

# Planet Data - North Pole

Case studies related to Norwegian Open Data

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# Outline

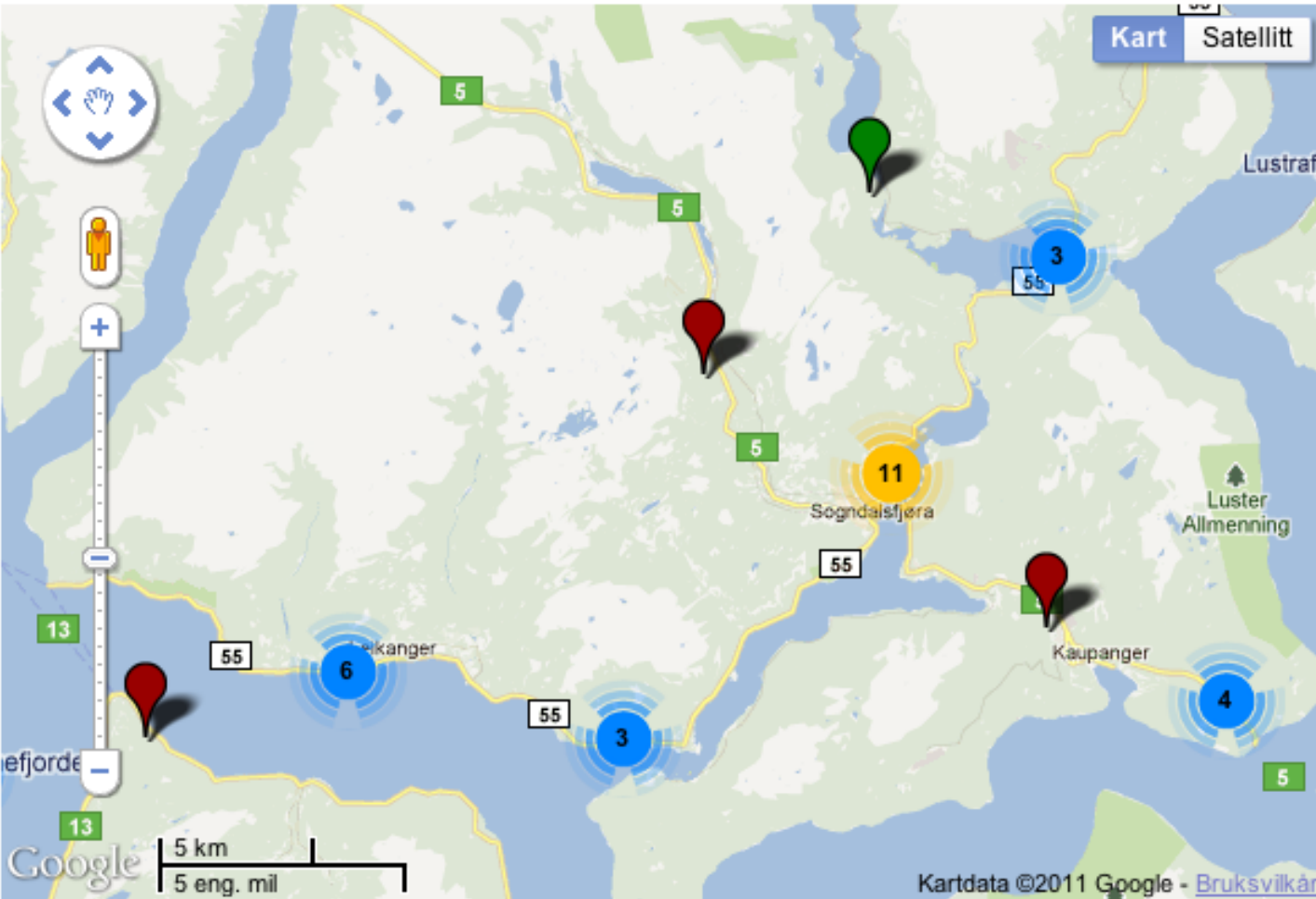
- Case studies related to Norwegian Open Data
  - Regional development
  - Environmental-friendly behavior
- Norwegian LOD sets and relationships
- PlanetData-NorthPole
- Web-based visualization of linked data
  - Overview of Javascript libraries
  - LODWheel prototype
- Open issues and outlook

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- **Case studies related to Norwegian Open Data**
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# Bergens Tidende "The death roads"

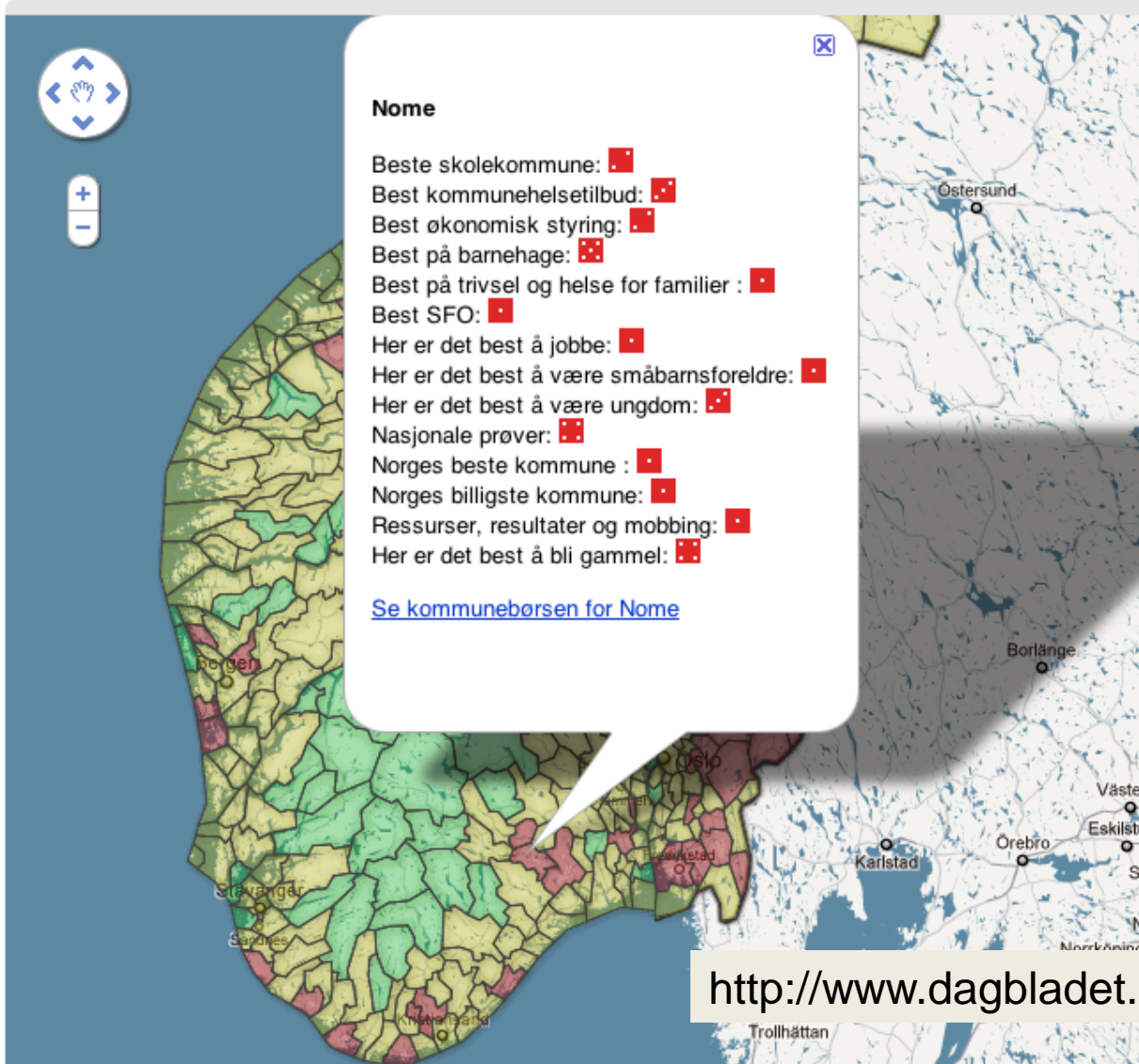


**Sogndal**  
Antall ulykker: 21  
Antall døde: 9  
Antall meget alvorlig skadde: 0  
Antall alvorlig skadde: 18

NULLSTILL

ÅRSTALL:	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
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ALVORLIGHET:	Dødsulykke	Meget alvorlig skadet	Alvorlig skadet								
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**Nome**

- Beste skolekommune: ■
- Best kommunehelsetilbud: ■
- Best økonomisk styring: ■
- Best på barnehage: ■
- Best på trivsel og helse for familier : ■
- Best SFO: ■
- Her er det best å jobbe: ■
- Her er det best å være småbarnsforeldre: ■
- Her er det best å være ungdom: ■
- Nasjonale prøver: ■
- Norges beste kommune : ■
- Norges billigste kommune: ■
- Ressurser, resultater og mobbing: ■
- Her er det best å bli gammel: ■

[Se kommunebørsen for Nome](#)

<http://www.dagbladet.no/kommuneborsen/>

*Klikk på kartet for å sjekke din kommune.*

**Kategoriene:** [Alle](#) [NORGES BESTE KOMMUNE](#) [Best økonomisk styring](#)  
[Beste skolekommune](#) [Nasjonale prøver](#) [Ressurser, resultater og mobbing](#)  
[Best kommunehelsetilbud](#) [Best å jobbe](#) [Best på barnehage](#) [Best SFO](#)  
[Best å være småbarnsforeldre](#) [Best å være ungdom](#) [Norges billigste kommune](#)

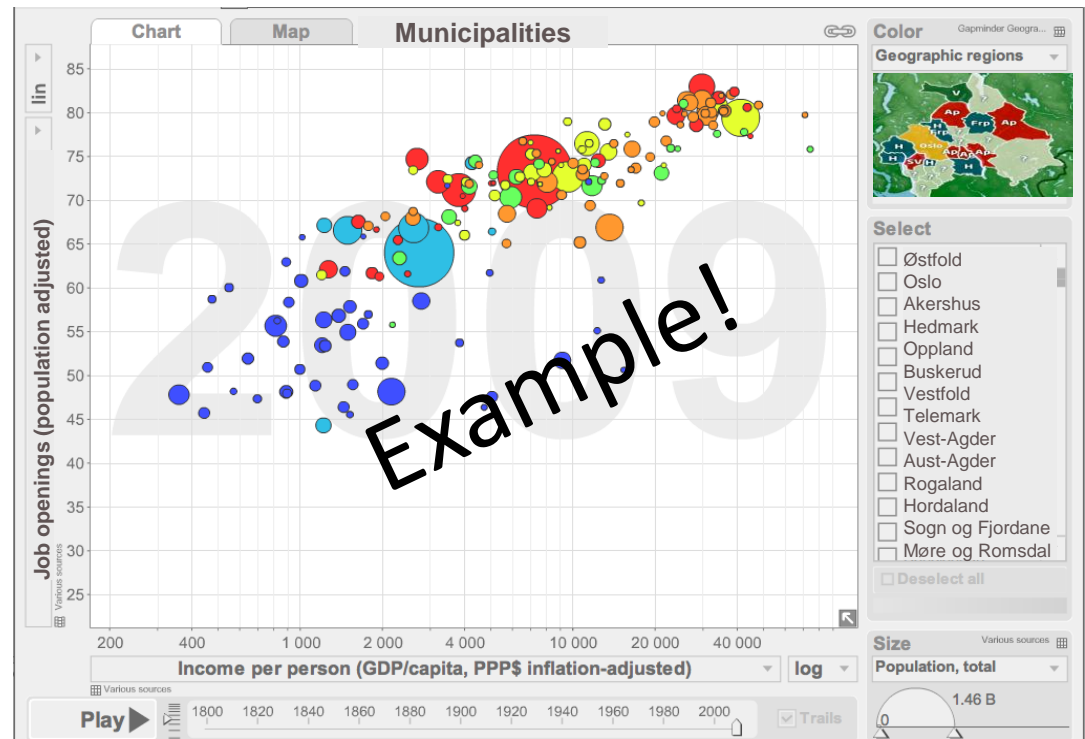
# Example use cases and app overview

Question: Are there relatively more jobs in larger municipalities, and do they earn more there?

Showing: Job openings vs. income in municipalities over time while showing population-size

Requires datasets:

- Income level for each municipality
- Job openings for each municipality
- Population size



Inspired by Gapminder

# Data sources

<http://www.brreg.no/registrene/enhet/>



The screenshot shows the website for Brønnøysundregistrene. The main heading is "The Central Coordinating Register for Legal Entities". A sidebar on the left lists various services like "Organization", "The Brønnøysund registers", "Coordination activities", etc. The main content area explains the register's role in coordinating information from various public registers.

**Brønnøysundregistrene** Home Contact us Norsk

Registration Information About us

Organization **The Central Coordinating Register for Legal Entities**

The Brønnøysund registers

Coordination activities

International cooperation

Projects

Acts, regulations

Photos, maps

Addresses, phone numbers

The primary task of the Central Coordinating Register for Legal Entities is to coordinate information on business and industry that resides in various public registers, and which is also frequently requested on questionnaires from the public authorities. Instead of having each public authority send their own separate form for a company to answer, the Central Coordinating Register for Legal Entities ensures that all the information is collected in one place. The Central Coordinating Register for Legal Entities contains basic data about entities that are under reporting obligations to the Register of Employers, the Value Added Tax Register, the Register of Business Enterprises, the Business Register of Statistics Norway, the Corporate Taxation Data Register or the County Governors' Register of Foundations. The Central Coordinating Register for Legal Entities and The Register of Bankruptcies are affiliated registers. All estates in bankruptcy are given an organization number.

- [More about the Central Coordinating Register for Legal Entities](#)

<http://www.ssb.no/>



The screenshot shows the Statistics Norway website. It features a search bar, navigation links for "Statistics by subject" and "Publications", and a list of categories including "00 General", "03 Health, social, welfare and crime", and "04 Education".

**Statistics Norway** Statistisk sentralbyrå Search Search

Statistics by subject Publications

» Main page **Statisti**

**00 General**

- National and international overviews
  - National
  - Regional
  - International
- Elections
  - General elections
  - Local elections
  - Referendums, attitudes
- Living conditions
  - Gender equality
  - Time use
  - Social indicators

**03 Health, social, welfare and crime**

- Health, general
- Health conditions
  - Diseases, functional disabilities, causes of death
  - Pregnancy terminations, sterilizations
- Health services
- Child welfare and family counselling
- Social security and social assistance
- Crime and the justice

**04 Education**

- Level of education
- Educational institutions

<http://www.kommunenokkelen.no/adresse/kommuneregisteret.do>



The screenshot shows the website for Kommunenøkkelens. It features a login form with fields for "LoginID" and "Passord", and buttons for "LOGG INN" and "GLEMT PASSORD". Below the login form, there is a welcome message and a description of the register's purpose.

**Kommunenøkkelens** Kommuneforlaget

KF Kommuneregister Styrevervregisteret

FORSIDEN KOMMUNENØKKELEN

**LOGG INN**

LoginID

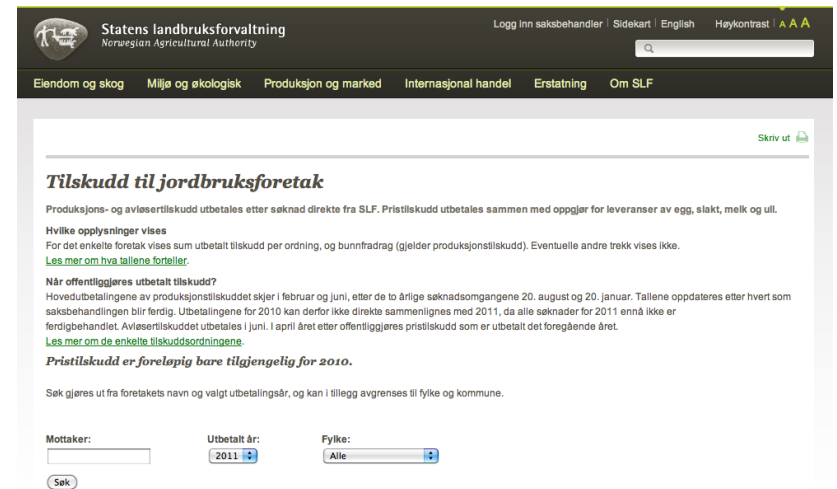
Passord

LOGG INN GLEMT PASSORD

**VELKOMMEN TIL KOMMUNEREGISTERET OG STYREVERVREGISTERET**

Kommuneregisteret skal være det sentrale registeret for kommunesektoren. Registeret inneholder grunndata om kommunene og fylkeskommunene, navn på administrative og politiske ledere, adresser, e-postadresser og telefonnummer.

<https://www.slf.dep.no/no/tilskuddsbase>



The screenshot shows the website for Statens landbruksforvaltning. It features a search bar, navigation links for "Elendom og skog", "Miljø og økologisk", etc., and a main heading "Tilskudd til jordbruksforetak". The page contains detailed information about agricultural subsidies and a search form.

**Statens landbruksforvaltning** Norwegian Agricultural Authority Logg Inn saksbehandler Sidekart English Høykontrast A A A

Elendom og skog Miljø og økologisk Produksjon og marked Internasjonal handel Erstatning Om SLF

Skriv ut

**Tilskudd til jordbruksforetak**

Produksjons- og avlæsertilskudd utbetales etter søknad direkte fra SLF. Pristilskudd utbetales sammen med oppgjør for leveranser av egg, slakt, melk og ull.

Hvilke opplysninger vises

For det enkelte foretak vises sum utbetalt tilskudd per ordning, og bunnfradrag (gjelder produksjonstilskudd). Eventuelle andre trek vises ikke.

[Les mer om hva tallene forteller.](#)

Når offentliggjøres utbetalt tilskudd?

Hovedutbetalingene av produksjonstilskuddet skjer i februar og juni, etter de to årlige søknadsomgangene 20. august og 20. januar. Tallene oppdateres etter hvert som saksbehandling blir ferdig. Utbetalingene for 2010 kan derfor ikke direkte sammenlignes med 2011, da alle søknader for 2011 ennå ikke er ferdigbehandlet. Avlæsertilskuddet utbetales i juni. I april året etter offentliggjøres pristilskudd som er utbetalt det foregående året.

[Les mer om de enkelte tilskuddsordningene.](#)

**Pristilskudd er foreløpig bare tilgjengelig for 2010.**

Søk gjøres ut fra foretakets navn og valgt utbetalingsår, og kan i tillegg avgrenses til fylke og kommune.

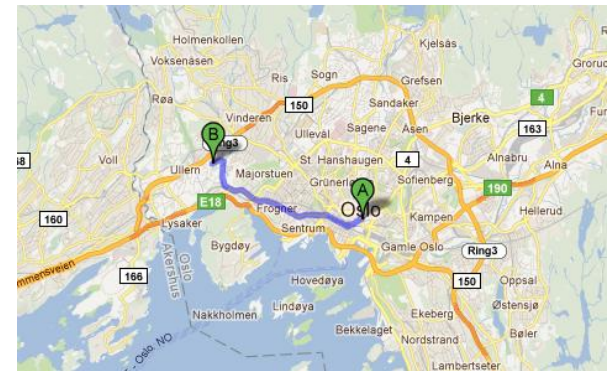
Mottaker:  Utbetalt år: 2011 Fylke: Alle

Søk

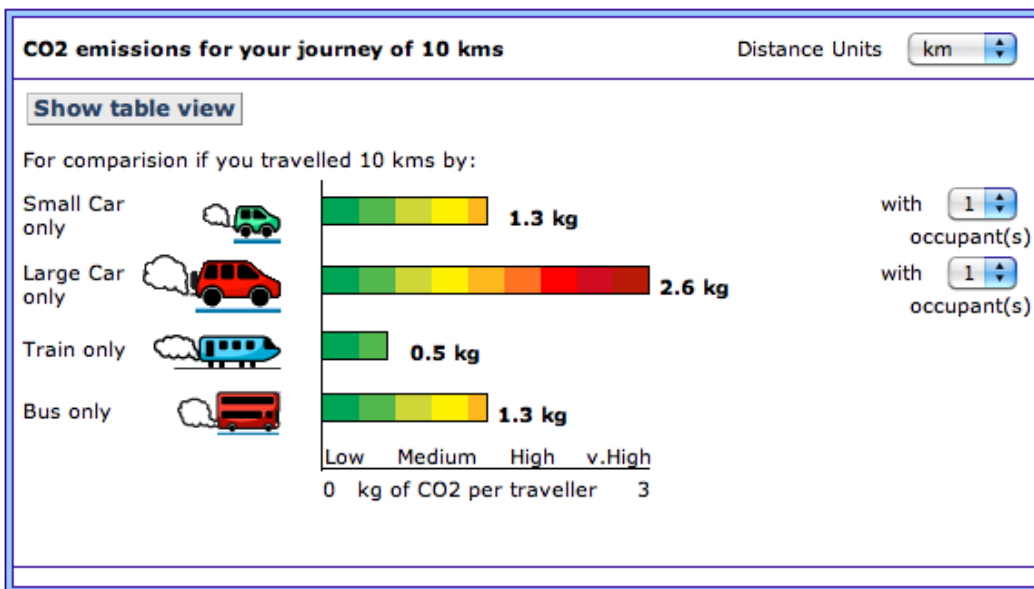
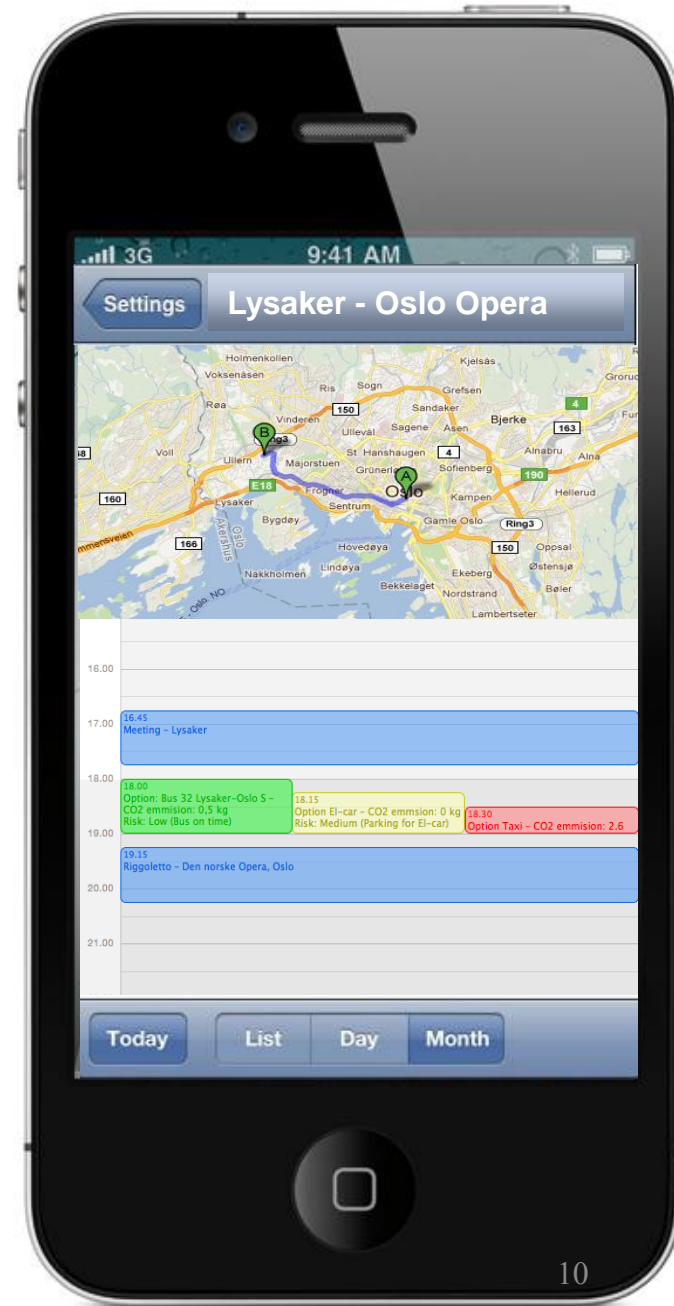


# Environmental-friendly behavior (CS2)

- Get from location A to location B in a town/region (focus on Oslo or Bergen)
- Typically different options
  - Public transportation (bus/tram/metro/train)
  - Privat car, sharing car, electric car, taxi
  - Cycling, walking
- Sometimes constraints on trip
  - Time
  - Aviod bad weather, polluted zones
- Problem: *Faced with different options for a trip, which are the most envionmental-friendly options given the constraints?*
  - Environmental parameters: CO2 emissions, energy efficiency
- **Added value proposition:** enable smarter/faster environmental-freindly decision making for local trips when options are available



# App overview



# Data sources

<http://trafikanten.no/>

The screenshot shows the trafikanten.no website interface. At the top, there are navigation tabs: Home, Travel planner, Mobile, Tickets, and Services. Below this is a search bar with fields for 'From?', 'To?', 'Date', and 'Time'. A 'Search' button is visible. On the left, there's a 'Traffic status' section with dropdown menus for Metro, Train, Tram, Bus in Oslo, and Boat. In the center, there's a 'Real time info' section with a search box and a 'Will it make it?' button. On the right, there's a 'News' section with an image of a person holding a ticket.

<http://www.ladestasjoner.no/>

The screenshot shows the ladestasjoner.no website. The header includes the site name and the tagline '- den komplette guide til elbilparkering i Norge!'. Below the header, there's a search bar and a map of Norway with numerous blue pins indicating taxi pickup locations. The map is titled 'Søk etter byer eller steder for å vise tilgjengelige ladestasjoner.'.

Taxi

- [Taxi](#)
- [CityTaxi](#)
- [Fiord taxi \(boat taxi\)](#)
- [Fonnafløy: Seaplane taxi](#)
- [HeliWing: Helicopter transportation and helicopter taxi](#)
- [Nor Aviation: Helicopter Taxi](#)
- [Norgestaxi](#)
- [Oslo Taxi](#)
- [Taxi2](#)

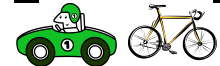
<http://www.oslobysyssel.no/>

The screenshot shows the oslobysyssel.no website. It features a map of Oslo with blue pins indicating bicycle rental locations. A text overlay says 'Se antall sykler/ledige plasser i stativene på mobiltelefonen! KART til 2440'. There's also a small inset map showing the city layout.

<http://www.bilkollektivet.no>

The screenshot shows the bilkollektivet.no website. It features a map of Oslo with green pins indicating car-sharing locations. The header includes the site name and the tagline 'OSLO • STAVANGER • KRISTIANSAND • TROMSØ'. There's also a section titled 'Våre oppstillingsplasser'.

User profile



Private vehicles



Calendar

<http://www.yr.no/>

The screenshot shows the yr.no website. It features a search bar with the text 'Search in forecasts for Norway and the world:'. Below the search bar, there's a navigation menu with 'Front page', 'Norway', 'Oslo', and 'Oslo'.

Weather forecast for Oslo

Today, Thursday 08/09/2011

Time	Forecast	Temp.	Precipitation	Wind
13:00-18:00		15°	0 mm	Light air, 1 m/s from southwest
18:00-00:00		16°	0 mm	Calm, 0 m/s

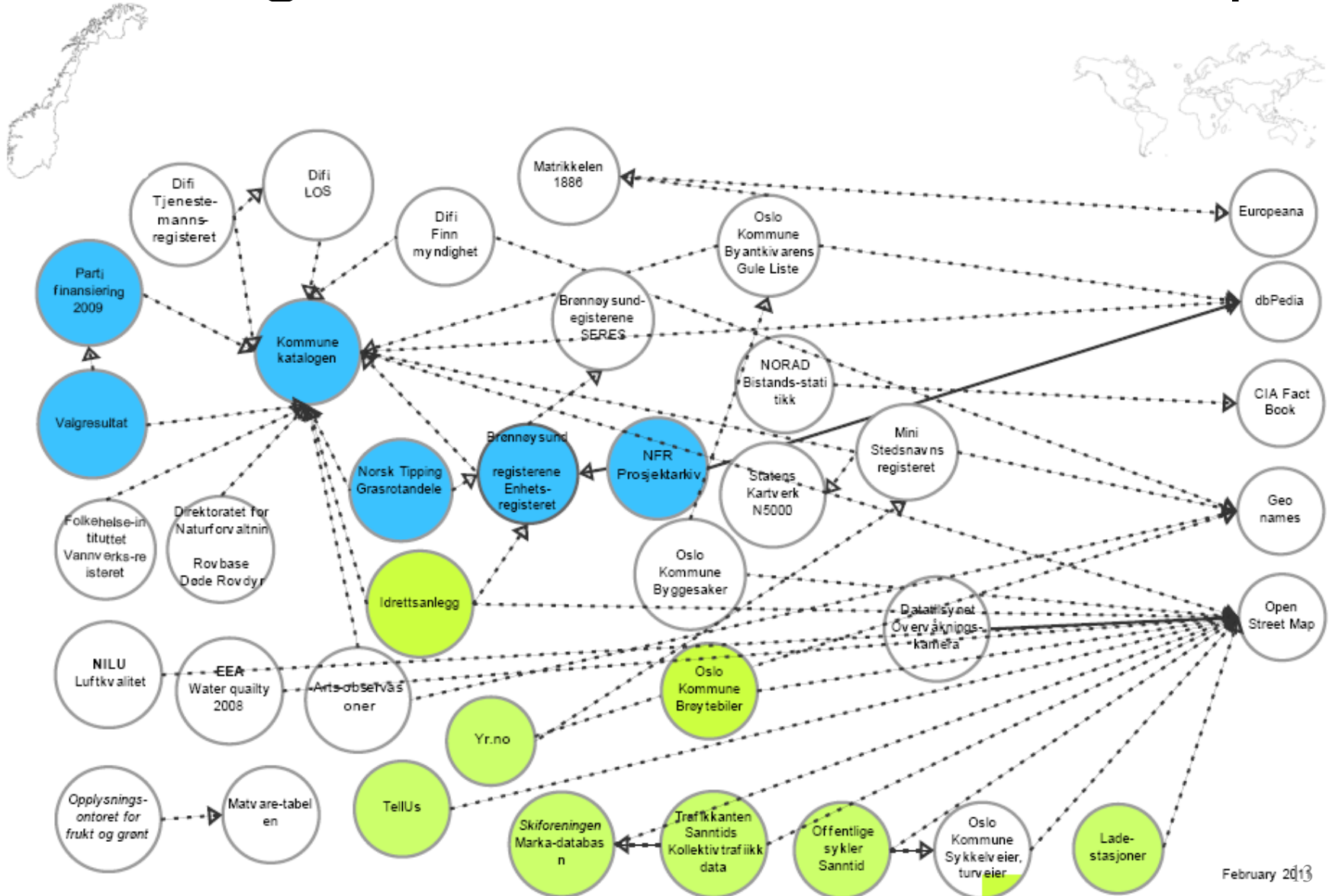
<http://www.luftkvalitet.info/>

The screenshot shows the luftkvalitet.info website. It features a map of Oslo with green circles indicating air quality data points. The header includes the site name and the tagline 'Luftkvalitet.info'. There's also a navigation menu with 'FORSIDEN', 'BEDRE BYLUFT', 'LENKER', 'LEKSIKON', and 'OM NETTSTEDET'.

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# Norwegian data sets and relationships



# Relevant Norwegian data sets for the proposed case studies

Name	Owner	Format	Hosting	Estimated # of triples	Quality (stars)	Case study applicability
Enhetregisteret	Brønnøysundregisterene	Restful RDF Web service	Brønnøysundregisterene	> 4.500.000	5	Case study #1
Kommunekatalogen	KS	XML	Univ of Oslo / Semicolon II	Ca 2.000	3	Case study #1
NFR prosjektarkiv	Norwegian Research Council	RDF	Computas/ Sesam4	Ca 200.000	5	Case study #1
Valgresultat 2005	Government	RDF	Computas/ Semicolon II	Ca 100.000	4	Case study #1
Partifinansiering 2009	Government	RDF	Computas/ Semicolon II	Ca 100.000	4	Case study #1
Grasrotandelen	Norsk Tipping	RDF	Computas/ Semicolon II	Ca 70.000	4	Case study #1
Trafikkanten sanntid	Oslo Kommune	XML, JSON	Oslo Kommune or Computas	Ca 50.000	3	Case study #2
Yr.no	Met. Inst.	XML	Univ of Oslo / Semicolon II	Ca 700.000.000	3	Case study #2
Markadatabasen sanntid	Skiforeningen	XML	Oslo Kommune or Computas	Ca 100.000	3	Case study #2
Offentlige sykler sanntid	ClearChannel	XML	Oslo Kommune or Computas	Ca 10.000	3	Case study #2
Sykkelveier, turveier	Oslo Kommune	XML	Oslo Kommune or Computas	Ca 10.000	3	Case study #2
Ladestasjoner (Sanntid)	Ladestasjoner.no	RDF	Computas/ Semicolon II	Ca 1.100	3	Case study #2
Brøytebiler Sanntid	Oslo Kommune	XML	Oslo Kommune or Computas	Ca 10.000	3	Case study #2
Tellus	Tellus	RDF	Computas/Sesam4	Ca 600.000	3	Case study #2
Idrettsanlegg	Ministry of Culture	RDF	Computas/Sesam4	Ca 1.000.000	3	Case study #2

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# The context:

## PlanetData Large-scale Data Management

- FP7 Network of Excellence (2010-2014)
- Aim: establish an interdisciplinary, sustainable European community on large-scale data management
  - Publishing and managing new species of interlinked data sets
  - Improving the usefulness of existing data sources
  - Data sets, vocabularies, best practices for publishing self-descriptive data
  - Portal with data provisioning and management tools
  - Training infrastructure, learning resources, summer schools, standards
- PlanetData Programs:
  - Call 1: “Consuming Linked Data” (deadline was February 2011)



<http://planet-data.eu/>



# PlanetData-NorthPole

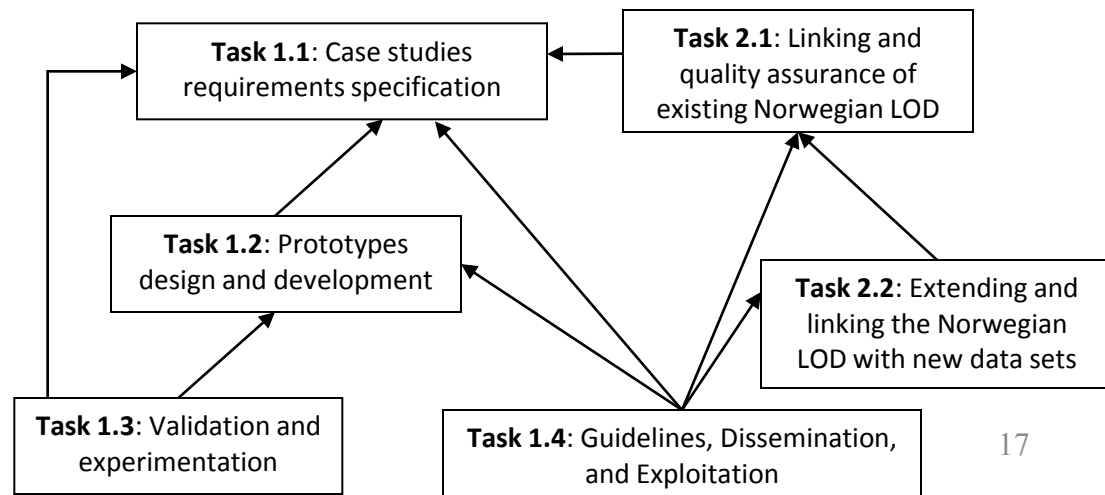
Consuming and Improving Norwegian Linked Open Data for Regional Development and Environmental Friendly Behavior



**The objectives of PlanetData-NorthPole are:**

1. To **specify and implement two case studies** for demonstrating the use and benefits of LOD in *regional development* and *environmental friendly behaviour*, with a particular localization on Norway;
2. To **improve the existing Norwegian LOD and extend it** with new data sets to support the proposed case studies;
3. To **provide guidelines** for other countries in the use of LOD for regional development and environmental friendly behaviour applications.

- Participants:
  - Computas AS
  - SINTEF
- Duration: 6 months
  - Oct 2011 – March 2012
- Budget: approx 120K Euro



# Outline

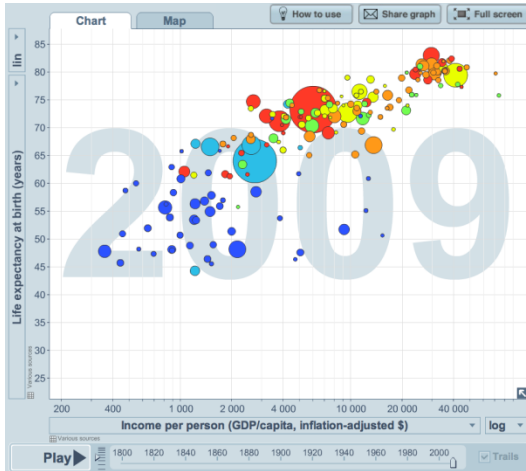
- Case studies related to Norwegian Open Data
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# Web-based visualization of RDF data

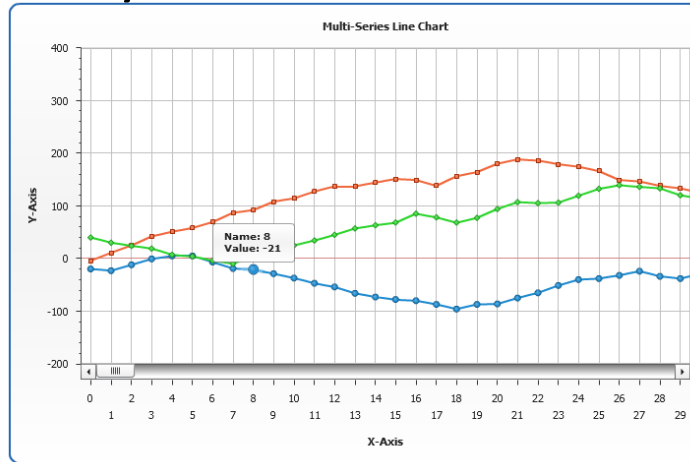
- Aim: graph- and chart-based Web visualization techniques for RDF to support PlanetData-NorthPole case studies
- Contributions:
  - Evaluation of state-of-the-art libraries/tools for Javascript-based visualization
  - Development of *LODWheel* - a prototype for visualizing RDF data in graphs and charts

# Relevant Javascript libraries/tools

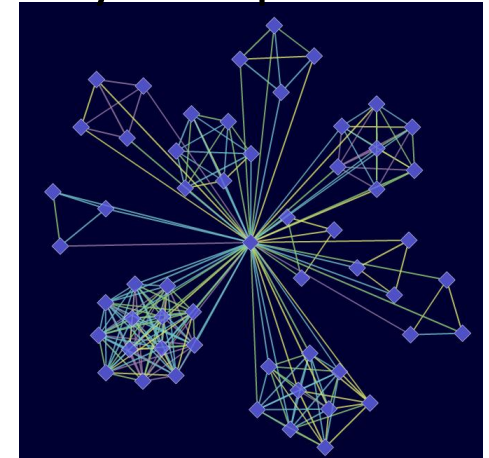
## GapMinder



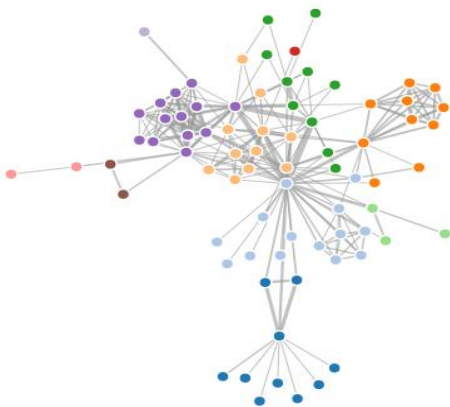
## AnyChart



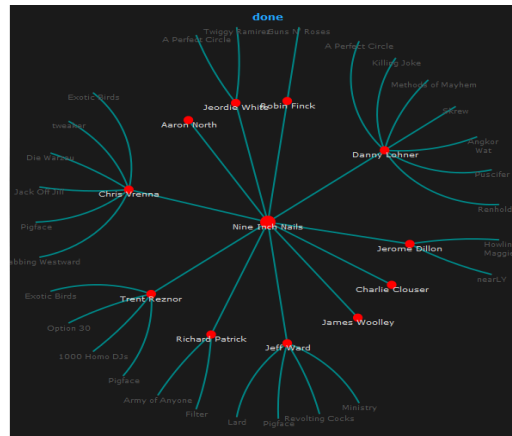
## Cytoscape Web



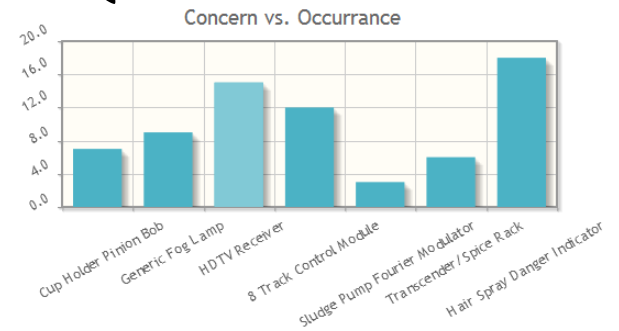
## d3



## JIT

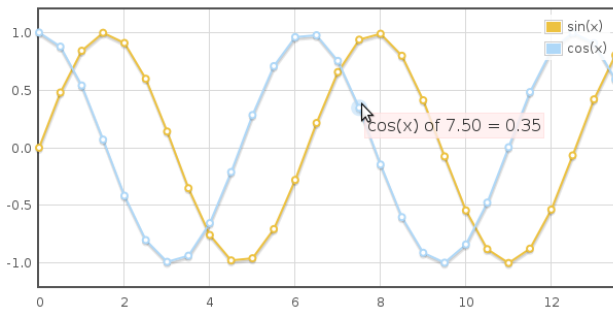


## JQPlot

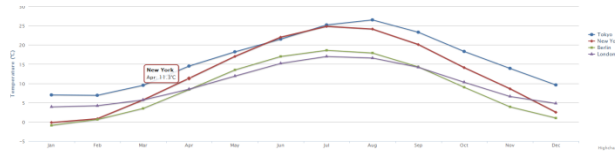


# Relevant Javascript libraries/tools (cont')

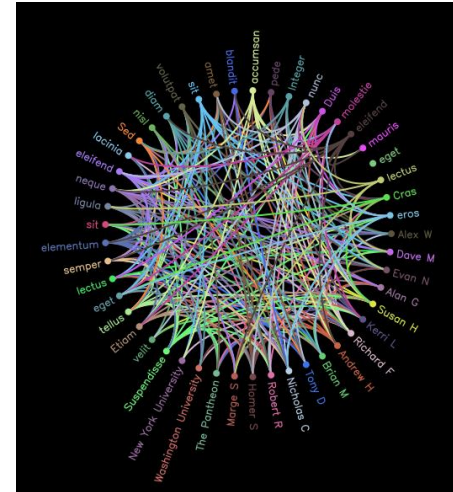
## Flot



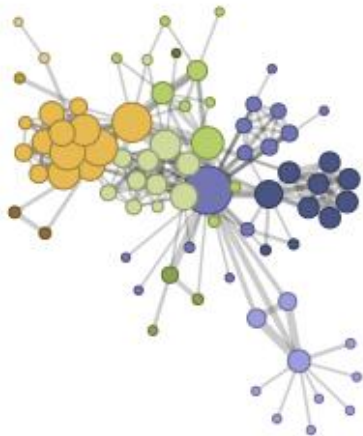
## Highcharts JS



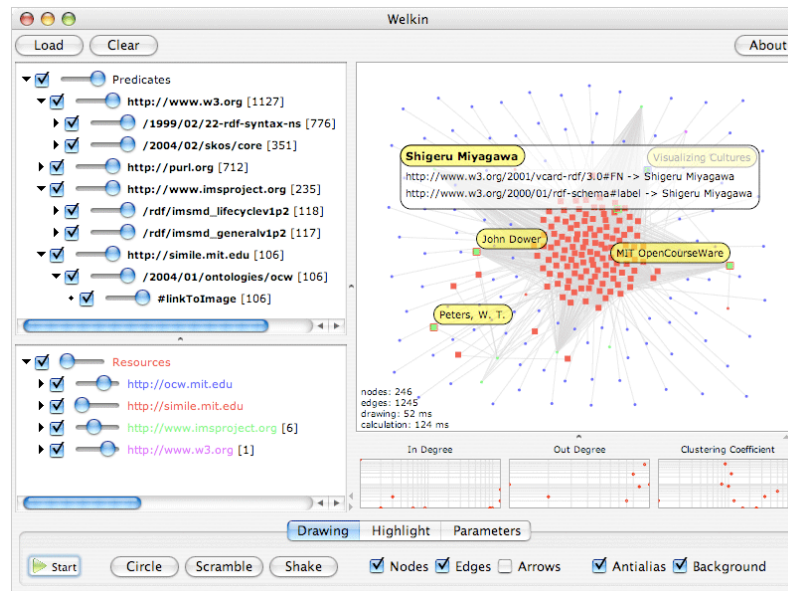
## MooWheel



## Protovis



## Welkin



# Evaluation criteria

Usability	Data	Quality
Click on elements	JSON compatible	Layout
Hover on elements	JSON from file	Space efficiency
Drag nodes *	JSON simplicity	Performance
Different colors	Update via AJAX	
Text on nodes *		
Text on edges *		
Pointers between data *		
Legend		

\* = *exclusive for the graph-visualization libraries.*

# Evaluation summary

Library	Strengths (+)	Weaknesses (-)	Overall score
Ajax Mgraph	<ul style="list-style-type: none"> <li>- Space efficient</li> <li>- Great hovering</li> </ul>	<ul style="list-style-type: none"> <li>- Cannot click on elements</li> </ul>	31
amCharts	<ul style="list-style-type: none"> <li>- Simple JSON format</li> <li>- Great performance</li> </ul>	<ul style="list-style-type: none"> <li>- Cannot read JSON from external file</li> </ul>	90
Arbor	<ul style="list-style-type: none"> <li>- Space efficient</li> <li>- Arrows/pointers</li> </ul>	<ul style="list-style-type: none"> <li>- Not JSON compatible</li> <li>- Not optimal layout</li> </ul>	72
d3	<ul style="list-style-type: none"> <li>- Space efficient</li> <li>- Nice layout</li> </ul>	<ul style="list-style-type: none"> <li>- Not optimal performance on larger data sets</li> <li>- Nodes are not clickable</li> </ul>	57
Dracula Graph Library	<ul style="list-style-type: none"> <li>- Different colors on nodes</li> <li>- Text on nodes</li> </ul>	<ul style="list-style-type: none"> <li>- Layout is not optimal for visualizing large data sets</li> <li>- Space inefficient</li> </ul>	43
Flot	<ul style="list-style-type: none"> <li>- Great performance</li> <li>- Very simple JSON format</li> </ul>	<ul style="list-style-type: none"> <li>- Not optimal functionality for clicking on nodes</li> </ul>	72
Google Chart Tools	<ul style="list-style-type: none"> <li>- Great performance</li> <li>- Space efficient</li> </ul>	<ul style="list-style-type: none"> <li>- JSON incompatible</li> </ul>	56
Highcharts JS	<ul style="list-style-type: none"> <li>- Great performance</li> <li>- Simple JSON format</li> </ul>	<ul style="list-style-type: none"> <li>- Cannot read JSON from external file</li> </ul>	77
JIT	<ul style="list-style-type: none"> <li>- Great performance</li> <li>- Simple JSON format</li> </ul>	<ul style="list-style-type: none"> <li>- Space inefficient</li> <li>- No arrows/pointing</li> </ul>	84

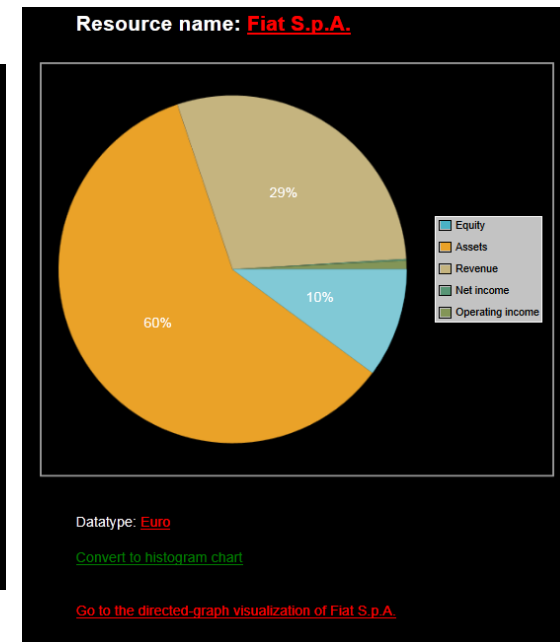
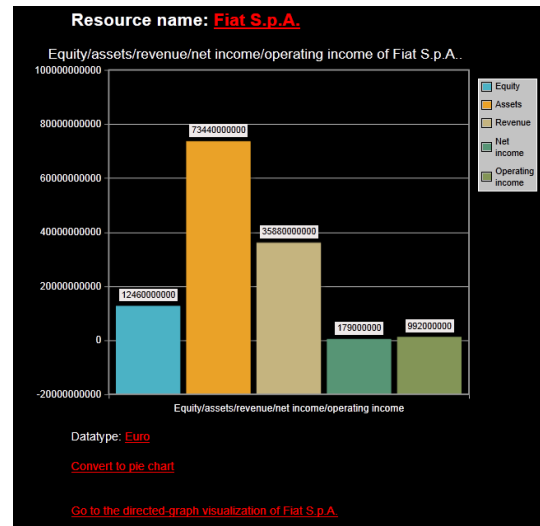
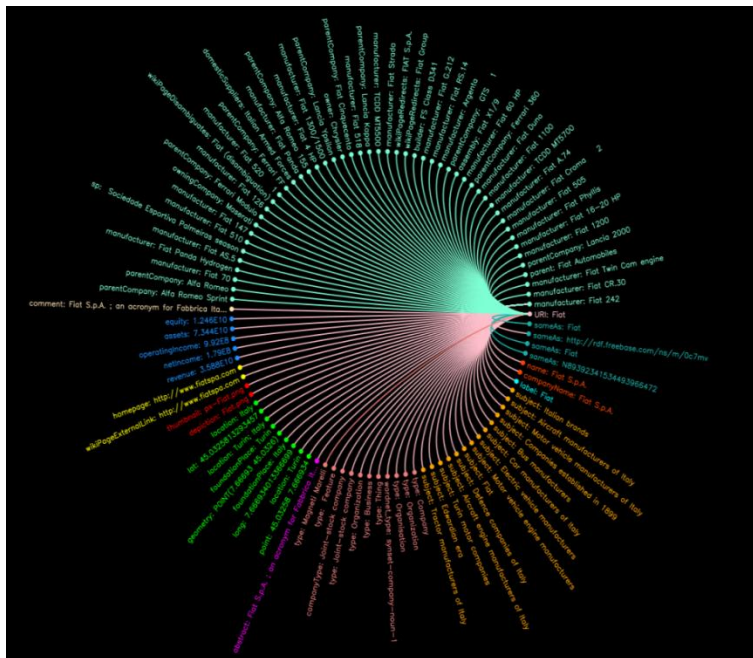
# Evaluation summary (cont')

Library	Strengths (+)	Weaknesses (-)	Overall score
<b>JQPlot</b>	<ul style="list-style-type: none"> <li>- Great performance</li> <li>- Simple JSON format</li> </ul>	No major weaknesses.	<b>86</b>
JS Charts	<ul style="list-style-type: none"> <li>- Space efficient</li> <li>- Simple JSON format</li> </ul>	<ul style="list-style-type: none"> <li>- Bad performance</li> <li>- Cannot click on elements</li> </ul>	53
JSViz	<ul style="list-style-type: none"> <li>- Different colors on nodes</li> </ul>	<ul style="list-style-type: none"> <li>- Performance and layout</li> <li>- JSON incompatible</li> </ul>	15
<b>MooWheel</b>	<ul style="list-style-type: none"> <li>- Great performance</li> <li>- Simple JSON format</li> <li>- Pointing between nodes</li> </ul>	No major weaknesses.	<b>106</b>
PlotKit	No major strengths.	<ul style="list-style-type: none"> <li>- Not optimal performance</li> <li>- JSON incompatible</li> <li>- Cannot click on elements</li> </ul>	11
Protovis	<ul style="list-style-type: none"> <li>- Different colors on nodes</li> <li>- Can drag elements</li> </ul>	<ul style="list-style-type: none"> <li>- No arrows/pointing</li> <li>- Not optimal functionality for clicking on nodes</li> </ul>	62



# LODWheel

- Visualize Linked Open Data in graphs and charts
- Prototype based on MooWheel and JQPlot



Demo at <http://opendata.computas.no:7001/lodwheel/moowheel/>

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## **LODWheel**

### **– JavaScript-based Visualization of RDF Data –**

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**Abstract.** Visualizing Resource Description Framework (RDF) data to support decision-making processes is an important and challenging aspect of consuming Linked Data. With the recent development of JavaScript libraries for data visualization, new opportunities for Web-based visualization of Linked Data arise. This paper presents an extensive evaluation of JavaScript-based libraries for visualizing RDF data. A set of criteria has been devised for the evaluation and 15 major JavaScript libraries have been analyzed against the criteria. The two JavaScript libraries with the highest score in the evaluation acted as the basis for developing LODWheel (Linked Open Data Wheel) – a prototype for visualizing Linked Open Data in graphs and charts – introduced in this paper. This way of visualizing RDF data lead to a great deal of challenges related to data-categorization and relating data resources to each other in new ways, which are discussed in this paper.


**Keywords:** RDF visualization, LODWheel, Linked Open Data, ontology-categorization.

# Outline

- Case studies related to Norwegian Open Data
  - Regional development
  - Environmental-friendly behavior
- Norwegian LOD sets and relationships
- PlanetData-NorthPole
- Web-based visualization of linked data
  - Overview of Javascript libraries
  - LODWheel prototype
- **Open issues and outlook**

# Some Open Issues

- Issues with the data sets
  - Methods for creating links
    - How to measure quality of the link
    - Speed up the process of link creation
  - Storing the links
  - Understanding the data;
    - e.g. accuracy of location data
    - common vocabularies
- Issues with Web-based visualization
  - The importance of “properly structured” RDF data
  - Understanding what “make sense” to visualize
    - e.g. pie chart issue
    - Ontology-categorization vs. Application-categorization
  - Up-to-date external references (i.e. owl:sameAs)
  - Data resources can have richer relationships

An aerial photograph of a wide fjord or bay, surrounded by dark, forested mountains. The sun is low in the sky, creating a bright, shimmering reflection on the water's surface. A small boat is visible in the middle of the water. The sky is filled with dramatic, grey clouds.

**THANK YOU!**  
**Q&A**