NORTH SEA REGION ELECTRIC MOBILITY NETWORK

e-mobility NSR

A review of electric vehicle charge point map websites in the NSR

Interim report

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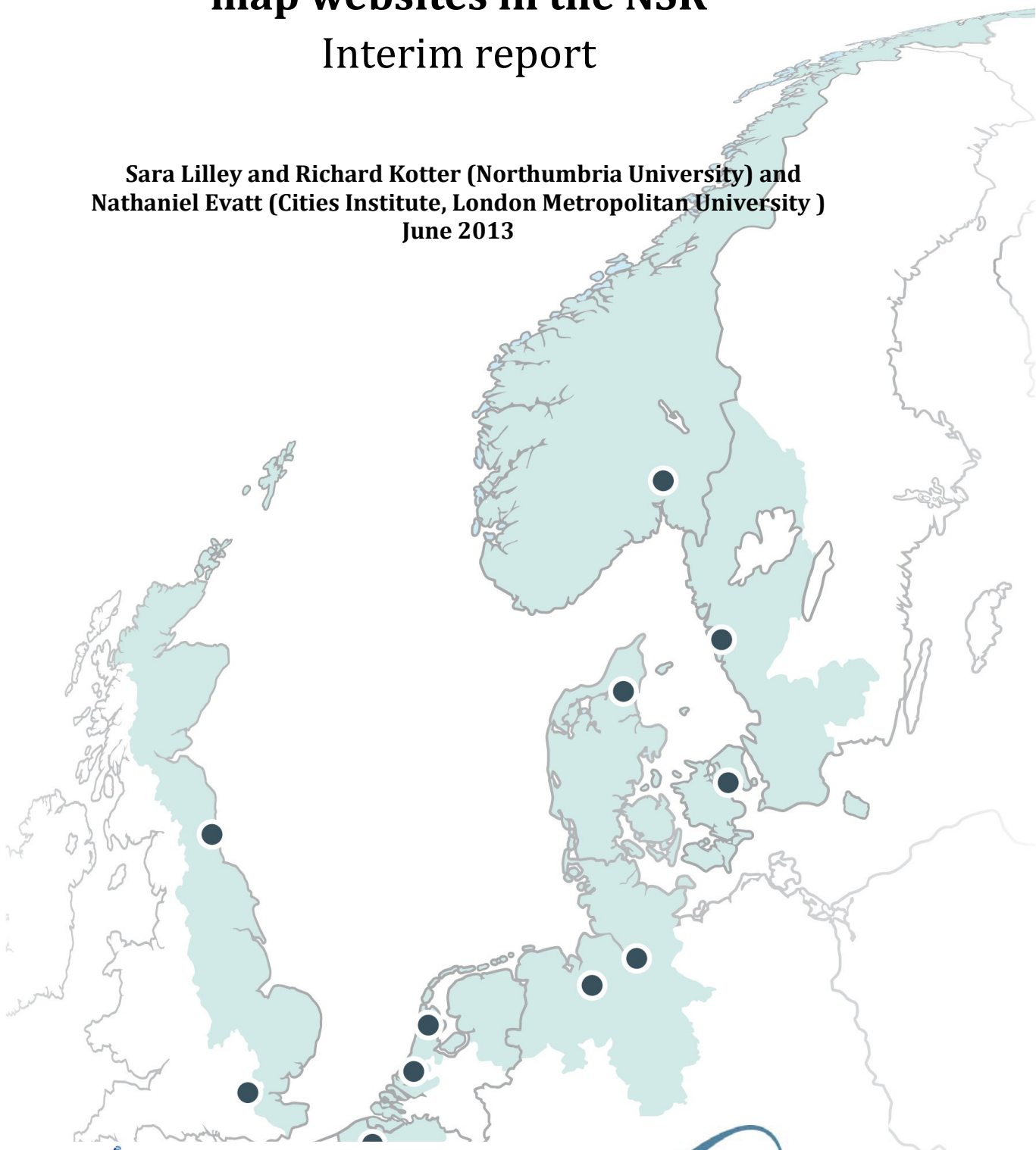
June 2013



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Introduction

The electric vehice charge point network is an infrastructure of charging points (stations) at accessible public locations. Examples of the public charging point (station) locations include on-street parking, businesses and organisation's car parks, hotel car parks, airports, shopping centers, supermarkets, restaurants, cafes, as well as at existing petrol stations.

Range anxiety and locating charging points can be a major concern for Electric Vehicle (EV) drivers and reported as the barriers for EV uptake is the limited driving range as well as limited availability of public charging infrastructure (Hubner et al, no date). Range anxiety can be reduced by ensuring EV drivers have freely available online access to EV charge point information including live availability of providers charge points and their locations.

EV telematics packages, containing a Point of Interest (POI) and navigation packages, could reduce range anxiety and range conservation and encourage the mass adoption of EV's (Frost and Sullivan, 2009). Currently, in vehicle navigation systems provide the location of charging points to electric vehicle drivers, as key destinations similar to POIs. The location of the charging points is collected and integrated into digital maps by the map provider of the in-vehicle navigation system. The charging point data includes information on location, private access, connector or power feed types, the number of connectors, and opening hours and payment methods (Norden 2012). The ELVIRE project aims to develop an effective communication and service platform to help drivers to overcome range anxiety by better managing their EV charging and enabling them to locate available and reachable charge spots and battery switch stations. The project aims to develop on-board driver assistance and communication system as well as external management services between the service provider and EV user. The information covers forecasts about the remaining driving range as well as status updates for all relevant infrastructures within this range (Green eMotion January 12th 2012).

One example of a charge spot map website is PlugSurfing (http://plugsurfing.co.uk), launched in September 2010 - this is the largest social EV charging network.

A forerunner in Europe was Chargemap.com (http://chargemap.com), which was launched 3 months prior to PlugSurfing and then focused only on France, Belgium and Switzerland, but has expanded since to include Norway, Sweden, Denmark, Estonia, Germany, The Netherlands, and the UK as well as Switzerland, Italy, Spain and Portugal, and outside Europe. The network has reached more than 6000 charging points listed, also to be found via an app or the website, with a new beta version of a search tool that displays all our listed charging points between your departure point and destination (http://chargemap.com/stats).

PlugSurfing is a community based project that aims firstly to connect electric vehicle owners and drivers with charging points and secondly to help to '*overcome the poor charging infrastructure in the UK and promote cleaner transport, carbon reduction, e-mobility and the strength of the community.*' This is the first to use the UK Governments National Charging Point Registry. PlugSurfing members are able to see location, access and payment information for 16,000 plugs across the whole of Europe, including the UK, Holland, Germany, Norway, Switzerland, Austria, Bulgaria and Denmark. The free PlugSurfing smartphone app and interactive website will locate

not only public and commercial charge points but also private charge points. The service aims to encourage private owners of charging points to register on PlugSurfing to share the charge point with registered community members via the website and smartphone app. For private charge points, the user is able to locate the nearest PlugSurfing community member, check the availability of the charge point and chat to the member to arrange to use this. Users are encouraged to rate the plug as well as leave feedback on their charging experience. PlugSurfing has 22 apps and website services in 16 languages across Europe, Asia and Australia. The Danish and Spanish services launched were part of wider expansion in 2012 (http://www.cars21.com/news/view/688)

Open Charge Map is another global public registry of electric vehicle charging locations, which allows Vehicle Manufacturers, Sat Nav vendors, App Developers, Website Owners to access and download the latest charging locations using their API. The data can be used in own apps, databases, websites for example, and the Open Charge map provides some widgets to include on other web pages to provide maps and to gather data submissions from the website users. This appeals to Operators and Data Providers such as EVSE Suppliers, Network operators, national registries, local charging info apps and sites to supply the latest charging location information, regardless of whether the organisation owns, operates or simply catalogs the available charging locations (http://openchargemap.org/site).

Purpose and structure of this report

This report is a review of the EV charge point (station) map websites in the North Sea Region (NSR). For each example of the charge point (station) map website, a review has been undertaken by visiting the charge point (station) map website and recording if the site contains the following information, which is of importance from an EV user perspective:

- Level of detail of the site (low, medium or high);
- An interactive map;
- Any information on the charger power of the charge points (stations);
- Type of connection of the charge points (stations);
- Addresses of the charge points (stations);
- Owner contact details;
- Live update information;
- Membership details.

This information has been presented in table format, including a further comments box for any other points of importance including possible mobile phone application versions of the website, a search filter option for the map and if the charge points (stations) are free or have a charge for example. In some cases the table appears empty, as the site has been an iframe of another website, the further comments box will include information on this. This review will seek to identify if there are any patterns, or any noticeable gaps on the information presented.

The table below shows the charge point (station) map websites by country/ NSR project partner that has been included in this review:

Country/NSR project partner	Charge point (station) map
1. Hamburg model region	http://www.elektromobilitaethamburg.de/energie-laden/
2. UK	http://www.chargeyourcar.org.uk/searchmap.php
	http://www.thegreencarwebsite.co.uk/blog/index.php/available-uk-charge-points-for-electric-vehicles/
	http://www.electriccarsite.co.uk/electric-car-charging-points http://www.zerocarbonworld.org/zero-net
	http://www.pod-point.com/home/live-availability/
	http://www.nextgreencar.com/electric-cars/charging-points.php/ http://openchargemap.org/
	http://www.newride.org.uk/recharge.php
3. Sweden Norway, Finland (Denmark, France, Australia, NZ)	http://www.uppladdning.nu/
4. Sweden Norway, Finland	http://www.ladestasjoner.no/
5. Norway	http://www.ladestasjoner.no/
	http://www.klimabiler.no/kart/
	http://nobil.no/
6. Denmark	http://www.ladestandere.dk/ https://www.clever.dk/find-ladestander/ http://danmark.betterplace.com/oplad-din-elbil-her/
7. The Netherlands	https://www.agentschapnl.nl/onderwerp/cijfers-elektrisch-rijden http://www.anwb.nl/auto/themas/elektrisch-rijden http://www.oplaadpunten.nl/Oplaadpunten.aspx http://www.oplaadpalen.nl/ http://e-laad.nl/zoek-een-oplaadpunt http://stekkerweb.nl http://www.amsterdam.nl/parkeren-verkeer/amsterdam-elektrisch/opladen/
8. Belgium	http://www.asbe.be/nl/laadpunten http://www.oplaadpunten.org/
9. Germany	http://www.bem-ev.de/ http://www.swb-gruppe.de/verantwortung/swb-und-umwelt/stromtankstellen-raum-bremerhaven.php http://www.swb-gruppe.de/verantwortung/swb-und-umwelt/stromtankstellen-raum-bremen.php
10. Global	http://openchargemap.org/ http://www.swb-gruppe.de/verantwortung/swb-und-umwelt/stromtankstellen-raum-bremerhaven.php http://www.swb-gruppe.de/verantwortung/swb-und-umwelt/stromtankstellen-raum-bremen.php www.plugsurfing.co.uk

Review of charge point (station) map websites

1. Hamburg model region

Charge point (station) map	Regional control center project electro mobility model region Hamburg http://www.elektromobilitaethamburg.de/energie-laden/ Sponsors and partners: DAIMLER, DB, BAHN, GE capital, Hamburg City Portal, Hamburg Chamber of Commerce, HSBA Hamburg School of Business Administration, hy solutions, Mercedes Benz Bank, Nissan, RCI Banque groupe RENAULT, Renault, Hamburg University of Technology (TUHH), VATTENFALL				
Region	Hamburg	**Level of detail**	High	**Map**	Yes
Power of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	Yes	**Live update**	No	**Membership information**	Yes
Comments: High detail though only for a small portion included. No filter search option available for the user, only a search box by location. Does not provide information on the charge station though when you zoom into the location.					

2. UK

Charge point (station) map	Charge Your Car http://chargeyourcar.org.uk/ Regional recharging network. **Sponsors**: Office of Low Emission Vehicles (OLEV), Department for Transport. **Partners:** One North East ONE), Low Carbon Futures, Gateshead College, Future Transport System				
Region	Newcastle, UK	**Level of detail**	Medium	**Map**	Yes
Power of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	No	**Live update**	No	**Membership information**	-
Comments: Mobile phone application is available. Map includes filter search option for users by power of charging point and if Pay As You Go (PAYG). Search box option to enter location name if known. When clicking on the charge station on the map, detailed information provided including address, number of charging bays, socket type, status (if in use) and directions to the location. Includes mobile phone app.					

Charge point (station) map	The Green Car Website.co.uk http://www.thegreencarwebsite.co.uk/blog/index.php/ Website guide to green cars, providing information on electric cars, efficient petrol and diesel cars to biofuels, solar, wind and hydrogen technology. Run by Really Good Domains Ltd				
Region	-	**Level of detail**	-	**Map**	-
Power of charger	-	**Type of connection**	-	**Address**	-
Owner contact	-	**Live update**	-	**Membership information**	-
Comments: An iframe of the openchargemap					

Charge point (station) map	Electric Car Site http://www.electriccarsite.co.uk/electric-car-charging-points. A one stop shop for electric vehicle information				
Region	UK	**Level of detail**	Low	**Map**	No
Power of charger	No	**Type of connection**	No	**Address**	Yes
Owner contact	No	**Live update**	Yes	**Membership information**	No
Comments: No map. It does not hold a lot of information on the site specifically, but contains more general information about car charging posts and car charging points.					

Charge point (station) map	Zero Carbon World http://www.zerocarbonworld.org/zero-net Registered charity promoting sustainable travel				
Region	-	**Level of detail**	-	**Map**	-
Power of charger	-	**Type of connection**	-	**Address**	-
Owner contact	-	**Live update**	-	**Membership information**	-
Comments: Uses data from openchargemap					

Charge point (station) map	Pod Point http://www.pod-point.com/home/live-availability/ POD Point is company based in the UK specializing in all aspects of electric vehicle charging. A brand of Pod Point Ltd, partners include Dumfries and Galloway Council, Source East, Office for Low Emission Vehicles (OLEV), Heathrow and Gatwick Airports, Tesco, Sainsbury's and IKEA, Nissan, Westhaven Homes, Berkeley Homes and Cornwall Council.				
Region	UK	**Level of detail**	High	**Map**	Yes
Power of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	Yes	**Live update**	Yes	**Membership information**	Yes
Comments: Good map including a data symbol for charge point status across the UK: available, charging, offline and coming soon, no filter search option for the user. Live Availability facility to discover nearest available POD Point, coming soon locations and plan your route. Map includes information on each charging point including number of charging points, type of charging point, power and fitter of charging point.					

Charge point (station) map	Next Green Car and Zap Map http://www.nextgreencar.com/electric-cars/charging-points.php/. Next Green Car is an independently run site, which covers all issues relating to green motoring including guides on all the emerging technologies. Zap-Map, UK's electric car charging point map.				
Region	UK	**Level of detail**	High	**Map**	Yes
Power of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	Yes	**Live update**	Yes	**Membership information**	No
Comments: Zap map and Next Green Car are the same company, very detailed; many locations have pictures from Google street view. Allows users to see the type of charge point: slow, fast or rapid and also coming soon.					

Charge point (station) map	Newride London http://www.newride.org.uk/recharge.php Newride is an initiative of the Clear Zones Partnership. The Clear Zones Partnership includes Camden Council, the City of Westminster and the City of London. Newride aim is to use partnership working between Central London Authorities to reduce congestion, air and noise pollution and improve the urban realm; the partnership uses innovative technologies and sustainable transport measures to achieve this aim.				
Region	London (most of UK)	**Level of detail**	Low	**Map**	Yes
Power of charger	No	**Type of connection**	No	**Address**	Yes
Owner contact	**No**	**Live update**	Yes	**Membership information**	No
Comments: Very small map with only some of the London data. Contains printable list of EV charge points'on-street' or 'off-street' (typically located on dedicated bays within a car park). Indicates if the charge point is free, and also car parking charges. Searchable by London Borough.					

3.Sweden Norway, Finland (inc Denmark, France, Australia and NZ)

Charge point (station) map	http://www.uppladdning.nu/ Free internet service that helps EV drivers find charging stations. It contains database with information about the charging stations, mapping service, mobile apps, and downloadable files for usage in-car GPS unit.				
Region	Sweden, Norway, Finland, Denmark, France, Australia, New Zealand	**Level of detail**	High	**Map**	Yes
Power of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	Yes	**Live update**	Yes	**Membership information**	No
Comments: This covers a large area and detailed information on each charge point. There are currently 572 charging sites registered with a total of 1607 outlets. ChargerFinder is available for mobile phones as well as a mobile phone version of the site. Pictures are provided. Allows user to filter charge stations available on the map by power, type and place of charging station.					

4. Sweden Norway, Finland

Charge point (station) map	http://www.ladestasjoner.no/ A resource for anyone interested in electric vehicle charging, Partners include Norwegian Electric Vehicle Association, Nobil, ABB, EVS27, STATOIL.				
Region	Sweden, Norway, Finland	**Level of detail**	Medium	**Map**	Yes
Power of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	**Yes**	**Live update**	Yes	**Membership information**	No
Comments: Provides pictures and a fast map. Includes regular charger map and a fast charging map (data from Nobile) and an integrated mobile phone application to locate charging stations, along with user involvement and academic material. No search facility, just a click on map function available, which gives more information on the charging station.					

5. Norway

Charge point (station) map	Fuel Map On Klimabiler.No http://www.klimabiler.no/kart/ Zero Emission Resource Organisation (ZERO) operates klimabiler.no. ZERO is an environmental foundation that helps mitigate climate change by highlighting and gain support for emission-free energy solutions and other good climate. Klimabiler.no is a project to help user's select environmentally-friendly cars. Partner is transnova.				
Region	Norway	**Level of detail**	Low	**Map**	Yes
Power of charger	Yes	**Type of connection**	No	**Address**	Yes
Owner contact	No	**Live update**	No	**Membership information**	No
Comments: Clean and fast map with pictures, holds fewer details than other sites, so quite limited information. Some filter search options available for the map including fuel types and EV charger - fast charge, but this part is limited. Requires users to zoom in to the location and then look at information on location.					

Charge point (station) map	Charging Station Database Nobile http://nobil.no/ This has been developed and managed in cooperation between Transnova by Project Eva Solvi and Norwegian Electric Vehicle Association.				
Region	Norway	**Level of detail**	Low	**Map**	No
Power of charger	No	**Type of connection**	No	**Address**	No
Owner contact	No	**Live update**	Partially	**Membership information**	No
Comments: This site has only a static map with no locations. Provides mostly general information about charging stations, but not the locations. Information includes accessibility, availability, pay to park and charge or free, and time limits. Nobile can also provide information on the status values of the charging station for idle, busy, and whether it is operating.					

6. Denmark

Charge point (station) map	http://www.ladestandere.dk/ Ladestandere.dk aims to display locations on the country's public charging stations and battery exchange stations for electric cars. The site is created by the Ecological Council to encourage the development of electric cars on the Danish market.				
Region	Denmark	**Level of detail**	Low	**Map**	Yes
Power of charger	No	**Type of connection**	No	**Address**	No
Owner contact	**No**	**Live update**	No	**Membership information**	no
Comments: A lot of the information on the charge points are simply collections of pictures seems to be done by hand.					

Charge point (station) map	CLEVER Charge Network https://www.clever.dk/find-ladestander/ Danish electric mobility operator (EMO). Charging network for EVs in Scandinavia. CLEVER is owned by the utility companies SEAS-NVE, SE, NRGi, EnergiMidt and Energi Fyn.				
Region	Denmark	**Level of detail**	Medium-High	**Map**	Yes
Power of charger	No	**Type of connection**	Yes	**Address**	Yes
Owner contact	**No**	**Live update**	Yes	**Membership information**	no
Comments: Network operated by CLEVER – The operator with most charging points in Denmark.					

Charge point (station) map	http://danmark.betterplace.com/oplad-din-elbil-her/				
Region	Denmark	**Level of detail**	Medium	**Map**	Yes
Power of charger	No	**Type of connection**	Yes	**Address**	Yes
Owner contact	**No**	**Live update**	No	**Membership information**	no
Comments: Network operated by BetterPlace – Charging points and Battery Swap Stations.					

7. The Netherlands

Charge point (station) map	https://www.agentschapnl.nl/onderwerp/cijfers-elektrisch-rijden NL Agency is the Dutch governmental organisation that implements policy in relation to sustainability, innovation and international business.				
Region	Netherlands	**Level of detail**	High	**Map**	No
Power of charger	No	**Type of connection**	No	**Address**	No
Owner contact	No	**Live update**	No	**Membership information**	No
Comments: This site provides statics on E-Mobility, for example total number of charging points. For maps with locations of charging points links are provided.					

Charge point (station) map	The Royal Dutch Touring Club ANWB http://www.anwb.nl/auto/themas/elektrisch-rijden this is an association in the area of mobility, vacation and leisure.				
Region	Netherlands	**Level of detail**	High	**Map**	Yes
Power of charger	No	**Type of connection**	No	**Address**	No
Owner contact	No	**Live update**	No	**Membership information**	Yes
Comments: The site contains information on E-mobility. It does not have a map with charging points. For a map with locations of charging points the ANWB refers to oplaadpalen.nl with a link.					

Charge point (station) map	http://www.oplaadpunten.nl/Oplaadpunten.aspx an overview of charging stations.				
Region	Netherlands, parts of Europe	**Level of detail**	High	**Map**	Yes
Power of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	No	**Live update**	Yes	**Membership information**	No
Comments: Information on charging points and several different things including, owners of charging points can provide (additional) information on charging points and facilities.					

Charge point (station) map	http://www.oplaadpalen.nl/ Independent site providing an overview of all charging stations and charging points. Sponsors and partners: Liander (Main sponsor) , E-loading, IVDM (Sustainable on the way), Do, Does, developed and maintained by Innovader Founded and managed by Eco-movement.				
Region	Netherlands, parts of Europe	**Level of detail**	Medium	**Map**	Yes
Power of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	No	**Live update**	Yes	**Membership information**	No
Comments: Provides information on several different things including bikes, food, and public transportation. Search facility for the map allows users to choose filters for searching for charging stations including vehicle (bike or car), power of charge voltage, type of charger, if the charger is a cost or free, type of charge point facility (public or private) and other facilities available (shops, WC, public transport, Wi-Fi etc.). Includes a route planner. Available as a mobile phone application.					

Charge point (station) map	Foundation E-loading http://e-laad.nl/zoek-een-oplaadpunt Foundation E-loading installs and maintains public charging points for electric cars – 2300 public charging stations in 272 municipalities in the Netherlands. Partners include Alfen ICU, ChargePoint, Mennekes, DBT, via Hollander Engineering, EV-BOX , GreenSource Company.				
Region	Netherlands	**Level of detail**	Medium	**Map**	Yes
Power of charger	No	**Type of connection**	No	**Address**	Yes
Owner contact	No	**Live update**	No	**Membership information**	Yes
Comments: Has limited information but does seem to have live updates. Includes a list of charging stations and upcoming charging stations. There is no search facility available for the map.					

Charge point (station) map	http://stekkerweb.nl Independent site, which serves as a platform for providers of charging points and stations, for an advertising cost.				
Region	Netherlands, parts of Belgium and Germany	**Level of detail**	High	**Map**	Yes
Power of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	Yes	**Live update**	No	**Membership information**	No
Comments: Site contains maps and detailed information on charging stations.					

Charge point (station) map	http://www.amsterdam.nl/parkeren-verkeer/amsterdam-elektrisch/opladen/				
Region	Amsterdam, Netherlands	**Level of detail**	High	**Map**	Yes
Power of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	No	**Live update**	Yes	**Membership information**	No
Comments: Provides information on e-mobility in the city of Amsterdam. Detailed information on charging stations including vehicle (bike, scooter and boot), power of charge voltage, type of charger, type of charge point facility (public or private).					

8.Belgium

Charge point (station) map	http://www.asbe.be/nl/laadpunten ASBE is the Belgian section of the European AVERE network for manufacturers, suppliers, importers and distributors of Electrically propelled vehicles (battery, hybrid, fuel cell) and accessories. Partners include Bond beter leefmilieu, Circuit Zolder, clean week 2020, Erasmus Hogeschool Brussel, Mobility, Logistics and Automotive Research Centre Vrije Universiteit Brussel, mobimix.be.				
Region	Belgium and small part of Netherlands and Luxemburg	**Level of detail**	High	**Map**	Yes
Power of charger	No	**Type of connection**	Yes	**Address**	Yes
Owner contact	-	**Live update**	-	**Membership information**	Yes
Comments: Only able to search the map by type of electric vehicle, and location (address).					

Charge point (station) map	http://www.oplaadpunten.org/ Website displaying charging stations and charging points for electric cars or electric bicycle.				
Region	Belgium	**Level of detail**	High	**Map**	Yes
Power of charger	No	**Type of connection**	Yes	**Address**	Yes
Owner contact	-	**Live update**	-	**Membership information**	-
Comments: Not an interactive map, only able to click on the region of Belgium and then a list of charge points is then displayed. The list includes information on the charge point name, address and the type of electric vehicle it is for.					

9.Germany

Charge point (station) map	Federal eMobilität http://www.bem-ev.de/ By Kelag since 2009, and hosted online by the Bundesverband e-Mobilität (German Association for e-mobility). BEM aims to improve the legal framework for the development of electric vehicles as a sustainable and future-oriented mobility concept and the implementation of equal opportunities in the transition to electric mobility.				
Region	Germany	**Level of detail**	High	**Map**	Yes
Speed of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	-	**Live update**	-	**Membership information**	-
Comments: Private persons, companies or local authorities can all for free and without restrictions advertise their e-charge station here, which by iPhone and iPad app and mobile phone. The website is in Web 2.0 for smartphones and can be found quickly and easily. The coordinates can also be downloaded for sat-navigation car guidance systems. It does give information on / is searchable by: plug type; Volt / Ampere strength; opening hours and costs -- suitability for. Also the detailed site for each location by provider will give details on: - how many parking places for E-cars and also E-scooters / bikes each - source of electricity (if 100% - if solar energy locally produced is available I'm not sure if the website actually shows if a charge point is free (colour changes from yellow to green on more detailed map) but can't see legend to see if that means anything. The site has a map with locations, and is trans border with a few main cities in the Czech Republic, Poland, Slovakia / Hungary but more in Switzerland, Luxemburg, and the Netherlands.					

Charge point (station) map	http://www.swb-gruppe.de/verantwortung/swb-und-umwelt/stromtankstellen-raum-bremerhaven.php				
Region	Bremerhaven	**Level of detail**	Low	**Map**	Yes
Speed of charger	No	**Type of connection**	No	**Address**	Yes
Owner contact	-	**Live update**	No	**Membership information**	No
Comments: Very limited information.					

Charge point (station) map	http://www.swb-gruppe.de/verantwortung/swb-und-umwelt/stromtankstellen-raum-bremen.php				
Region	Bremen	**Level of detail**	Low	**Map**	Yes
Speed of charger	No	**Type of connection**	No	**Address**	Yes
Owner contact	-	**Live update**	No	**Membership information**	No
Comments: Very limited information.					

10. Global

Charge point (station) map	Open Charge Map http://openchargemap.org/ Global registry of electric vehicle charging locations, it is a non-commercial, non-profit, electric vehicle data service hosted and supported by a community of businesses, charities, developers and interested parties around the world.				
Region	-	**Level of detail**	High	**Map**	Yes
Speed of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	Yes	**Live update**	Yes	**Membership information**	-
Comments: Global open source of charge point data. Search box facility on the map (to enter location and charge point proximity) to find nearest charge point for user, submission status, operator, connection type, charging levels, usage type and status type.					

Charge point (station) map	EV-charging.com http://e-tankstellen-finder.com/at/de/elektrotankstellen Kelag is the developer of the E-Charging Station Finder website.				
Region	Austria, Germany, UK, Bulgaria, Switzerland, Croatia, Slovakia, Netherlands, Belgium, Poland, Italy.	**Level of detail**	High	**Map**	Yes
Speed of charger	Yes	**Type of connection**	Yes	**Address**	Yes
Owner contact	Yes	**Live update**	?	**Membership information**	Yes
Comments: The development of the E-Tankstellen-Finder website is used to promote, contribute and accelerate the use of E-Mobility. Downloadable applications for iPhone and iPad as well as satellite navigation systems. Map is searchable by plug, volt, opening times, cost and the type of electric vehicle you are charging e.g. E-vehicle, E-bike, E-cycle, E-boat and batteries for E-bikes. EV Charging Directory is searchable by place or address. Includes route planner and e-mobility news.					

Charge point (station) map	PlugSurfing http://plugsurfing.co.uk Location, access and payment information for 16,000 EV charge plugs across the whole of Europe				
Region	UK, Holland, Germany, Norway, Switzerland, Austria, Bulgaria and Denmark.	**Level of detail**		**Map**	Yes
Speed of charger	No	**Type of connection**	Yes	**Address**	Yes latitude and longitude information
Owner contact	Yes	**Live update**	Yes	**Membership information**	Yes
Comments: The free PlugSurfing smartphone app and interactive website will locate public and commercial charge points but also private charge points. The service aims to encourage private owners of charging points to register on PlugSurfing to share the charge point with registered community members via the website and smartphone app. For private charge points, the user is able to locate the nearest PlugSurfing community member, check the availability of the charge point and chat to the member to arrange to use this. Users are encouraged to rate the plug as well as leave feedback on their charging experience. PlugSurfing will soon have 22 apps and website services in 16 languages across Europe, Asia and Australia. The Danish and Spanish services launched were part of wider expansion in 2012.					

Summary and discussion

There is a considerable variation in the amount of information available and presented on each charge point (station) map website, as this review has presented.

The majority of the charge point (station) map websites reviewed do not contain all of the information that would be useful from an EV user perspective. This would include a good size interactive map, which would include a search filter facility to search for relevant charge points (stations) by location (including address), charger type, charger power, cost of charger, public or private, other facilities available and number of charger points. Other useful information for the EV user would include the live availability of the charge points (stations) and from a user access perspective, a mobile phone application of the website. Examples of mobile phone apps identified in this review include PlugSurfer, Open Charge Map, Charge Point, Charge Your Car, ChargerFinder, EV-charging.com, German Association for e-mobility, oplaadpalen.nl and ladestasjoner.no.

Car manufacturers offer smart phone apps for EVs, to promote and market EV services and products and connect with EV drivers/users. The Ford Electric app, for example, enables users to view the car charge status, schedule when the car needs charging and unlock the car doors remotely. The app contains information on nearby charge points, as does the cars satellite navigation system which displays these as POIs. When entering journeys into the car satellite navigation system, this automatically prompts the driver, and asks if they will re-charge the car at the destination point, and shows the number of miles until the next recharge (Josh Miller/CNET no date). Other apps include the Nissan LEAF CARWINGS app, which enables drivers to check the battery charge; start charging the vehicle; check when the charge is completed; and see the driving range (Nissan no date). The GreenCharge app (http://www.greenchargeapp.com/) made by Xatori, Inc. is available for users of Nissan Leaf, Prius Plug-in and Ford Focus EV to see driving patterns, charging cost, and environmental contribution.

Smartphones are becoming an ever more integral part of those driving electric vehicles and an increased number of mobile phone applications of the charge point (station) map websites will be developed. It is important that the electric vehicle charging infrastucture (including the existing and the new one) will be supported by suitable business models, meeting user needs (Green eMotion 2012). In addition that there is a need to integrate the EV with its infrastructure and that communications inter-operability relies on some form of standardisation of the data that is currently available with collaboration from automakers, charging network and utility providers, and standards bodies (Knox 2013).

Standards regarding data communication between the electric vehicle and the charging infrastructure are an important point in the harmonisation of technology and standards for electro-mobility. It has been suggested that the communication area is the area which seems most open. There are several options and standards for communication of the EV towards the different systems: direct mobile communication, communication via the charging point as well as communication via and to the grid. These standards need to be combined to enable combinations of these options (Green eMotion February 16th 2012).

Wider communications between the vehicle or the user and the infrastructure, e.g. concerning data communication, safety issues, billing/payments or information to drivers on availability of nearby charging stations are addressed in the ISO/IEC 15118 standard. These are further addressed in a number of standards contexts, for instance those relating to the Intelligent Transport Systems and Smart Grids, on both of which the European Standards Organisations are already working. The communication is able to use any one of a number of existing data channels including information transfer through the AC supply cable, airborne radio communication, or hand held devices (CEN, CENELEC 2011).

It has been reported that there are three major categories of charge point infrastructure being installed throughout the European jurisdictions Public and On Street charging infrastructure: Fast Charging infrastructure and Home Charging infrastructure. There is a trend toward the Mode 3 Type 2 variety for the home charging and street/public charging. In France, charge points being installed are generally Mode 3 Type 3, in some parts of Ireland and the UK, Mode 3 with tethered cables and Yasaki connectors are being installed for home use (Green eMotion April 2012). Although Mode 3 is the most used in Europe, all the different modes are still in use. This may be related to different kinds of charging points (public, semi-public, private, etc.), but it has been suggested that this may be an obstacle to interoperability, if it is not properly known and addressed (Green eMotion, February 16th 2012).

Recently, the German and Italian Standardization Bodies and experts from German and Italian industry are proposing to enhance the exisiting standard on EV charging plugs charging infrastructure. The proposal recommends using the Type 2 socket outlet with an optional shutter for the EV charging infrastructure, which will allow compatibility with many European countries including Italy. This will be a step towards the European Commissions aim to achieve a single emobility charging infrastructure using the Type 2 plug (Krivevski 2013).

Furthermore, the CROME (Cross-border Mobility for EVs) project is aiming to enable a user-friendly and reliable use of electric mobility between France and Germany and to give recommendations for the European standardization process for an EV infrastructure and related services. This includes interoperable charging facilities and user-friendly identification/authentication, existing charging process analysis and its implications on technical issues and usability and performing a cross-border field operational test to ensure reliable recommendations through feedback on user acceptance and compliance with future standards (Green eMotion January 2012).

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NORTH SEA REGION ELECTRIC MOBILITY NETWORK

e-mobility NSR

About E-Mobility NSR

The Interreg North Sea Region project North Sea Electric Mobility Network (E-Mobility NSR) will help to create favorable conditions to promote the common development of e-mobility in the North Sea Region. Transnational support structures in the shape of a network and virtual routes are envisaged as part of the project, striving towards improving accessibility and the wider use of e-mobility in the North Sea Region countries.

www.e-mobility-nsr.eu

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