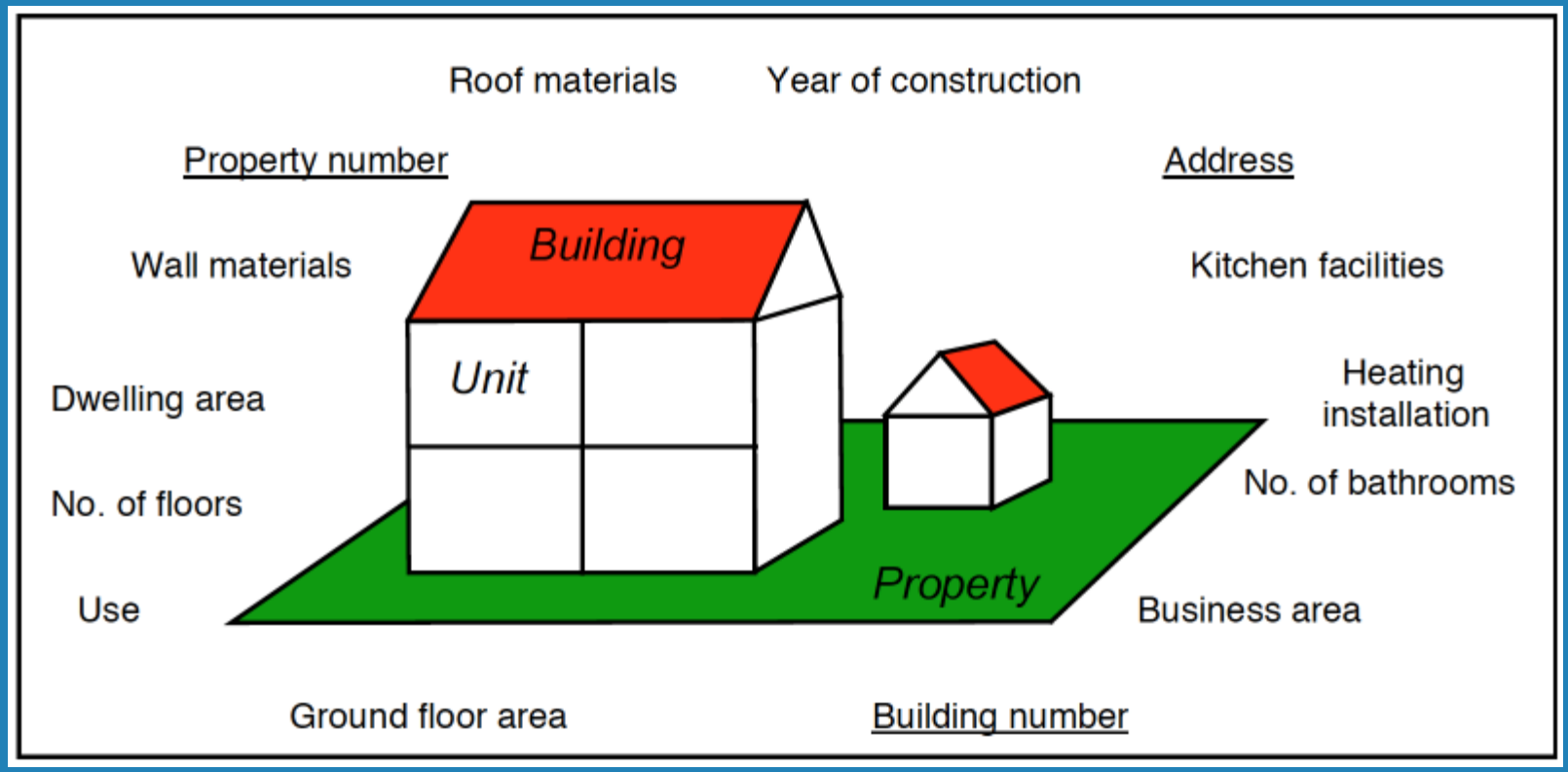
Urban land-use

- Urban areas have a wide range of economic activities and accordingly land-uses
- Often of small geographical extent
- Mixed land-use classes within the same building is common
- Requires on-site surveys
- ..... or detailed maps or registers

BBR



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Urban land-uses

• Industry	220
• Commercial services	320
• Community services	160, 420, 430, 440, 490
• Cultural services	410, 530
• Other services	390, 490
• Detached / semi-detached houses	120, 130, 160
• Blocks of flats	140, 150
• Residential mixed with others	???
• Summer cottages	510
• Allotments	540

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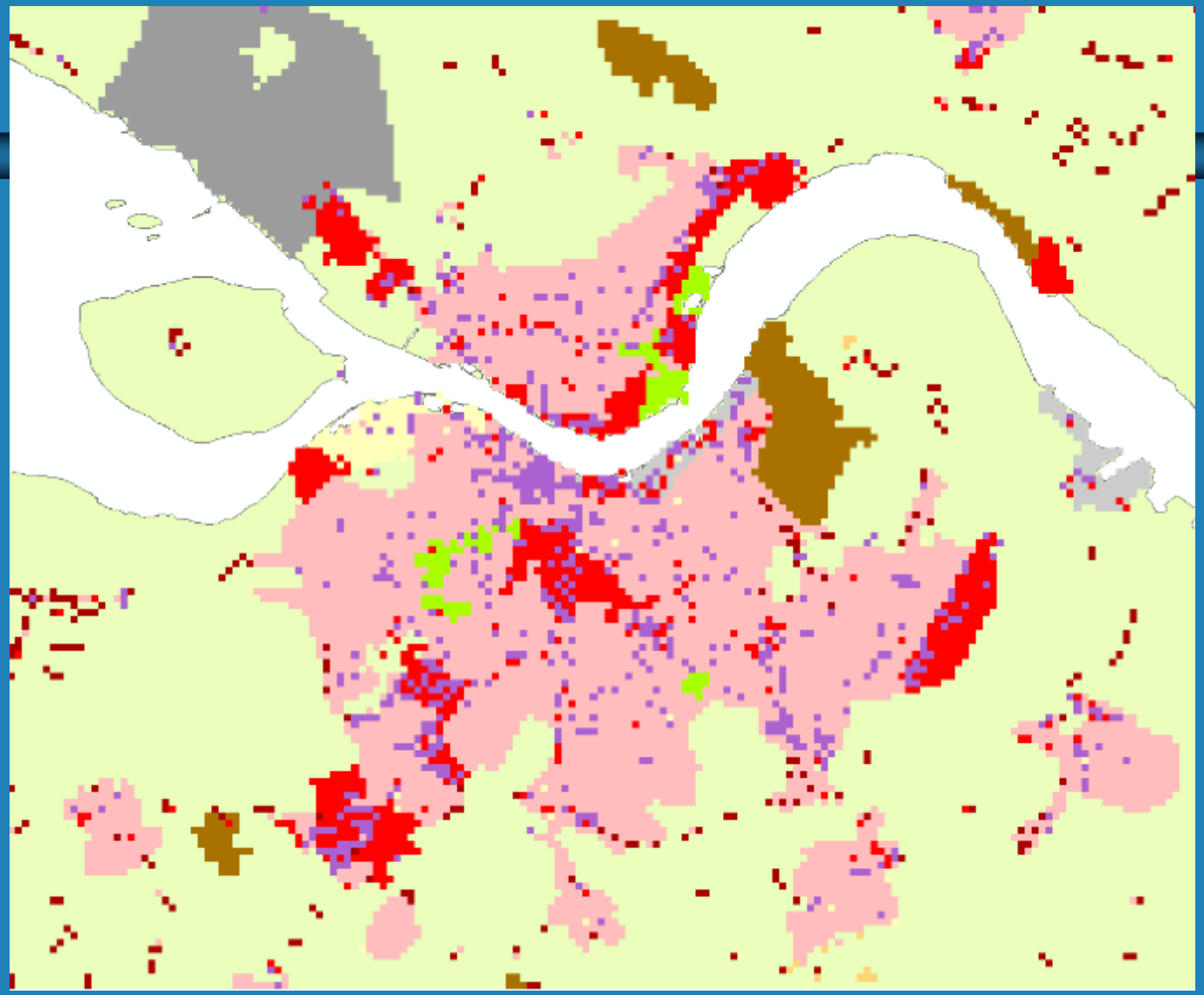

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Land-use for energy production

- Energy is produced from different sources where the most important ones are fossil based power plants, wind energy, and bio-energy, which is split up into the the production of bio-energy crops and the bio-energy power plants
- The Danish National Energy Agency maintains detailed registers over all wind turbines, fossil based wind turbines, and bio-energy power plants
- The Danish AgriFish field block maps contains information about energy crops

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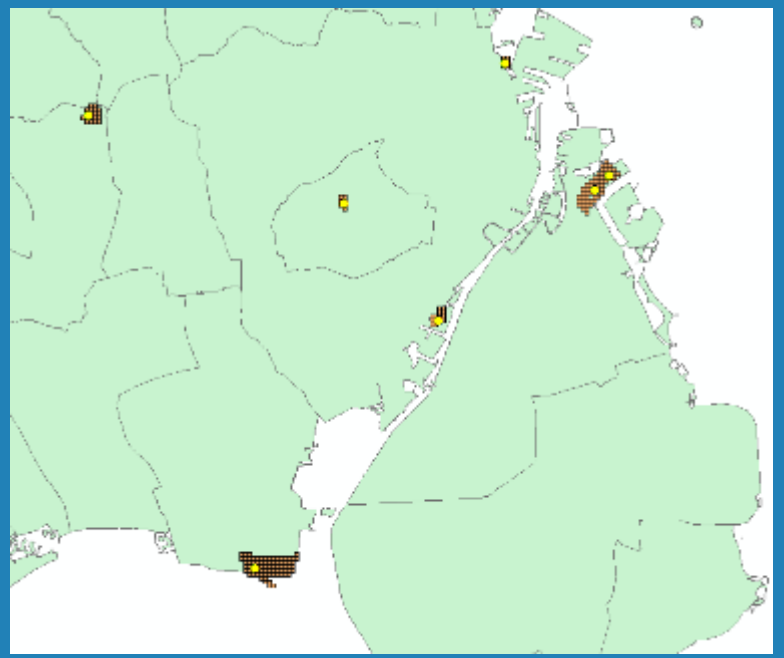
Fossil based energy production

CollectER database

OID	YEAR	LPS_ID	NUTS3_ID	LPS_NAME	LPS_LG	LP	LPS_LT	LP	Shape *
0	2013	001	DK001	Amagerværket	728825 E		6177100 N		Point
1	2013	002	DK001	Svanemølleværket	725350 E		6180014 N		Point
2	2013	003	DK001	H.C. Ørstedsværket	723736 E		6173536 N		Point
3	2013	004	DK003	Kyndbyværket	680370 E		6159606 N		Point
4	2013	005	DK008	Masnedøværket	664102 E		6098108 N		Point
5	2013	007	DK005	Stigsnæsværket	643307 E		6120217 N		Point
6	2013	008	DK005	Asnæsværket	637021 E		6170419 N		Point
7	2013	009	DK005	Statoil Raffinaderi	631973 E		6166927 N		Point
8	2013	010	DK002	Avedøreværket	719115 E		6157294 N		Point
9	2013	011	DK008	Fynsværket	589268 E		6143526 N		Point
10	2013	012	DK00D	Studstrupværket	583332 E		6234738 N		Point
11	2013	014	DK00H	Nordjyllandsværket	553014 E		6326209 N		Point
12	2013	015	DK00F	Aarhusværket	596681 E		6223186 N		Point
13	2013	017	DK00D	Shell Raffinaderi	547102 E		6190917 N		Point
14	2013	018	DK005	Kasselø-kraftværket	638847 E		6151868 N		Point
15	2013	019	DK009	Enstedværket	528264 E		6097186 N		Point
16	2013	020	DK00A	Lisbjergværket	485652 E		6146510 N		Point
17	2013	022	DK007	Destilværk	893288 E		6120018 N		Point
18	2013	024	DK00A	Nybro Gasbehandlingsanlæg	490422 E		6199862 N		Point
19	2013	025	DK00B	Herningværket	553719 E		6189957 N		Point
20	2013	026	DK00C	Hemingværket	606452 E		6219521 N		Point
21	2013	027	DK002	RS Vestforbrænding	714904 E		6178706 N		Point
22	2013	028	DK001	Amagerforbrænding	727666 E		6176819 N		Point
23	2013	029	DK00D	Energi Randers Produktion	584537 E		6257613 N		Point
24	2013	030	DK00D	Grenaa Kraftvarmeværk	617466 E		6254807 N		Point
25	2013	031	DK003	Hillerød Kraftvarmeværk	706981 E		6206721 N		Point
26	2013	032	DK003	Helsingør Kraftvarmeværk	721701 E		6214047 N		Point
27	2013	034	DK008	Dalum Varmecentral, Fjernvarme Fyn	587466 E		6136044 N		Point
28	2013	035	DK00D	Kolding Forbrændingsanlæg I/S	520256 E		6151011 N		Point



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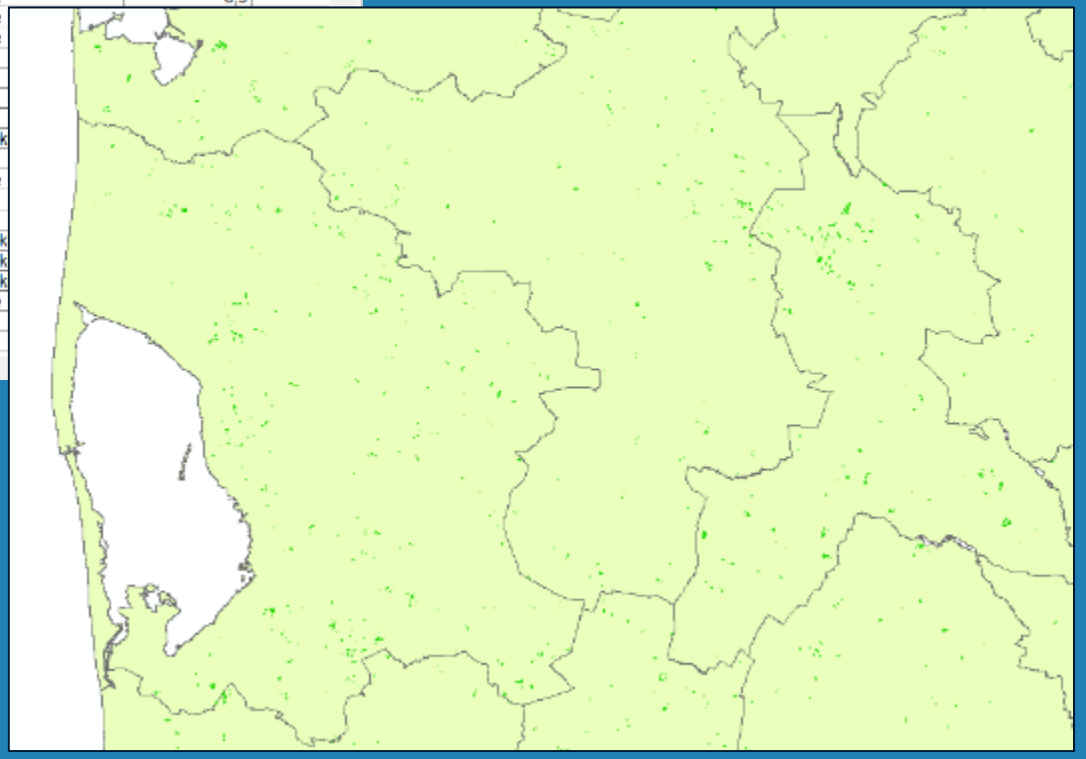
Land for bio-fuel production

Marker2014

FID	Shape	MARK_ID	MARKNUMME	AGKOD_NUM	AGKOD_TEKS	ANMELDT_AR	EB_ANM
0	Polygon	17354939	5-0	216	Silomajs	0,38	
1	Polygon	17354938	8-0	276	Permanent græs og kl	1,02	
2	Polygon	17361519	22-0	11	Vinterhvede	7,47	
3	Polygon	17361518	19-0	11	Vinterhvede	4,77	
4	Polygon	17361517	14-3	271	Rekreative formål	0,26	
5	Polygon	17361516	14-2	263	Græs uden kløvergræs	0,93	
6	Polygon	17361515	14-1	263	Græs uden kløvergræs	2,54	
7	Polygon	17361514	12-0	11	Vinterhvede	6,9	
8	Polygon	17361513	11-0	11	Vinterhvede		
9	Polygon	17361512	4-0	11	Vinterhvede		
10	Polygon	17361511	3-0	15	Hybridrug		
11	Polygon	17361510	2-0	15	Hybridrug		
12	Polygon	17361509	1-0	124	Spinatfrø		
13	Polygon	17361507	2-1	124	Spinatfrø		
14	Polygon	17361506	23-3	263	Græs uden k		
15	Polygon	17361505	2-2	1	Vårbyg		
16	Polygon	17361508	20-0	11	Vinterhvede		
17	Polygon	17361504	23-2b	1	Vårbyg		
18	Polygon	17361503	23-2a	1	Vårbyg		
19	Polygon	17361502	26-0	263	Græs uden k		
20	Polygon	17361500	26-3	263	Græs uden k		
21	Polygon	17361499	26-2	263	Græs uden k		
22	Polygon	17361498	25-0	11	Vinterhvede		
23	Polygon	17361501	27-0	10	Vinterbyg		
24	Polygon	17361497	24-0	124	Spinatfrø		

Field map database



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Pro and Con

Pro

- Very detailed information
- Easy to update
- Cheap solution
- Can be combined with other solution like remote sensing for nature and forest areas

Con

- Requires reliable registers with input from citizens
- Not easy to convert point observation to an area
- Not available in all countries

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Conclusions and outlooks

- The method described is an innovative solution to provide detailed land-use mapping
  - At low cost
  - with frequent update
- Possible to derive land-use maps 20 years back

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THANK YOU FOR YOUR ATTENTION !

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