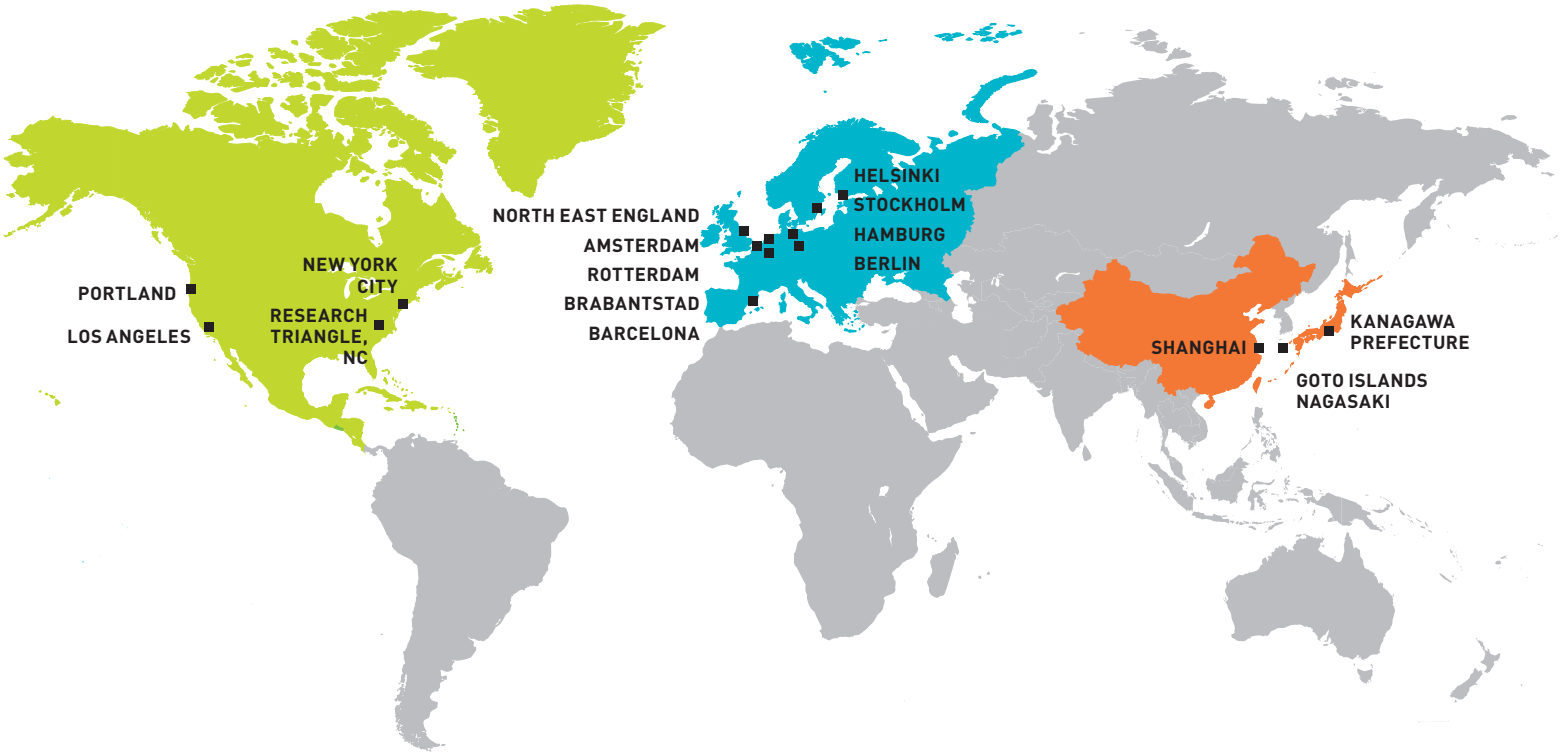
EV CITY CASEBOOK

A LOOK AT THE GLOBAL ELECTRIC VEHICLE MOVEMENT

AMSTERDAM
BARCELONA
BERLIN
BRABANTSTAD
GOTO ISLANDS, NAGASAKI
HAMBURG
HELSINKI
KANAGAWA
LOS ANGELES
NEW YORK CITY
NORTH EAST ENGLAND
PORTLAND
RESEARCH TRIANGLE, NC
ROTTERDAM
SHANGHAI
STOCKHOLM

2012

EV CITY CASEBOOK



A GLOBAL MOVEMENT

ELECTRIC VEHICLES: TRANSFORMING THE WAY THE WORLD MOVES

// Electric vehicles (EVs) hold the potential of transforming the way the world moves. EVs can increase energy security by diversifying the fuel mix and decreasing dependence on petroleum, while also reducing emissions of greenhouse gases and other pollutants. Just as important, EVs can unlock innovation and create new advanced industries that spur job growth and enhance economic prosperity. However, the mass deployment of EVs will require transportation systems capable of integrating and fostering this new technology. To accelerate this transition, cities and metropolitan regions around the world are creating EV-friendly ecosystems and building the foundation for widespread adoption.

// In recognition of the importance of urban areas in the introduction and scale-up of electric vehicles, the EV City Casebook presents informative case studies on city and regional EV deployment efforts around the world. These case studies are illustrative examples of how pioneering cities are preparing the ground for mass market EV deployment. They offer both qualitative and quantitative information on cities' EV goals, progress, policies, incentives, and lessons learned to date. **The purpose of the EV City Casebook is to share experiences on EV demonstration and deployment, identify challenges and opportunities, and highlight best practices for creating thriving EV ecosystems.** These studies seek to enhance understanding of the most effective policy measures to foster the uptake of electric vehicles in urban areas.

// The cities represented here are actively engaging in a variety of initiatives that share the goal of accelerating EV adoption. This publication is the result of an effort to coordinate those initiatives and provide a global perspective on the electric vehicle movement. This international knowledge-sharing network consists of the **Electric Vehicles Initiative (EVI)**, a multi-government initiative of the Clean Energy Ministerial; **Project Get Ready**, a Rocky Mountain Institute (RMI) initiative; and the International Energy Agency's **Implementing Agreement for Cooperation on Hybrid and Electric Vehicle Technologies and Programmes (HEV IA)**; with the support of the **C40 Cities in partnership with the Clinton Climate Initiative (CCI)**.

// In addition, these organizations are collaborating to launch the World EV Cities and Ecosystems web portal, for which the EV City Casebook will provide initial content. This first-of-its-kind website captures EV deployment progress in cities worldwide and will serve as a central hub for harmonizing efforts, leveraging existing resources and participants, and disseminating best EV deployment practices to global stakeholders. By working together and sharing knowledge, cities from diverse regions and countries will realize the benefits of electric mobility and achieve a sustainable energy future.

Photo provided by Portland General Electric.

EV OUTLOOK

ELECTRIC VEHICLE DEPLOYMENT IN THE GLOBAL CONTEXT

// In 2009, transportation accounted for approximately one-fifth of global primary energy use and one quarter of all energy-related carbon dioxide (CO_2) emissions, with nearly half of those emissions originating from passenger vehicles [1]. In the baseline scenario of the International Energy Agency's (IEA) Energy Technology Perspectives 2012, which assumes no major energy and climate policies are introduced, it is expected that vehicle stocks and fuel consumption will rise steadily, more than doubling by 2050 [1][2]. This scenario would increase CO_2 emissions and lead to higher oil demand, driving oil prices upward unless new supplies are brought to market or alternative fuels become available.

// Although a variety of clean vehicle technologies and fuels are being developed, electric vehicles represent one of the most promising technology pathways for cutting oil use and CO_2 on a per-kilometer basis. With a moderately clean electric grid, EVs can achieve 50 grams of CO_2 per kilometer, well below today's most efficient cars, which emit between 100 and 150 grams of CO_2 per kilometer. Even hybrid electric vehicles (HEVs) achieve only around 90 grams of CO_2 per kilometer [1][2].

// The IEA has developed an "Improve" scenario to reduce CO_2 emissions and oil dependence by introducing low emission vehicles, such as plug-in hybrid electric vehicles (PHEVs), battery electric vehicles (BEVs), and fuel cell vehicles (FCVs). In this scenario, 27 million PHEVs and BEVs are expected to be sold by 2020 and over one billion by 2050, as shown in Figures 1 and 2, so as to reduce CO_2 emissions by 10 gigatons (Gts) by 2050, along with strong fuel-economy improvements of conventional internal combustion engines.

// The cumulative national targets for EV and PHEV sales announced by EVI member governments add up to almost six million by 2020, with assumed growth rates of 20 percent per year (Figure 3). If achieved, this would almost reach six percent of total vehicle sales by 2020, and result in 20 million EVs on the road in that year (Figure 4). EVI's goal of 20 million EVs/PHEVs on the road worldwide is consistent with the IEA Improve scenario, as part of a longer-term plan to meet climate change mitigation goals.

// Before reaching this ambitious goal, electric vehicle technology must pass through several stages of market development, optimization and scale-up. Although the current EV market is small, the outlook is encouraging. About 40,000 EVs/PHEVs were sold worldwide in 2011, the most in any year in history (and greater than the historical EV stock peak of approximately 30,000 at the turn of the 20th century) [4]. Since the nascent market is still developing, with more models being launched each month, it is clear that 2012 auto sales will be important in determining the road ahead for electric vehicles.

References: [1] *OECD/IEA, Energy Technology Perspectives 2010, ISBN 978 92-64-08597-8, Paris, (2010) http://www.iea.org/;* [2] *International Energy Agency analysis.;* [3] *Electric Vehicles Initiative, http://www.iea.org/evi/index.asp, and http://www.cleanenergyministerial.org/our_work/electric_vehicles/;* [4] *MarkLines Database.*

FIG 1. WORLD EV/PHEV SALES (MILLIONS/YEAR)*

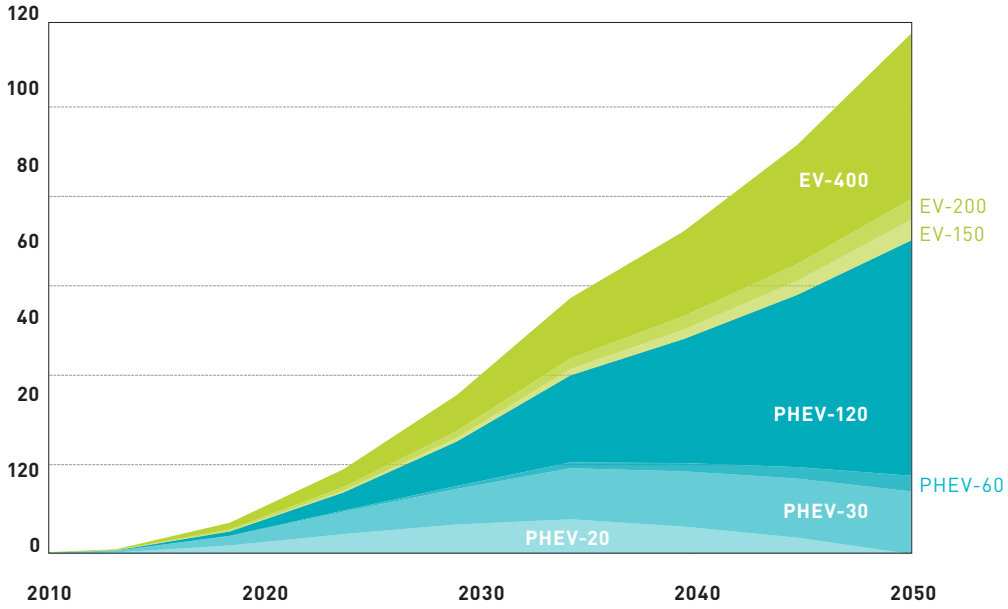
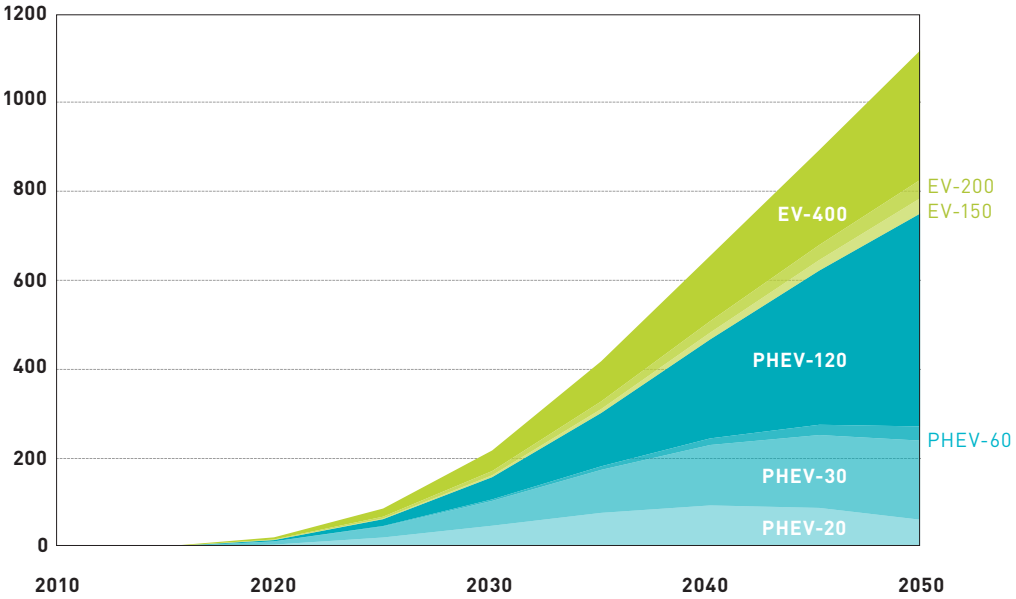


FIG 2. WORLD EV/PHEV STOCKS (MILLIONS)*



**Expected vehicle stock by technology type and range in kilometers (km) [1].*

FIG 3. EV SALES IN EVI COUNTRIES (MILLIONS)*

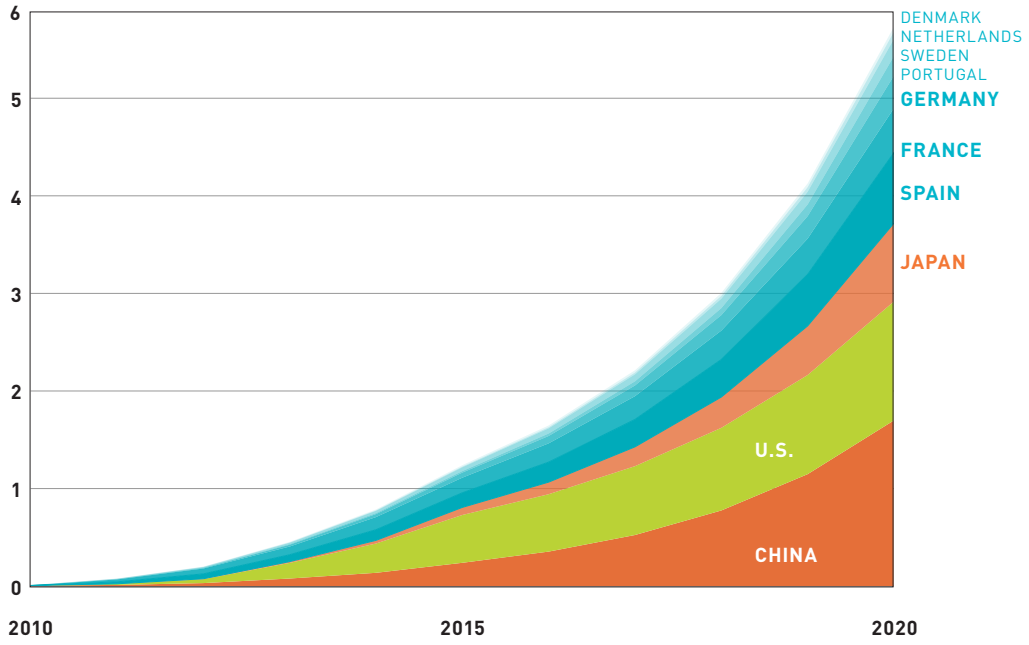
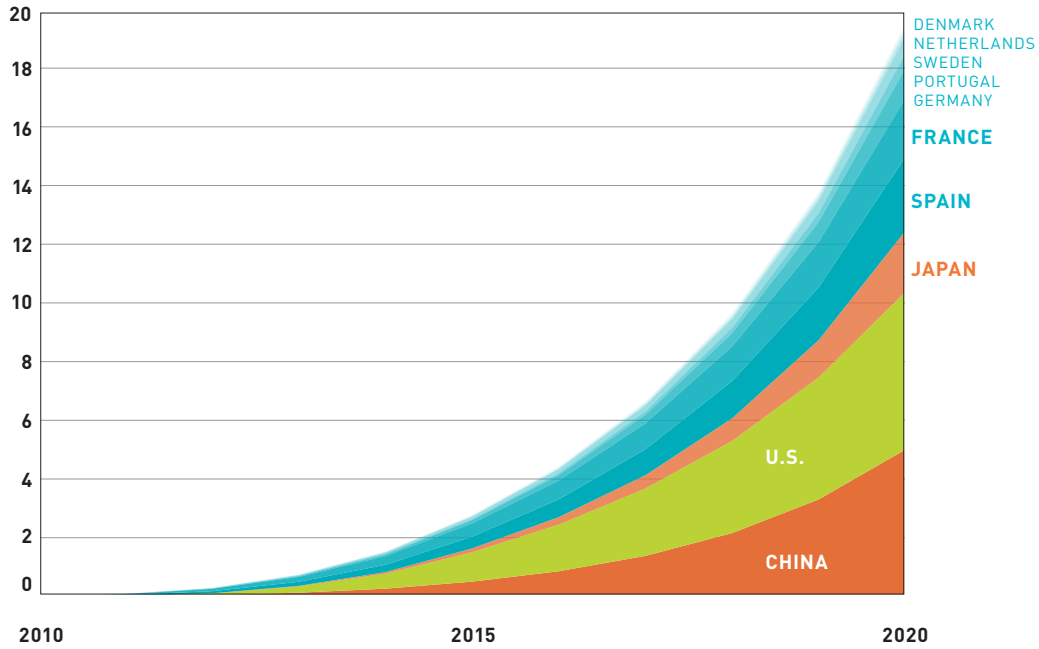
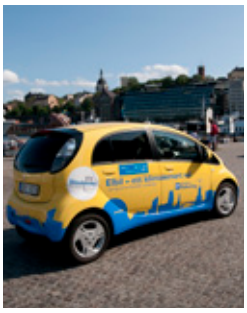


FIG 4. EV STOCK IN EVI COUNTRIES (MILLIONS)*



**Based on official targets of EVI countries.*

THE URBAN APPROACH



// As the EV City Casebook demonstrates, a number of major cities and regions around the world are committed to making electric mobility a reality. They are actively pursuing ambitious deployment goals through a variety of innovative policy measures and programs. While these approaches are often tailored to each city's particular circumstances, many common practices emerge. For instance, many cities employ a mix of financial and non-financial consumer incentives to boost demand for vehicles and charging infrastructure. Financial incentives include rebates or tax credits on vehicles (often paired with national government purchase subsidies), exemptions from vehicle registration taxes or license fees, discounted tolls and parking fares, as well as discounts for recharging equipment and installation. A variety of non-financial incentives figure just as prominently, including preferential parking spaces, access to restricted highway lanes, and expedited permitting and installation of electric vehicle supply equipment (EVSE).

// Cities are also leading by example. Many have already added electric vehicles to municipal fleets and incorporated hybrid buses into public transportation. They are placing charging spots at public buildings and, in some cases, offering discounted electricity rates for EV users from municipal-owned utilities. Just as important, cities are using their convening power to assemble multi-stakeholder groups that include city planners, automakers, utilities, infrastructure suppliers, academic and research institutions, and city and national officials. These groups work together to create a roadmap for EV readiness that considers all stakeholder perspectives and seeks to identify and address technical, economic and regulatory barriers to EV adoption and integration.

// It is in the context of the global EV movement that the efforts of these and other cities become particularly important. As the real-world "test beds" of EV deployment, cities will be the first to experience the introduction and significant use of EV technology and infrastructure. Given their density and relatively short commutes, urban populations are well positioned to benefit from electric vehicles. The experiences of urban drivers and the pioneering policies of local governments can help spur widespread EV uptake and accelerate the transition to clean and sustainable mobility.

Photo credit: Mosebacke Media.

AMSTERDAM
THE NETHERLANDS

THE GREEN ELECTRICITY CAPITAL

// By 2040, the City of Amsterdam expects that nearly all kilometers driven will be powered with electricity generated by windmills, solar panels and biomass plants. The canals will be filled with silent electric boats. Cargo will be transported over the road and water using electric power. The city will even smell better and sound quieter thanks to electric transport. Fossil fuels will be unnecessary when travelling in the city. Harmful emissions will be dramatically reduced, as will the costs of electric transport. All of this will make Amsterdam an attractive city in which to live, work and play—all thanks to developments that are being put in motion today.

// By 2015, Amsterdam is expected to have 10,000 EVs on the roads. More and more electric cars are being produced, and although they are currently more expensive than traditional vehicles, their prices will fall as the market for them increases.

[SNAPSHOT] AMSTERDAM

= 100,000 people = 100,000 vehicles

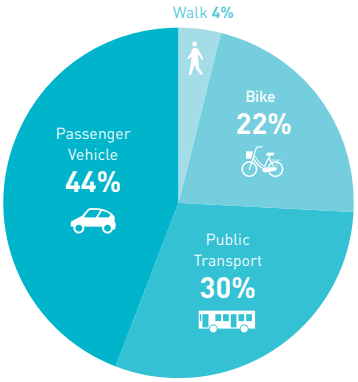
POPULATION

780,559

REGISTERED VEHICLES

246,452

TRANSPORTATION MIX



CITY SIZE

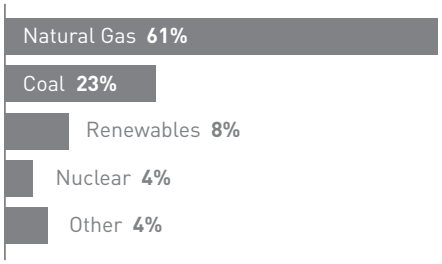
219 km²

AVERAGE DAILY TRAVEL (KM)

08.0

[COUNTRY CONTEXT] THE NETHERLANDS

ELECTRICITY MIX*



EV TARGET

2015: 20,000
2020: 200,000
2025: 1 million

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
750	10,000 by 2015	350 public (highest per inhabitant rate in the world)	1,000 public (2013) 1,000 semipublic/ on business premises

**Source: IEA, 2009. Photo provided by the City of Amsterdam.*

INFRASTRUCTURE

NATIONAL STRATEGY // A leading role for the private sector in roll out of charging infrastructure. // The national government creates preconditions and tackles bottlenecks. // Deployment of charging points on public and private land and centered in focus area.

CURRENT CHARGING POINTS (NATIONALLY)	NORMAL CHARGING POINTS	FAST CHARGING POINTS
Public Land	1,250	14
Semipublic Land	576	
Private Land	699	
TOTAL	**2,525**	**14**

SPENDING AND FINANCIAL INCENTIVES

NATIONAL // There are several tax measures to stimulate electromobility and up to 2015 €9 million is available to implement the national Action Plan. The plan contains a range of activities to stimulate electromobility in focus areas and viable market segments, strengthen international collaboration and partnerships, and roll out communication, research and monitoring. Besides this general economic policy, the national government offers opportunities to stimulate electromobility and aims to participate in European projects and welcomes opportunities for cooperation with other countries.

EV SPOTLIGHT

CAR2GO

In November 2011, Car2Go launched in Amsterdam with 300 smart-for-two EVs. The vehicles can be picked up and dropped off at any public parking spot inside the business area, with no need to commit to a specific return time/location. The vehicles have a range of 135 km and time is charged by the minute (€.29/minute, €12.90/hour).

REAL TIME CHARGING AVAILABILITY

By 2013, there will be approximately 1,000 public charging points on the streets of Amsterdam. Information on their location and availability is accessible in real-time via an open API, making Amsterdam the first city in the world to provide such information in this manner.

ELECTRIC TAXIS

The average diesel taxi contributes nearly 35 times more to the nitrogen dioxide concentration in the city than the average petrol vehicle. There are approximately 2,500 taxis active in Amsterdam during the work week, with the number rising at the weekend. Reducing the pollution caused by taxis is therefore an effective means of improving air quality in Amsterdam. As a result of a 2009 subsidy, the first 10 electric taxis began running in May 2011. By mid 2012, there will be approximately 40 electric taxis in the city.

CONTACT

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MORE INFORMATION

amsterdamelectric.nl

All photos on this page provided by the City of Amsterdam.

EV SUBSIDY SCHEME

// The City of Amsterdam has launched a subsidy scheme to support companies intending to use electric cars, taxis and trucks as a key means of transportation around the city. With this, the municipality hopes to become a green transportation hub

EV SUBSIDIES

Passenger: €5,000
Taxi: €10,000
Truck: €40,000

// The City has a reserve of €8.6 million until the end of 2015. The results of a 2009 subsidy scheme led to more than 200 electric vehicles purchased, highlighting the effectiveness of subsidies.

Amsterdam electric

BARCELONA SPAIN

A CENTER OF INNOVATION IN ELECTRIC MOBILITY

// Barcelona is the capital of Catalonia and the second largest city of Spain. The city has a high population density and is at the center of an important European metropolis. City transport is mostly public, thanks to integrated multimodal pricing that allows indiscriminate use of bus, metro, tram and train. Non-motorized transport equals 41.7 percent, thanks in part to Bicing, a public bike system, with 35,000 daily uses. Powered two-wheelers (PTW) account for 40 percent of private travel within the city.

// The city is pursuing electric mobility solutions as a way to reduce CO2 emissions and noise, reduce oil dependency and improve efficiency, and to provide opportunities for entrepreneurial, technical and economic development.

// Barcelona is a member of IMPACTS (International Network of European and North American Capital and Major Metropolitan Cities for exchanging information and experience on Urban Mobility and Transport Policies) and the European initiative, Green e-Motion, as a Demo Region.

// Promoted by Barcelona City Council, the public-private platform LIVE (Logistics for the Implementation of Electric Vehicles) was created with the objective of:

- Supporting the development and promotion of demonstration projects of electric mobility (Living Labs).
- Providing tools and resources to generate innovative attitudes, in economy and industry, by promoting R&D.
- Supporting the creation of local syndicates, national and European projects, and technology and knowledge programs from university and professional environments.
- Organizing events and activities that implement the electric mobility in Barcelona.
- Promoting the creation of recharge stations in public and private parking lots in Barcelona's metropolitan area.

[SNAPSHOT] BARCELONA

= 100,000 people = 100,000 vehicles

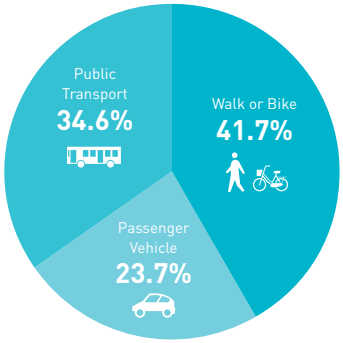
POPULATION

1,640,494

REGISTERED VEHICLES

981,580

TRANSPORTATION MIX



CITY SIZE

101 km²

DAILY TRIPS*

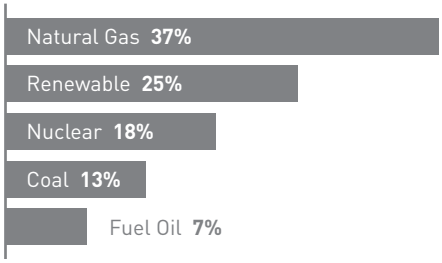
6,500,000

CONGESTION PLAN

Y

[COUNTRY CONTEXT] SPAIN

ELECTRICITY MIX**



CURRENT EVs/PHEVs

2,446+

15% cars
19% commercial vehicles
50% ePTW

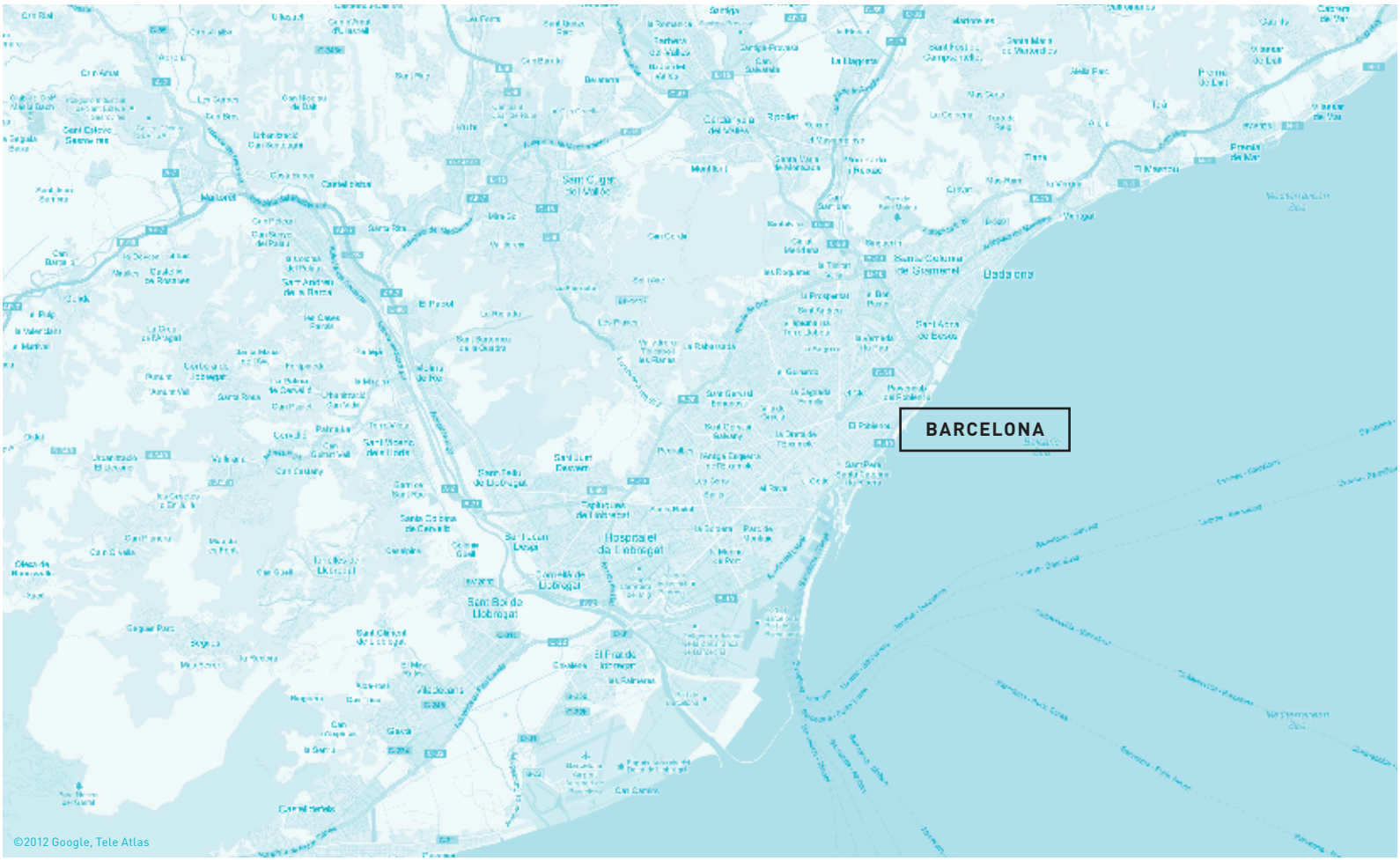
EV/PHEV TARGET

2014: 250,000 (70,000 by 2012)

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
280 public fleet*	500 public fleet	248 slow charging stations	4,400 slow charging stations
200 private (150 ePTW)	2,500 private	1 fast charging stations	20 fast charging stations
	forecast for 2014		forecast for 2014

*2010. **Source: IEA, 2009.



INCENTIVES

NATIONAL // Direct subsidies for purchase. // Changes in registration tax. // Free parking in controlled parking lots. // Lower electricity tax. **CITY** // Tax benefits: up to 75 percent of vehicle registration tax. // Free recharging for electric vehicles at all municipal points on public roads until the end of 2012. // Free parking in regulated areas for Barcelona residents with 100 percent EVs. // New public car parks with 2 percent of the spaces reserved for electric vehicles and facilities ready for the future inclusion of points in the rest of the spaces.

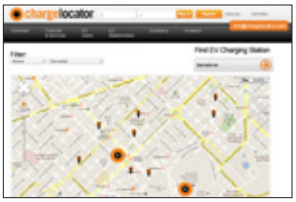
FLEET STRATEGY

Barcelona has more than 280 plug-in electric and hybrid vehicles in its fleet. // 50 percent of the PTW fleet in the city is expected to be electric by 2014. // LIVE , working with supporting institutions, will help consolidate projects relating to transformation of both public and private fleets. LIVE will also work with manufacturers and distributors to create the first prototype units of electric vehicles for Catalonia. // TMB (Transports Metropolitans de Barcelona), in an ongoing project in collaboration with SIEMENS, is developing projects for hybridization of buses and minibuses, and implementing 100 percent electric routes in neighborhoods with mobility difficulties. // Barcelona, along with a private consortium, is also defining a system of car sharing (Sharing). This is the first system of Sharing with electric vehicles, based on the concept of “Mobility on Demand”, developed for MIT in Boston. This new system is an improvement over current sharing systems, since users can access vehicles on demand, and pick up/drop off vehicles where they choose.

EV SPOTLIGHT

MOBECPOINTS COME TO BARCELONA

Barcelona is second only to Rome in the use of motorbikes for personal mobility. In the spring of 2011, Barcelona launched its first electric Mobecpoint (mobecpoint.com) motorcycle charging stations in the city at hotels (where e-bikes are available to guests for rental) and on university campuses. The stations are available free of charge through the end of 2012 to encourage e-bike ridership.



CHARGELOCATOR

The city of Barcelona, through its LIVE platform, has partnered with Chargelocator (chargelocator.com), to enable users of its mobile app to: Find the cheapest/nearest available charging stations in the city. // Get information such as phone numbers, rates, location access descriptions and comments from other users. // Get complete information about vehicle's charging history and billing: charge location, charge dates, prices, CO_2 emissions, etc.

VOLTA MOTORBIKES

Volta Motorbikes (voltamotorbikes.com) is an electric motorbike manufacturer created with the mission of providing new solutions for the pollution problems of big cities. The firm's first model, the Volta BCN, bears the name of Barcelona because it shares a number of different values that are associated with the Catalan capital: design, environmental respect and quality.

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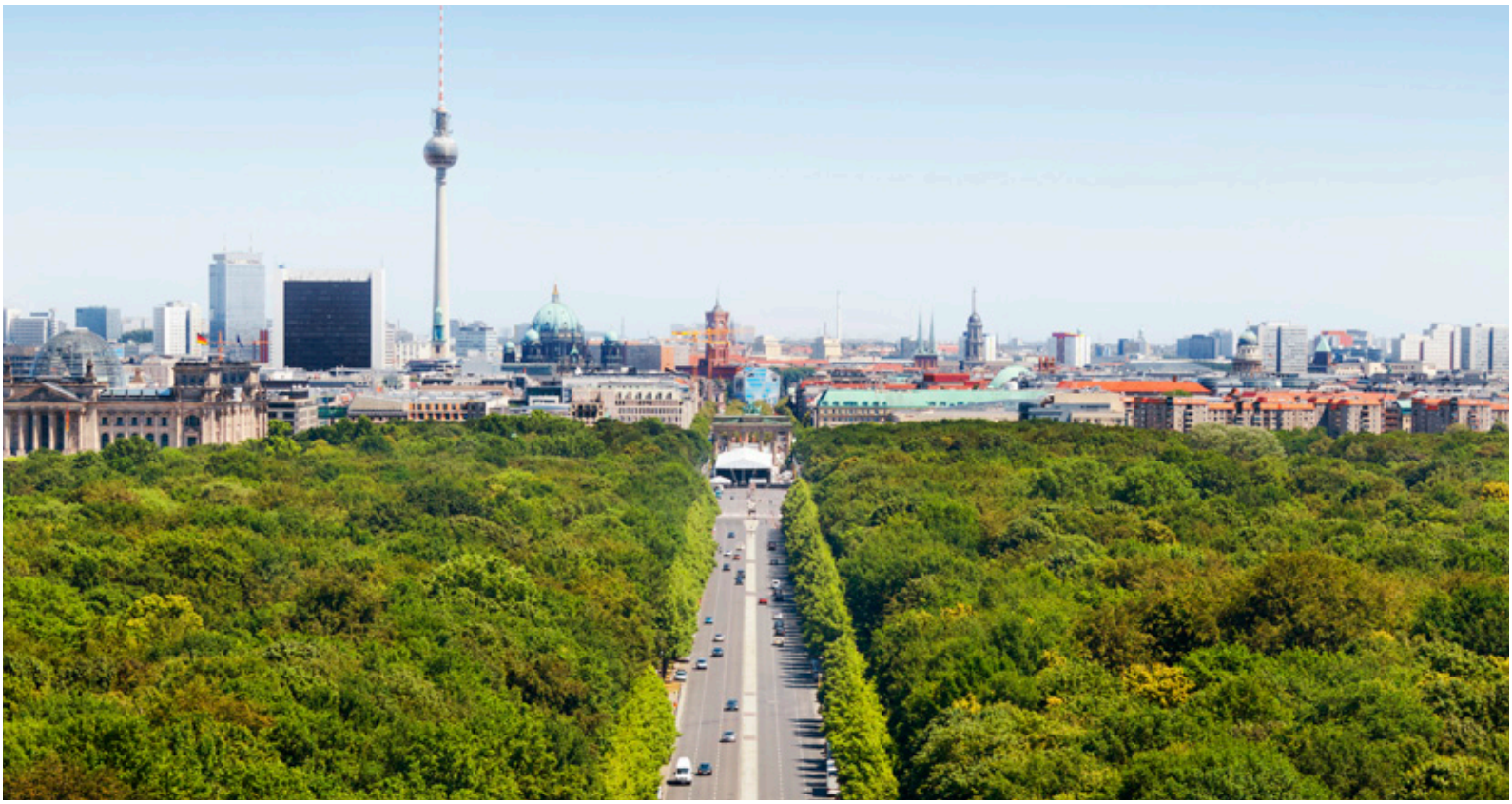
LIVE BARCELONA

// LIVE Barcelona (Logistics for the Implementation of the Electric Vehicle) is an open public-private platform that seeks to position Barcelona as a center of innovation in electric mobility. It is promoted by the Government of Catalonia, Barcelona City Council, the Spanish Government, SEAT, ENDESA and SIEMENS.

// LIVE set up the first citizens' office in Europe to provide information regarding electric mobility in Barcelona. As well as providing information for the general public, LIVE issues electric vehicle users cards required for using the municipal network of recharging points.

// Through its website and social networks, LIVE provides practical information for users. It is also a useful tool for the promotion of Barcelona and its electromobility initiatives. Today the city has more than 240 charging stations. This public network of recharging points is creating new business opportunities for innovators to implement new technologies. Many of these projects have been classified as pilot projects (Urban Labs) so as to position Barcelona as a city leader in innovation of public sanitation fleets, e-bike sharing programs and electric public bus services.

// Through LIVE, the City of Barcelona is promoting its participation in congresses and events related to electric mobility, such as the EV Battery Forum and EVS27.



BERLIN GERMANY

FORERUNNER OF INNOVATIVE AND SUSTAINABLE MOBILITY

// Today, the Berlin-Brandenburg capital region is Germany's largest electromobility lab and ranks ahead of all other German cities with 220 publicly accessible charging points. Projects implemented to date cover a broad spectrum of options for using integrated mobility and for future-oriented drive systems, from individual motorized transportation in private households to e-car sharing or company fleets, and on to electric cargo transport with trucks, electric transport bikes and transporters.

// Released in March 2011, the Action Plan for Electromobility Berlin 2020 set forth three main goals: 1) Improve the quality of life for the population by utilizing electromobility's potential to reduce noise and tailpipe emissions. 2) Sustainably strengthen the economy and establish new jobs for skilled workers. 3) Boost the development of new technologies and services and market them in an "international electromobility showcase."

// Since 2008 the Federal Ministries of Economics and Technology; Transport, Building and Urban Development; Environment, Nature Conservation and Nuclear Safety; and Education and Research, which all are leaders in electromobility, have supported numerous electromobility projects in the capital region Berlin-Brandenburg. Since 2009, the Berlin-Potsdam region has been one of eight model regions around Germany to receive support for practical projects.

// Brandenburg and Berlin plan to meet 100 percent of their electricity needs with renewable energies by 2020 and 2030, respectively.

[SNAPSHOT] BERLIN

= 100,000 people = 100,000 vehicles

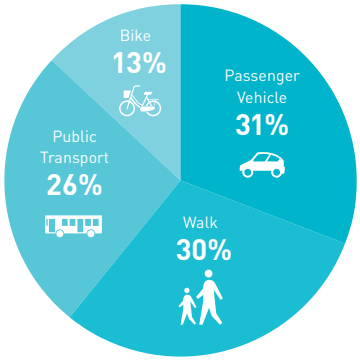
POPULATION

3,500,000

REGISTERED VEHICLES

1,300,000

TRANSPORTATION MIX*



CITY SIZE

892 km²

AVERAGE DAILY TRAVEL (KM)

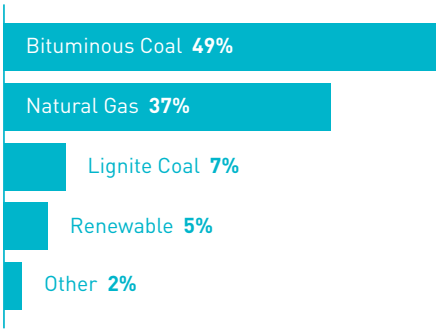
20.2

CONGESTION PLAN

Y

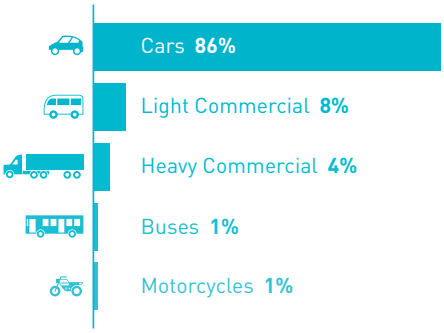
environment zone in city center

ELECTRICITY MIX**



GERMANY: Nuclear 23%, Coal Lignite 42%, Natural Gas 13.7%, Renewables 16.5%, Heating Oil, Pumped Hydro, Others 5.2%

CO2 EMISSIONS [VEHICLES]†



EVs/PHEVs [GERMANY]††

4,541

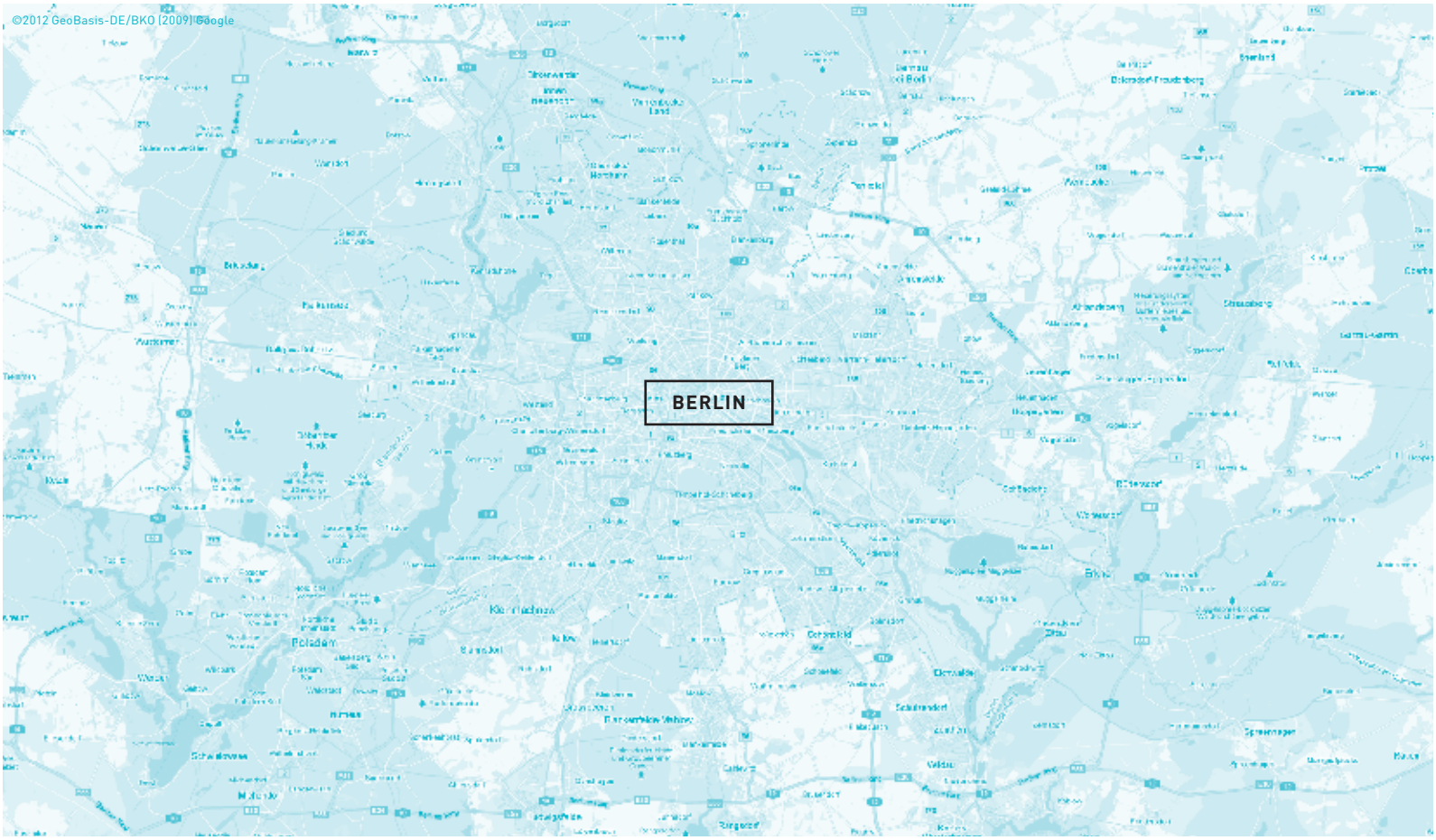
NATIONAL EV/PHEV TARGET‡

2020: 1 million

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
350 +/- cars & transporters (unknown number of e-bikes and pedelecs)	15,000 cars & transporters by 2015	220 +/- public charging points	1,400 +/- public charging points (plus additional fast charging points) by 2015

**Source: Mobilität der Stadt - Berliner Verkehr in Zahlen, Senatsverwaltung für Stadtentwicklung und Umwelt, 2011 **Source: Mobilität der Stadt - Berliner Verkehr in Zahlen, 2011; KBA, as of Jan 1, 2012; Energie- und CO2-Bilanz in Berlin 2008, Amt für Statistik BB. †Source: Umweltatlas Berlin, Senatsverwaltung für Stadtentwicklung und Umwelt, 2009. ††Source: Federal Motor Transport Authority, KBA, as of Jan. 1, 2012. ‡Source National Platform for Electromobility, NPE, 2011. Photo credit: © Ulrich Dahl, TU press office.*



CONDITIONS FOR EV

Berlin is a leader in using environmentally friendly types of transportation. Roughly half of all Berlin's households do not have their own cars. This makes conditions favorable for intermodal mobility options and car sharing models, which target having a flexible choice for types of transport. The population here is curious and extremely open for encounters with these new mobility concepts and products.

GOVERNMENT ENGAGEMENT

NATIONAL* // 10 year car tax exemption. // Transferable license plates. // Company car taxation (in preparation).

STATE // Strategic overall conception: city development plan for transport. // Designation of laboratory areas. // Development of a uniform platform for information and data. // Conceptualized city 'map' for expanding the public charging structure. // Participation in future demonstration projects with state funds. // Conversion of the senate's vehicle fleet to sustainable drives.

FLEET STRATEGY

The state of Berlin supports implementing alternative drives in its fleets and has begun converting its state-run vehicle fleet to electric and plug-in hybrid vehicles. Various projects with e-fleets and e-car sharing are underway or are planned, for example: the Initiative 120 project, a concept for testing alternative drive systems in patrol cars at the Berlin police department.

**Source: Regierungsprogramm Elektromobilität,2011. Photo credit: © Michael Hadad Autohandel.*

EV SPOTLIGHT

E-CITY LOGISTICS

The E-City Logistics project has successfully demonstrated the potential for electrically powered commercial vehicles for delivery use within the city. Because of the low noise level of electric vehicles, delivery of goods can be extended to off-peak hours and nights, allowing for peak delivery traffic to be avoided.

BE MOBILITY

Establishing intermodal transport options based on electric drives is both a challenge and an opportunity for Berlin. The BeMobility project took the first steps toward integrating electric vehicles (e-cars, pedelecs) in public transport. The short term target is to introduce a mobility card, which will connect all the city's mobility options.

MINI E

The Mini E project tested controlled charging with more than 70 electric cars. The charging process of the Mini E was constructed so that the greatest possible amount of surplus wind energy was used, whether charging at home or at work. The wind-to-vehicle approach can add to grid stability and simultaneously charge electric cars with green electricity–a win-win for the city.

CONTACT

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A LEADING EUROPEAN ELECTROMOBILITY METROPOLIS

// Berlin is following its goal of becoming the leading metropolis for electromobility in Europe. The full value chain for electromobility is planned for the capital region: from research and development to production to usage and educational training.

// In order to reach this target, the Berlin Agency for Electromobility (eMO) was founded in Nov. 2010 by Berlin Partner and TSB Innovation Foundation Berlin. eMO pools all electromobility activities and promotes them, together with the state governments in Berlin and Brandenburg, the Confederation of Employer and Business Associations of Berlin and Brandenburg (UVB), as well as businesses and institutions from business and science.

// Here in Berlin, automotive companies and service providers join with energy suppliers to develop and test solutions for the transport of the future. University and non-university institutes conduct research in all areas, from storage technology and emissions balancing, to new concepts for drives, vehicles, production and use, to mathematically optimizing transport systems and developing scenarios for a mobile city in a carbon-free era.

// Today, there are "Electromobility Sites", where the public can experience and test electromobility and the new technology, with more locations around Berlin planned.

// Local, national and international cooperation will be targeted, intensified and expanded. This will take place on a political, economic and scientific level.

Eindhoven

BRABANTSTAD
THE NETHERLANDS

BELIEVERS IN THE ECONOMIC OPPORTUNITIES OF EVs

// BrabantStad includes five major metropolitan cities–Breda, 's-Hertogenbosch, Tilburg, as well as Eindhoven and Helmond–which were together designated the smartest region in the world by the Intelligent Community Forum, in 2011. With strong technological leadership and a strategic location, Brabant is a gateway to Europe.

// BrabantStad has built a strong position in the electric vehicle field. With its many companies and research institutions, the region is supporting the e-mobility industry, strengthening its economy and participating in projects around Europe.

// The five major cities of BrabantStad all suffer from issues of congestion and pollution. Because of its central location, Brabant plays a major role in European logistics, resulting in a densely used roadways and setting an ideal scene for the development and implementation of electric mobility solutions.

// These solutions are the results of optimal cross-sectoral partnerships. Leading companies and high-tech energy startups are working together on innovative projects for smart e-mobility and smart grids.

// The BrabantStad strategy follows three waves: 1) demonstrate feasibility of e-mobility through industry-led pilot projects; 2) develop charging infrastructure, electrify urban logistics (public transport, goods transport and waste collection transport) and organize EV and smart-grid living labs and; 3) grow a mature market without government intervention.

[SNAPSHOT] BRABANTSTAD

= 100,000 people = 100,000 vehicles

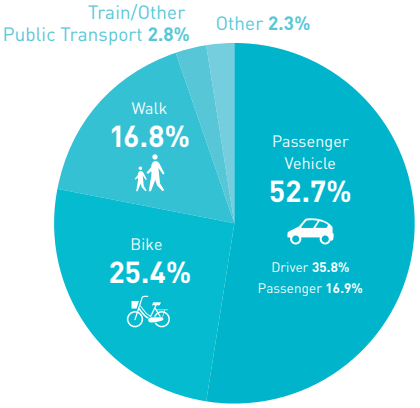
POPULATION

2,400,000

REGISTERED VEHICLES*

1,888,928

TRANSPORTATION MIX**



REGION SIZE†

5,000 km²

AVG. DAILY TRAVEL (KM)**

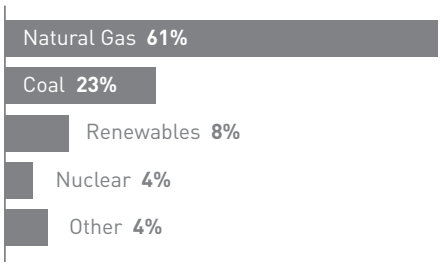
31.0

LIKELIHOOD: EV ADOPTION††

41% Yes | **59%** No

[COUNTRY CONTEXT] THE NETHERLANDS

ELECTRICITY MIX‡



NATIONAL EV TARGET

2015: 20,000
2020: 200,000
2025: 1 million

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
755 500 hybrid 50 plug-in hybrid 200 EVs 5 public buses	**1,500** EVs **500** e-bikes by 2014	**500**	**3,000** by 2014

**2011. **2009. †Includes: Breda, Eindhoven, Helmond, 's-Hertogenboschm, Tilburg and surrounding villages. ††2011 Accenture end-consumer survey on the electrification of private transport. ‡Source: IEA, 2009. All photos provided by Polotiek Online.*

INFRASTRUCTURE

NATIONAL STRATEGY // A leading role for the private sector in roll out of charging infrastructure. // The national government creates preconditions and tackles bottlenecks. // Deployment of charging points on public and private land and centered in focus area.

CURRENT CHARGING POINTS (NATIONALLY)	NORMAL CHARGING POINTS	FAST CHARGING POINTS
Public Land	1,250	14
Semipublic Land	576	
Private Land	699	
TOTAL	2,525	14

SPENDING AND FINANCIAL INCENTIVES

CITY // €100 million in public/private investment and tax benefits for EV drivers. **NATIONAL** // There are several tax measures to stimulate electromobility and up to €10 million is available up to 2015 to implement the national Action Plan. The plan contains a range of activities to stimulate electromobility in focus areas and viable market segments, to strengthen international collaboration and partnerships, and to roll out communication, research and monitoring. Besides this general economic policy, the national government offers opportunities to stimulate electromobility and aims to participate in European projects and welcomes opportunities for cooperation with other countries.

FLEET STRATEGY

The major cities and the province of Brabant currently include EVs in their fleets have plans to increase their share. Together with market companies, they will execute an active policy to expand the number of charging stations and EV's in company fleets. Enexis, an independent grid operator, and Essent, an energy supplier, are frontrunners in Brabant.

EV SPOTLIGHT

PUBLIC CHARGING IN EINDHOVEN

The City of Eindhoven has taken the lead in developing public charging infrastructure and in installing public charging points in conjunction with the E-laad Foundation, a partnership between energy network operators who maintain public charging stations on a nationwide scale. Other cities in the region are following Eindhoven's strategy.

EMISSIONS-FREE PUBLIC TRANSPORT

With approximately 500 public buses driving through Brabant each day, the province is organizing a transition to an emissions-free public transit system by the year 2020. In 2011, the province had five electric buses and plans to expand to 15 buses in 2013, which will provide an opportunity to identify new business cases and analyze the need for expanding the charging infrastructure.

SHARED FLEET: PALEISKWARTIER

In the Paleiskwartier district of 's-Hertogenbosch, local companies and institutions have created a shared fleet of different types of electric vehicles to increase the durability of the district and test the first smart charging system. This is the first Dutch project with a shared EV fleet. *To learn more, visit elektrischautodelen.nl or paleiskwartier.nl*

BRABANT: A TRIPLE HELIX

// Local test beds are key to Brabant's approach. They create an artificial market in which a "Triple Helix" of industries, knowledge institutes and government work together to develop expertise and knowledge in an open innovation environment.

// Based on this approach, regional actors and other stakeholders can develop a strong export position. BrabantStad supports the development and implementation of electric mobility solutions not only by creating demand but by incorporating the support of a technology-driven industry. With its strong background in electronic mechanics, semiconductors and industrial automation, BrabantStad is the ideal site to develop technologies for suppliers within the e-mobility industries.

// The regional capital 's-Hertogenbosch is creating test-bed markets for varying forms of electric vehicle technology, such as inductive charging in inner-city zones. The primary focus is on relatively small vehicles. In return, the city, the local bus company and other companies gain knowledge on issues like system failures, cost and maintenance.

// The ultimate aim is to export these ideas and products worldwide, creating new jobs locally and producing profits for both government and companies.

// Brabant invites companies, knowledge institutes, educational institutes and governments around the world to collaborate on smart grids and mobility in an open environment.

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GOTO ISLANDS
NAGASAKI, JAPAN

CREATING DRIVING TOURS OF THE FUTURE

// In 2009, the Nagasaki Prefecture established the Nagasaki EV&ITS Consortium, a collaborative effort by industry, academia and government to promote EVs and intelligent transportation systems (ITS) throughout Nagasaki. The introduction of electric vehicles on the Goto Islands makes it possible to experience a society where EVs operate widely in daily use. This unique project offers an opportunity to consider what such a society needs, including charging infrastructure, effective operating methodologies, and services. The goal of the EV&ITS project is to create "Driving Tours of the Future" by incorporating EVs and ITS technology into the local tourism industry.

// Nagasaki is working with local residents to develop new ideas such as tourist services with navigational guidance, new EV development by local industries, the utilization of renewable energy such as solar or wind power, and the establishment of a system for regional smart grid integration with EVs. The goal is to help create new businesses and industries, and revitalize the local economy and society.

// The project was launched to strengthen collaboration between local industries and universities, creating a Nagasaki-originated global standard and a Nagasaki-originated regional business model. To help achieve the "Driving Tours of the Future," Nagasaki Prefecture is resolved to have the Goto Islands listed as a UNESCO World Heritage Site for its commitment to ecological preservation, and leverage its special status as an island group.

Photo provided by METI (Ministry of Economy, Trade and Industry).

[SNAPSHOT] GOTO CITY & SHINKAMIGOTO TOWN*

= 100,000 people = 100,000 vehicles

POPULATION

62,696

Decreasing Population: > 50% in 40 years
Ratio of Population Older than 65: 33.4%

TOURISTS PER YEAR

358,361

REGISTERED VEHICLES

39,542

CITY SIZE

634.87 km²

DISTANCE FROM MAINLAND

60-100km

In/Outbound Transport: Air, Jetfoil, Ferry, etc.

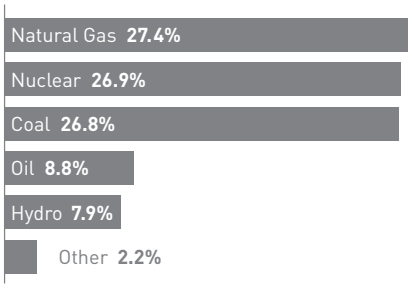
CO2 EMISSIONS (VEHICLES)

Other	Transportation
61.1%	38.9%

282,318 tons total (2008)

[COUNTRY CONTEXT] JAPAN

ELECTRICITY MIX**



CURRENT EVs/PHEVs

2,446+

EV/PHEV TARGET (2020)

20%

(sales target, all vehicles sold)

CHARGING TARGET (2020)

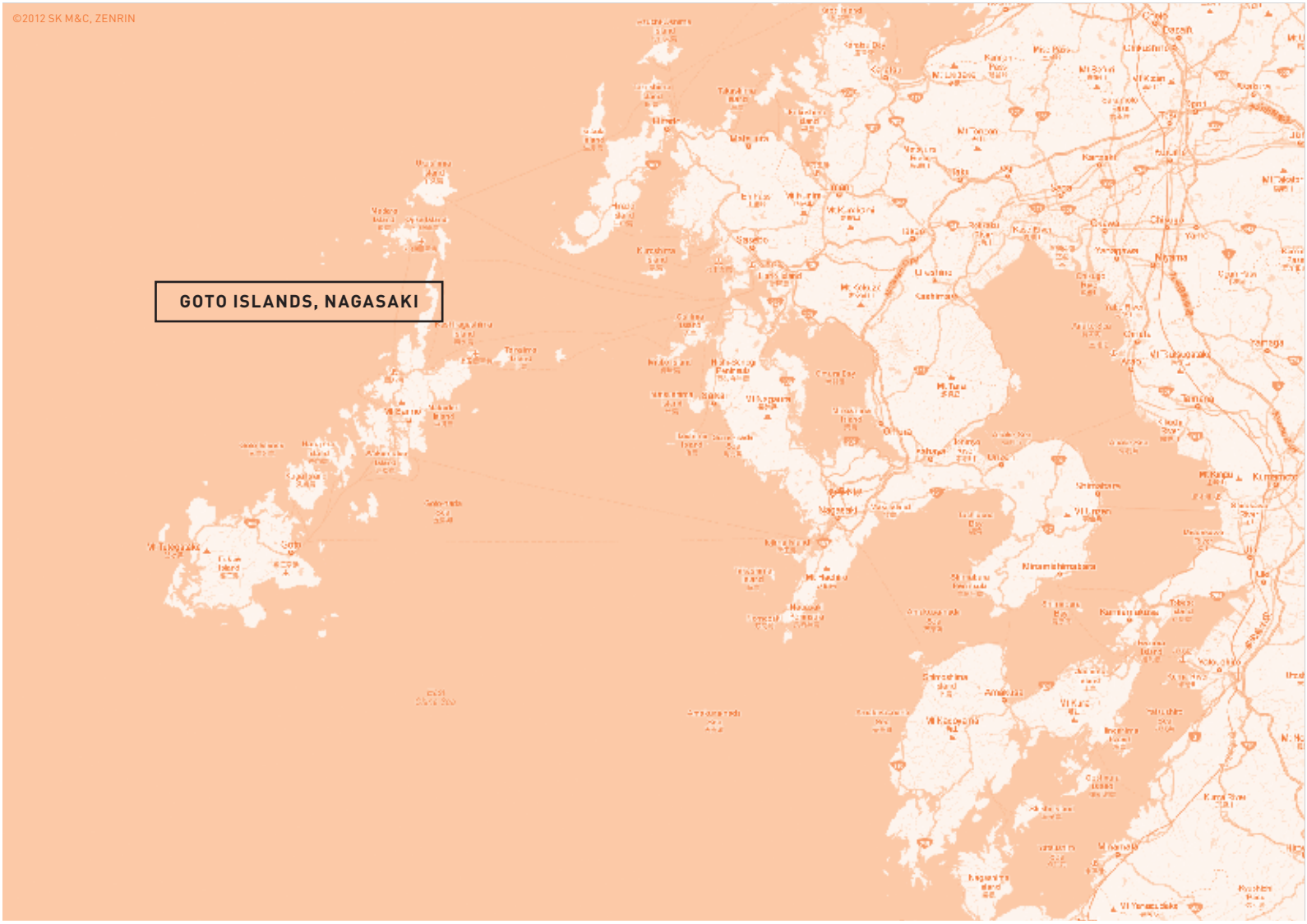
NORMAL **2 million**

FAST **5,000**

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
155 EV+PHEV 287 EVs/PHEVs Nagasaki Prefecture Dec. 2011	**500** EV+PHEV Nagasaki Prefecture by 2013	**12** Quick Charges (Goto) 19 Nagasaki Prefecture Dec. 2011	**40** Quick Charges Nagasaki Prefecture by 2013

**Unless specified, "City Snapshot" information is from 2010. *Source IEA, 2009. Photo provided by METI (Ministry of Economy, Trade and Industry).*


©2012 SK M&C, ZENRIN
GOTO ISLANDS, NAGASAKI

EV SPOTLIGHT

EV RENTAL CAR SUCCESS

About 35,000 people experienced EV rental cars from April 2010 through January 2012 (16,000 trips). In the highest season (August 2011), use reached to 398 rentals in one week (90.2 percent of all vehicles rented). The highest quick charger use was 19.9 charges/day at the Fukue Island port in August 2010, which made for a "charging queue," but now sufficient numbers of charging spots are available on the Goto Islands.

FUSION PROJECT

A smart-grid project, Fusion Project, was organized by Professor Nishi at Keio University and executed as a national project by the Ministry of Internal Affairs and Communications to demonstrate integrated control of various demand and supply sources by proposing "meta-standardization" of communication protocols.

EV PARADE SETS GUINNESS WORLD RECORD

On July 3, 2010, 100 EVs from Goto City and Shinkamigoto Town paraded around Fukue Island. The parade was certified as the world's longest for electric vehicles by Guinness World Records.

INFORMATION TRAFFIC SYSTEM (ITS) SPOTS

In order to utilize a limited numbers of chargers and to create the smartest service for EV drivers, ITS spots are now installed at charging spots to provide tourists with local information. This integrated tourism information platform provides locally collected information based on IP content, which can be provided simultaneously to other info devices.

CONTACT

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MORE INFORMATION

pref.nagasaki.jp/ev/ev&its/

All photos on this page provided by METI (Ministry of Economy, Trade and Industry).

NAGASAKI EV & ITS CONSORTIUM

// The Nagasaki EV & ITS Consortium started with 99 members from the auto industry, infrastructure providers, academies, associations, local companies, cities and towns, and observers from governments, other prefectures and cities, and has since grown to 200 members.

// The consortium discusses technical and functional specifications for the practical introduction and operation of EVs and ITS tourism and conducts demonstrations of connecting EVs to the grid. The creation of a global standard and a regional business model from the islands is another goal of the project.

// Goto Islands provide a thriving EV ecosystem with 155 EVs and PHEVs, 24 units of quick chargers at 12 spots, and locally developed ITS information systems. EVs and PHEVs are mainly used for rental cars and taxis for tourists and people can freely ride, and drive EVs and PHEVs on all of the islands. Quick chargers and ITS spots are installed at sightseeing locations and take into account spatial distribution and waiting time for charging.

HAMBURG GERMANY

A CENTER OF INNOVATION IN SMART MOBILITY AND GREEN ENERGY SUPPLY

// With more than 350 BEVs already in operation at the end of 2011, the City of Hamburg and many partners from industry, local enterprises and public entities have made a strong contribution to the German Federal Government's plans to establish the country as the prime market for e-mobility and as the global lead supplier in electric cars and components.

// Hamburg's trade and industry have a clear commitment to green their daily operations. The vital network of corporate partners with their commercial fleets offers a unique chance to share knowledge on how to gradually incorporate EVs into conventional fleets. The situation in Hamburg indicates a sound demand for more vehicles in the years to come, helping to reach a critical mass in development and production. Moreover, EV deployment poses quite a number of new challenges for urban planning strategies and transportation policies. The Hamburg Senate, the local state government, launched an ambitious masterplan in November 2011. This not only includes the extension of the ongoing implementation strategy but also maps out several assignments to the municipal entities, such as promoting EVs in municipal fleet procurement, installing charging spots at public buildings, and considering EV-driven concepts in tender procedures, for example, offering public plots.

// With regard to charging infrastructure, Hamburg has constituted three binding rules: 1) charging stations on public ground have to be in line with urban layout and city architecture; 2) they have to be accessible for all EV users without implying a customer relationship between provider and user ("discrimination-free") and; 3) they focus on 100 percent green energy from renewable sources. This clear commitment to power electric vehicles exclusively with electricity from additional renewable sources is best practice in environmental policy and will boost acceptance of this new technology.

Photo provided by the City of Hamburg.

[SNAPSHOT] HAMBURG

= 100,000 people = 100,000 vehicles

POPULATION

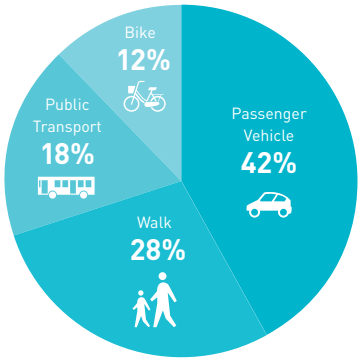
5.1 million

1.8 in city
5.1 million in Hamburg region

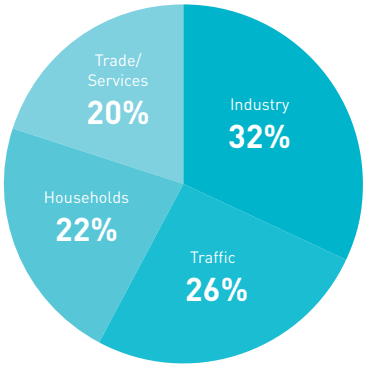
REGISTERED VEHICLES

834,000

TRANSPORTATION MIX*



CO2 EMISSIONS



CITY SIZE†

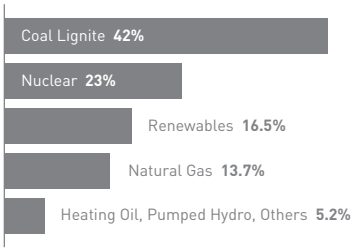
755 km²

AVG. DAILY TRAVEL (KM)**

32.0

[COUNTRY CONTEXT] GERMANY

ELECTRICITY MIX**



CURRENT EVs/PHEVs

4,541

EV/PHEV TARGET

2020: 1 million

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
350 268 passenger EVs 80 light duty EVs 5 hybrid buses (end of 2011)	**15,000** 10,500 passenger EV/PHEVs 4,300 light/heavy duty EVs 50 hybrid buses by 2015	**100** public **100** corporate	**600** public **600** corporate

**Source: City of Hamburg, 2012. **Federal Association of the Electricity and Water Industry (BDEW). †Federal Motor Transport Authority, KBA, as of Jan. 1, 2012. ††Source National Platform for Electromobility, NPE, 2011. Photo provided by the City of Hamburg.*

FLEET STRATEGY

PUBLIC PROCUREMENT // As of today, there are 60 EVs in municipal fleets (state departments, public institutes, municipal companies), with plans for up to 500 EVs/PHEVs by the end of 2015.

COMMERCIAL FLEETS // There is continuous introduction of EVs in the existing cluster patterns (logistics, aviation, maritime, renewable energy) and in specific branches of trade (e.g. media agencies).

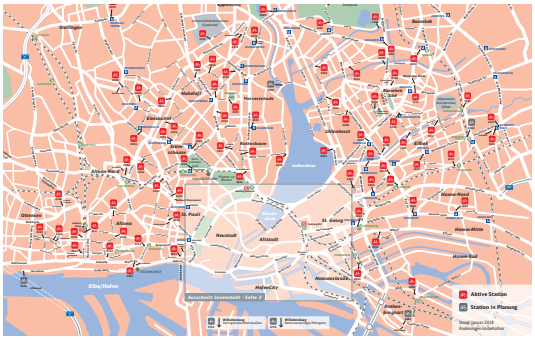
INNOVATIVE CONCEPTS: HAMBURG TRANSPORT SYSTEM

EV FLEETS (100 PUBLIC CHARGING SPOTS)

CAR SHARING: E-FLINKSTER

EV INFRASTRUCTURE INTEGRATION

STADTRAD (PUBLIC BIKE SYSTEM)



"Fleet Strategy" photo provided by the City of Hamburg. Photo credits: "Innovative Concepts Hamburg Transport System" (clockwise from top left): 1) Provided by the City of Hamburg. 2) DB Rent; 3) Hamburger Abendblatt; 4) Provided by the City of Hamburg.

EV SPOTLIGHT

CREATING STRONG PARTNERSHIPS

Fully aware of today's early market phase, policy-makers, industry, academia and local authorities in Hamburg are working hand-in-hand to establish a joint local strategy for EV deployment. This dialogue-based approach, which brings together companies, trade associations, the scientific community and social players, focuses not just on R&D-issues, but places much emphasis on the demand side, business cases and the economical feasibility of a broad-range implementation strategy for EVs and the respective mobility and energy schemes.

URBAN DEVELOPMENT INTEGRATION

Urban planning in Hamburg is greatly impacted by the broad diversification of mobility patterns, including: the adoption of car sharing; public bike systems (resulting in increased need for bike paths); the extension of public transport routes; and the need for a public EV charging infrastructure. // Hamburg has a clear strategy for EV adoption, smart development of urban structures, environmental and climate protection, competitiveness and economic viability. This political approach also includes the implementation of e-mobility schemes in housing programs, spatial planning and district development.

ONE STEP AHEAD: WIRELESS CHARGING

While Hamburg is not home to traditional automotive industries, there is great potential for EV innovation as Hamburg-based industrial companies from the intralogistics sector (Still, Jungheinrich, Linde), which have substantial knowledge in manufacturing electric motors and components. A growing network of partners has developed a comprehensive approach to provide converted e-cars and to testing and establishing innovative charging modes. Inductive energy transmission via the front number plate is one pathbreaking application \that could gain more significance in the near future.

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hysolutions-hamburg.de

All photos on this page provided by the City of Hamburg.

BENEFITS OF EV DEPLOYMENT

LOCAL KNOWLEDGE BUILD-UP

- Local dealers carry out maintenance and small repairs; they improve their handling with electric components
- Car users get experienced as early adopters and get familiar with this new technology
- Entrepreneurs take the risk of founding a new business and create new jobs
- Substantial framework policies like regulations for privileged parking, etc. are developed
- Business models are established on a business-to-business and business-to-consumer level

LESSONS LEARNED

- Demonstrate technical feasibility
- Identify barriers
- Implement innovative solutions
- Create local added value
- Launch first business models

HELSINKI FINLAND

NEW E-MOBILITY BUSINESS THROUGH THE TEKES EVE PROGRAM COMMUNITY

// Finland is the perfect location for e-mobility development due to its top class IT and engineering competence. The country's functional infrastructure and harsh weather conditions create optimal conditions for demanding testing environments.

// The Electric Vehicle Systems programme (EVE) was created to support the community of electric vehicle and support system developers with close contacts to international research and business networks. The program also focuses on developing test environments and standards for the industry.

// Four of the five consortia of the EVE program are focused on passenger traffic and related systems. The fifth develops electric vehicle technologies and services in commercial use.

// The EVE program akes advantage of the close cooperation of the Finnish research institutes and enterprises to create an outstanding international community of e-mobility businesses.

[SNAPSHOT] HELSINKI

= 100,000 people = 100,000 vehicles

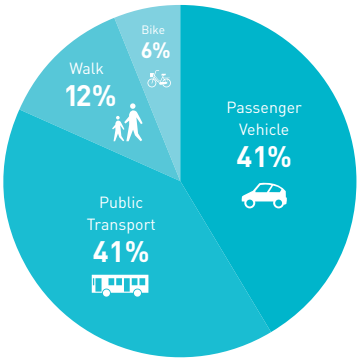
POPULATION

1 million+/-

CITY SIZE

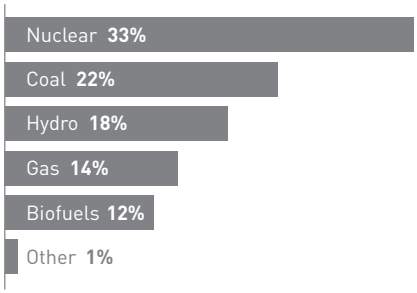
765 km²

TRANSPORTATION MIX*



[COUNTRY CONTEXT] FINLAND

ELECTRICITY MIX**



CURRENT EVs

120 (some PHEVs in test use)

EV/PHEV TARGET

2020: 80,000

(base estimate, no official target)

SPENDING & FINANCIAL INCENTIVES

The vehicle taxes are lower for low carbon dioxide emission vehicles. The state is investing totally about 40 MEUR to the development of electric vehicle systems.

INFRASTRUCTURE

Charging stations have been installed in public places like shopping centers, office buildings, parking houses etc. No special target is set for the infrastructure. However the infrastructure is developed as a part of the national electric vehicle system programme.

**Source: Urban Audit, 2004 **Source: IEA 2009*

EV SPOTLIGHT

EVC: HELSINKI'S COMMERCIAL ELECTRIC VEHICLE PROGRAM

Helsinki's EV program takes a "living laboratory approach" to discovering the best solutions for integrating electrical vehicles into society. This approach provides an open laboratory for the users interested in EV-related businesses. VTT Technical Research Centre of Finland is leading Electric Commercial Vehicles (ECV), a nationwide test platform for electric vehicles and their systems and components. As VTT's flagship initiative, the program seeks to introduce electric buses into Helsinki city traffic and support R&D of traction batteries. // ECV will create a large and versatile world-class research and testing infrastructure for electric commercial vehicles, encompassing a broad scope of vehicles from buses, vans and trucks to light and heavy working machinery. The project unites most of the Finnish companies and research centers working in this area. The main research topics of ECV are: 1) hybrid and full electric buses, light and heavy mobile machinery, electrochemical energy storage and other electrical components; 2) the innovation chain from design and performance of individual components, to the combination of components into subsystems, to systems as part of the EV and separate from the EV; 3) laboratory testing of components, systems and vehicles, and simulation and modelling at all levels; and 4) field testing, analysis and performance evaluation. // Veolia Transport Finland is a key player and is working with VTT to start up the first electric bus field test in Finland. Veolia Transport Finland will operate commercial battery electric buses in Espoo, and VTT will support the project with in-depth performance evaluations. In addition, an electric research bus was built to facilitate component development and bench-marking. For example, an extensive battery test lab is operated next to the electric bus R&D activities. Severe real-life operating conditions and the comprehensive setup of the project have attracted an impressive list of both Finnish and international industrial partners.

VALMET AUTOMOTIVE

// Valmet Automotive is a global service provider for the automotive industry and a forerunner in electric mobility. The Finland-based company is a partner of the American automotive company, Fisker Automotive, in engineering and manufacturing the luxury electric vehicle, Fisker Karma. Valmet Automotive participates in projects and initiatives aimed at advancing EV technology and developing test environments for gathering data from the real life operation of the new technologies.

// Valmet Automotive is an experienced provider of automotive engineering, vehicle manufacturing, convertible roof systems and related business services. The company's focus areas are premium cars, convertibles and electric vehicles. Valmet Automotive currently employs 1,700 professionals in Finland, Germany, Poland, Sweden, China and the U.S.

Photo credits (in order of appearance on page): 1) A123 Systems; 2) Provided by VTT Technical Center of Finland.

EV SPOTLIGHT

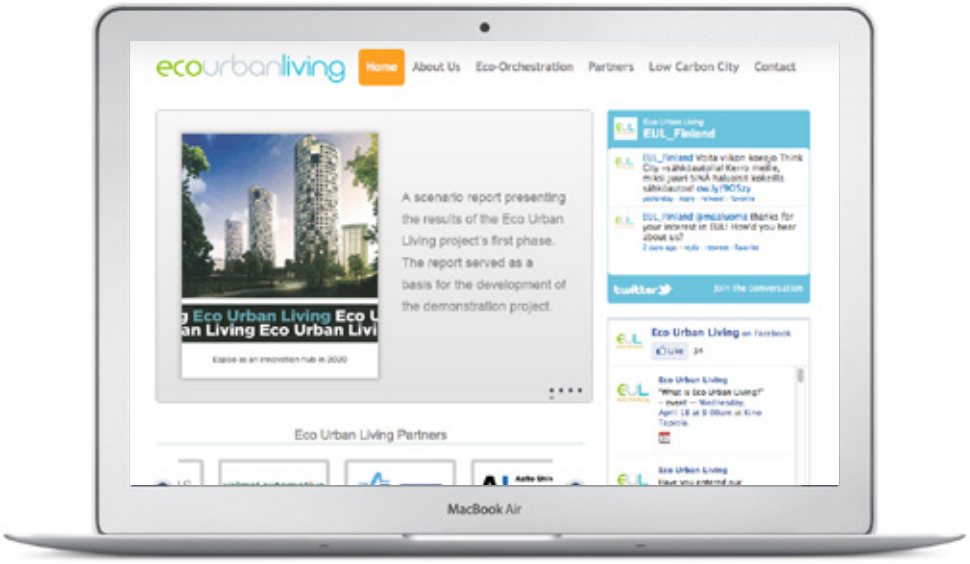
OPEN PLATFORM COLLABORATION

The Eco Urban Living initiative (EUL) is a development platform for new urban development and electromobility-related technologies. The EUL aims to research, test and demonstrate the features and functionality of fully electric vehicles as well as the economic feasibility of related components, including various charging solutions. The initiative operates on an open platform, allowing for the development and utilization of all types of equipment and services.

// EUL is comprised of several components: 1) EV Technology, 2) Customer Dialogue, 3) Market Making Ecosystems, and, 4) World Alliance for Low Carbon Cities.

// EUL promotes the development of new EV-related technologies and services as well as strengthens international networking in support of rapid commercialization of the demonstration results as well as their utilization both nationally and internationally. Thus, the initiative has three dimensions: regional, research-oriented and commercial.

// Participants in EUL include: leading cities; companies such as Synocus and Valmet Automotive; public sector organizations, university and research institutes, such as Aalto University, the Technical University of Lappeenranta, Hanken School of Economics, and the Technical Research Centre of Finland (VTT) as well as the City of Espoo–all with strong international networks to ensure that the research contributions will lead to concrete results and effective solutions. // *For more information, visit eco-urbanliving.com or email: Henrik.Hultin@synocus.com or Jussi.Hulkkonen@synocus.com*



ECO URBAN LIVING: OPEN PLATFORM COLLABORATION

Electric Traffic Helsinki Test Bed (Electrictraffic.fi) is an R&D and networking project that looks into the design of services within an electric traffic ecosystem of the future. Behind the project is a unique private-public partnership between 20 Finnish and international companies, five cities, three educational and research institutes as well as local and national authorities. Electricttraffic.fi is the largest of Tekes EVE program projects and one of World Design Capital 2012 Helsinki projects.

// The companies behind the project include energy companies like Siemens; Fortum and Helsingin Energia; infranet solutions provider Eltel Networks; charging equipment manufacturer Ensto; construction group Lemminkäinen; electrical components wholesaler SLO; vehicle importer Veho; retail, grocery store and restaurant operator HOK-Elanto–and many others.

// The project's focal points are the services EV users need and the infrastructures behind them. The project companies are building a fully-functional EV ecosystem in the Helsinki capital area–including a test fleet of several hundred EVs–that allows an EV driver to take advantage of all the charging points of different electricity providers without the need of becoming a direct client of them all.

// To learn more, please visit electrictraffic.fi or email Elias.Poyry@eera.fi.

KANAGAWA JAPAN

KANAGAWA CREATES MEASURES TO PROMOTE EVs

// **BASIC POLICY** Kanagawa Prefecture (K.P.G.) features many automobile and battery production facilities, as well as several universities and institutes that are conducting research and development of automobile technology and power generating units. In 2006, the Kanagawa EV Promotion Council, comprised of government, K.P.G., industry and academia, was established to develop and promote the EV technology. The Council has continued deliberations on concrete measures for EV promotion.

// In March 2008, the Council created the Kanagawa EV Promotion Measures. These measures established the goal of increasing the use of EVs to 3,000 in the prefecture by FY2014, and to present programs to be undertaken by the national government, K.P.G., and various businesses. In order to promote EVs, K.P.G. launched EV Initiative Kanagawa and began installing charging stations.

// **OBJECTIVE** Based on sales of previous hybrid vehicles, which reached 3,000 within five years of their introduction to the market, Kanagawa set a target of 3,000 EVs by 2013. The objective is to create an environment where the rate of electric vehicle sales will equal or surpass hybrid adoption.

// **RESULTS** As of December 31, 2011, Kanagawa has more than 2,100 EVs. As of January 31, 2012, the prefecture has 109 DC quick chargers and 341 100/200V outlets.

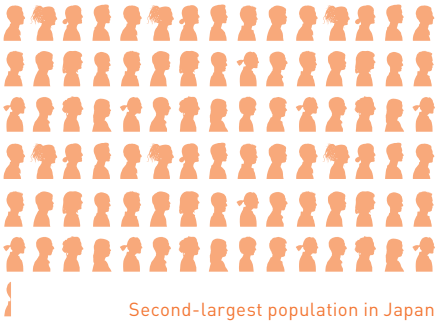
Photo credit: Kanagawa Prefectural Tourist Association.

[SNAPSHOT] KANAGAWA

= 100,000 people = 100,000 vehicles

POPULATION

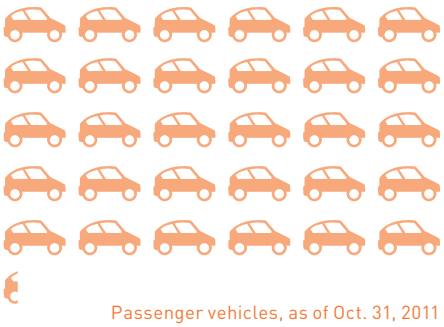
9,061,898



Second-largest population in Japan

REGISTERED VEHICLES

3,055,966



Passenger vehicles, as of Oct. 31, 2011

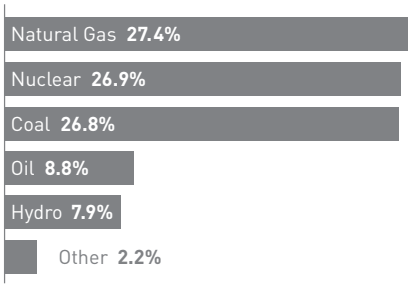
CITY SIZE

2,415.86 km²

6th smallest prefecture in Japan.

[COUNTRY CONTEXT] JAPAN

ELECTRICITY MIX*



CURRENT EVs/PHEVs

2,446+

EV/PHEV TARGET (2020)

20%

(sales target, all vehicles sold)

CHARGING TARGET (2020)

NORMAL **2 million**

FAST **5,000**

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
2,183	3,000	109 Quick Battery Chargers 341 100/200V Outlets	100 Quick Battery Chargers 1,000 100/200V Outlets
Dec. 31, 2011	by FY2013	Jan. 31, 2011	by FY2013

**Source IEA, 2009. Photo credits: Kanagawa Prefectural Government.*

INCENTIVES

K.P.G. provides subsidies, tax breaks and other incentives to reduce initial user burden and to improve convenience. The national government provides a subsidy equal to 50 percent of the cost differential between an EV and a gasoline vehicle. In addition, K.P.G. tops up the other half of this subsidy and provides tax relief for automobile tax (for five years) and automobile acquisition tax by 100 percent. // Additional incentives include half-price discounts for prefectural tolls and parking lots under the jurisdiction of K.P.G. and half-price discounts for expressway tolls within the prefecture.

CHARGING INFRASTRUCTURE

K.P.G. aims to install 100 DC quick chargers in the prefecture by the end of FY2014. In order to achieve this target, K.P.G. is providing subsidies to the companies who will install DC quick chargers at gasoline stations, convenience stores, shopping centers, etc. // K.P.G. established a target of installing 1,000 100/200V outlets by FY2014.

	DC QUICK CHARGERS	100/200V OUTLETS
Current (as of Jan. 31, 2012)	109	341
Target FY2014	100	1,000

EV SPOTLIGHT

CITIZEN AWARENESS MEASURES

In cooperation with the members of the Kanagawa EV Promotion Council, K.P.G. holds events where participants can test-drive EVs. This enables K.P.G. to examine and implement model projects and to give prefectural citizens the opportunity to experience the high performance of electric vehicles.

HAKONE EV TOWN PROJECT

Hakone is famous for its hot springs–over 20 million people a year visit from Japan and abroad. K.P.G. and the town of Hakone aim to create an EV showcase and transform Hakone into a low carbon community. As part of this plan, K.P.G., Hakone Town and private organizations are working with hotels, businesses, sightseeing spots, museums, golf courses, restaurants, etc., to install EV chargers (mainly 200V) for their guests. In addition, Hakone Town will feature a sightseeing EV taxi service as well as EV, and e-bike, rental sharing programs.

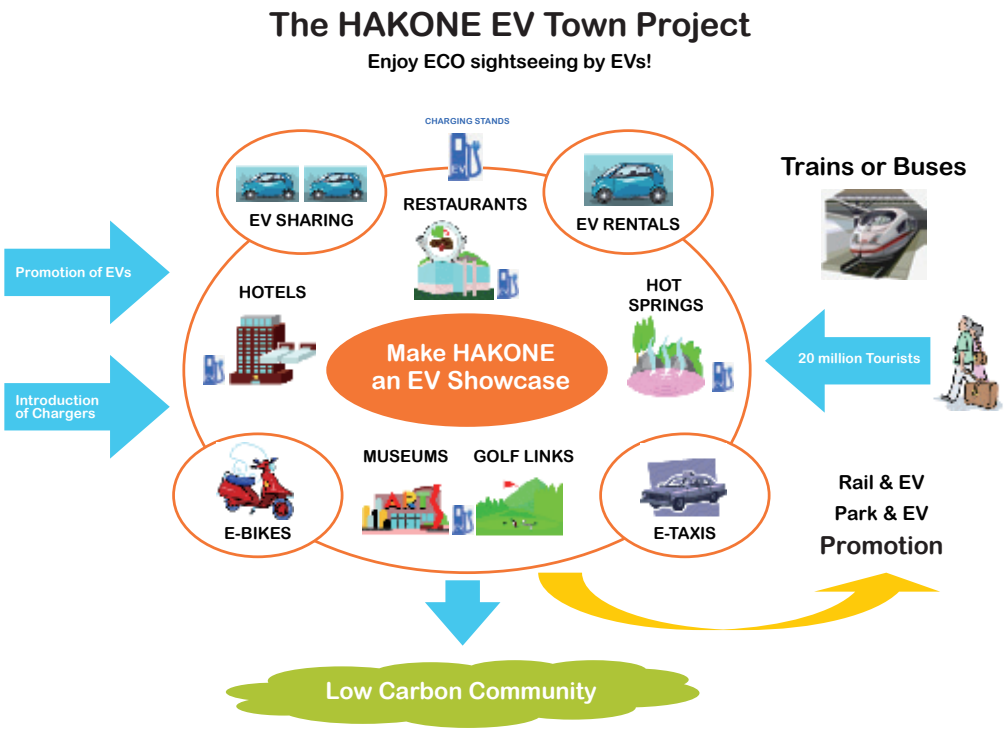


Photo credits (in order of appearance on page): 1) Kanagawa Prefectural Government; 2) Kanagawa Prefectural Tourist Association; 3) Kanagawa Prefectural Government.

NISSAN LEAF SUBSIDY EXAMPLE

Sale Price	3.7M ¥
LESS Nat'l Gov't Subsidy	-.78 M ¥
LESS K.P.G. Subsidy	-.39 M ¥
FINAL PRICE*	**2.60 M ¥**

*Does not account for additional savings due to municipal subsidies, tax reductions, reduction in fuel costs, etc.

CONTACT

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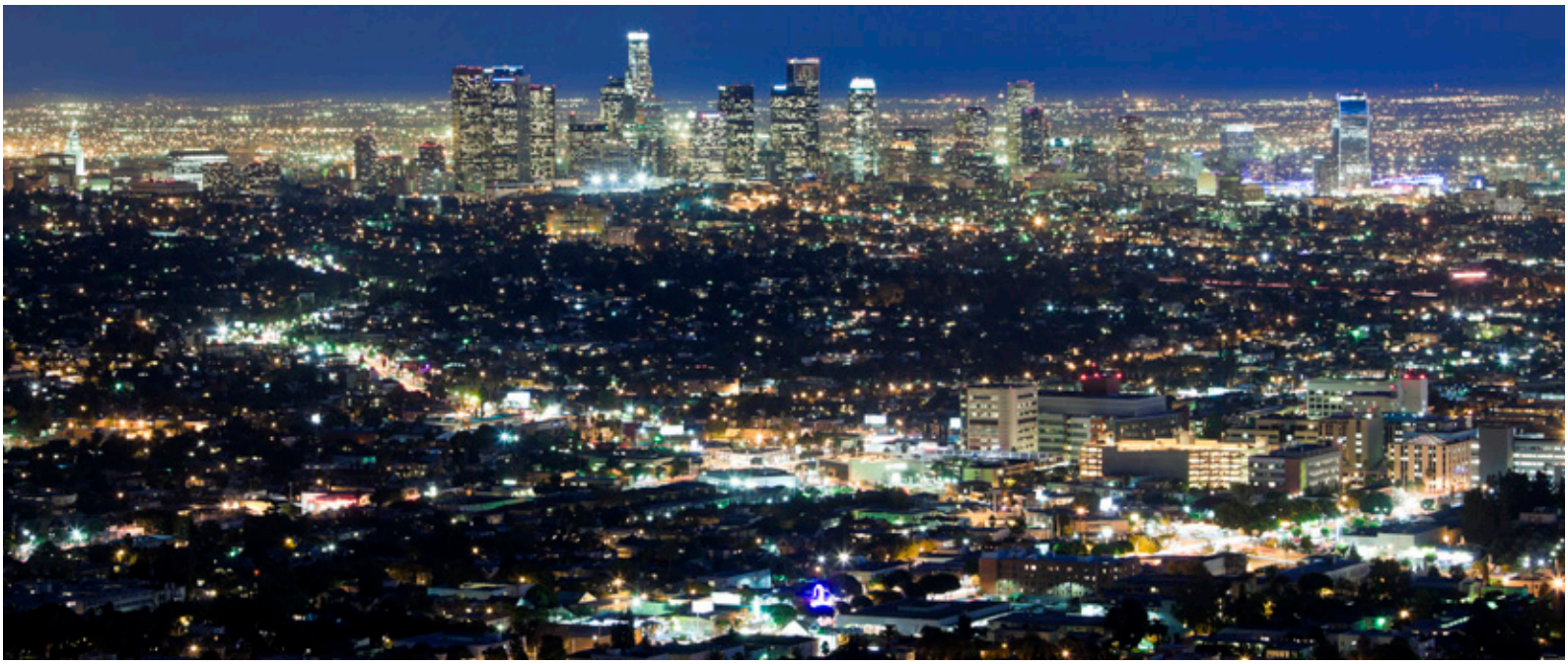
New Energy and Global Warming Counter-Measures Department, Environment & Agriculture Bureau

Kanagawa Prefectural Government

ev3000@pref.kanagawa.jp

MORE INFORMATION

pref.kanagawa.jp/cnt/f4259/



LOS ANGELES
CALIFORNIA, USA

BUILDING UPON A LEGACY OF COMMITMENT TO PEV TECHNOLOGY

// The City of Los Angeles is often known as the 'car capital of the world.' Mayor Antonio Villaraigosa is firmly committed to plug-in vehicle technology, building upon the city's historic EV deployment in the 1990s from which there remains a handful of vehicles and 117 public access legacy chargers. Mayor Villaraigosa aims to turn the City of L.A. into the PEV car capital of the world, and LA is already demonstrating national and international leadership in this space.

// Why PEVs? In Los Angeles, the deployment of plug-in vehicles is grounded firmly in the understanding that this technology will further enable the city to reduce GHG emissions from transportation, improve regional air quality, and drive local and national economic growth.

- On-road vehicles represent 43 percent of the City of Los Angeles' emissions, including carbon dioxide.
- While smog and soot levels have dropped significantly in Southern California over the last decade, the Los Angeles region still has the highest levels of ozone in the United States, violating federal health standards an average of 137 days a year.
- EVs currently produce 71 percent fewer emissions per mile than gas vehicles; PHEVs produce 48 percent fewer emissions per mile than gas vehicles (both based on California's grid mix). L.A.'s use of renewable energy is growing dramatically, reaching 20 percent in 2010, with the goal of 33 percent by 2020.
- With a municipally-owned utility, money previously exported through gasoline sales will now remain in the city and region. In addition, in 2010, Los Angeles also became headquarters to two electric vehicle manufacturers: BYD and CODA, and numerous other companies in the EV and EVSE supply chain.

[SNAPSHOT] LOS ANGELES

= 100,000 people = 100,000 vehicles

POPULATION

4,100,000

REGISTERED VEHICLES

2,500,000

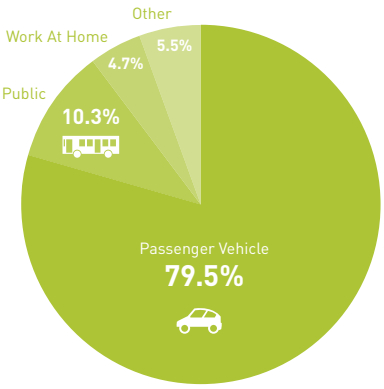
CITY SIZE

470 mi²

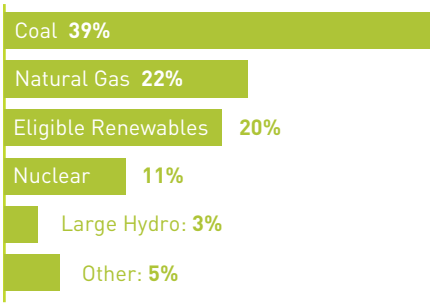
AVERAGE DAILY TRAVEL (MI)*

23.0

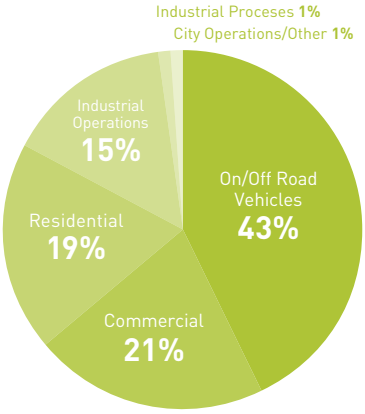
TRANSPORTATION MIX**



ELECTRICITY MIX



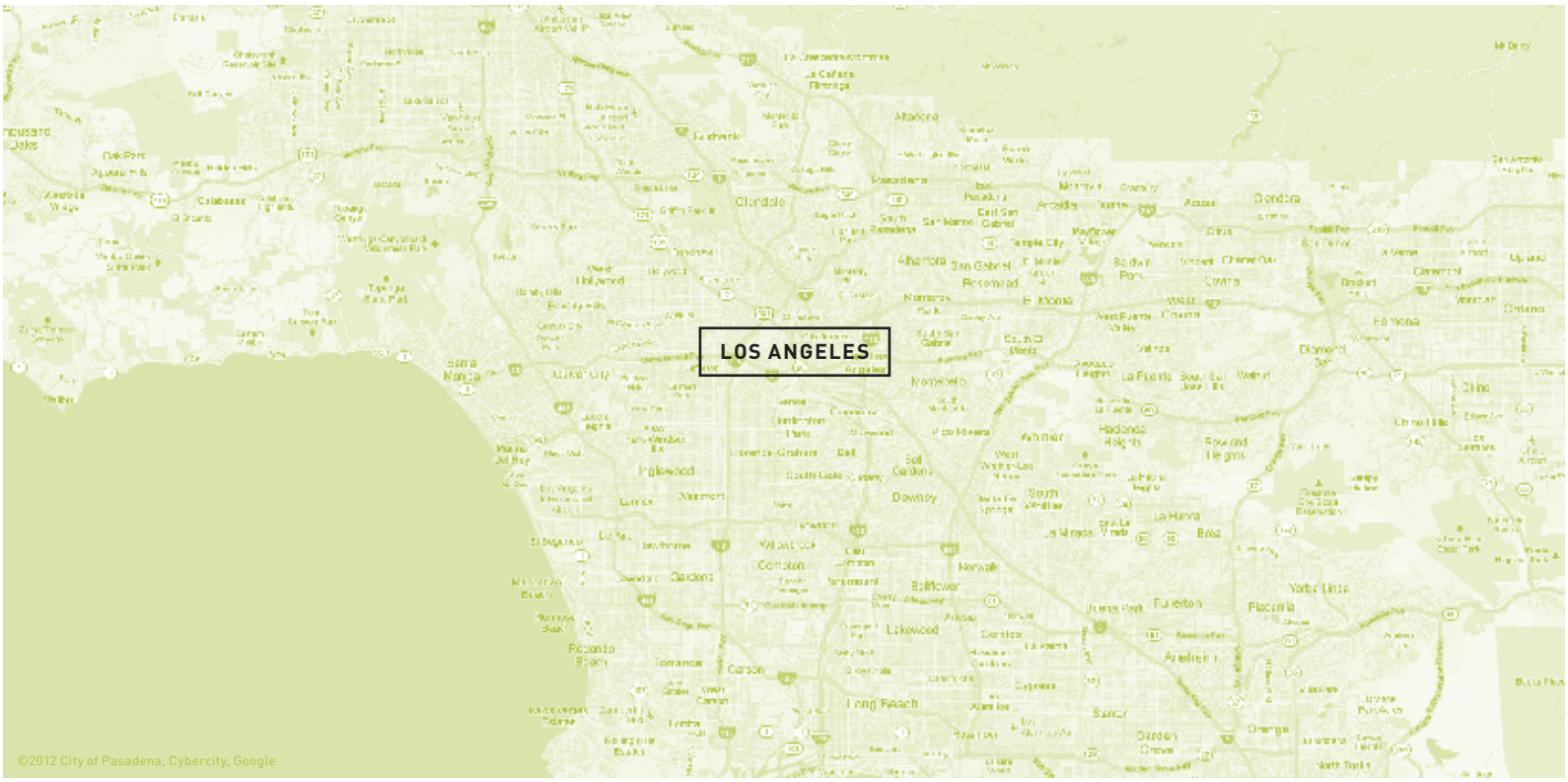
CO2 EMISSION MIX



EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
2,000	80,000† State Target: 1.4 million by 2015	106††	Undetermined

Source (Average Daily Travel): Federal Highway Administration. Source (Transportation Mix): The City of Los Angeles Transportation Profiles, 2009. †Source (EV Tomorrow): Realizing the Potential of the Los Angeles Electric Vehicle Market, Juan Matute, UCLA Luskin Center for Innovation. ††Source (EVSE Today): Advanced Fuels & Advanced Vehicles Data Center. EV & EVSE Status photo provided by the City of Los Angeles.*



SPENDING AND FINANCIAL INCENTIVES

NATIONAL // The federal government currently offers a tax credit of up to $7,500 for PEV purchases. **STATE** // The California Air Resources Board (CARB) is revising the Zero Emission Vehicle (ZEV) mandate to include GHG reduction; and the Low Carbon Fuel Standard (LCFS) will mandate a 10 percent reduction in average fuel carbon intensity for all fuels distributed by 2020. // The state offers a vehicle purchase rebate (through CARB) of up to $2,500. // Single-occupant Zero-Emission Vehicles allowed in HOV lanes.

E-BUSES AT LAX

On October 25th, 2011, BYD officially opened its L.A. headquarters. That day the company also announced a partnership with Hertz Car Rental, providing the first long-range all-electric eBUS shuttle bus fleet at Los Angeles International Airport and the first all-electric vehicles for their Los Angeles rental fleet. These all-electric buses not only dramatically reduce emissions, but also result in an estimated savings of up to $500,000 over the lifetime of each vehicle.

E-TRUCKS AT THE PORT OF LA

In 2009, the Port of Los Angeles took delivery of 25 heavy-duty, all-electric drayage trucks ordered from Balqon Corp. The truck–the first of its kind at any port worldwide–can pull a 60,000-pound cargo container at a top speed of 40 mph, and has a range between 30 to 60 miles per battery charge. Included in the provisions of its electric truck order, the port required Balqon Corp. to locate its factory in the City of Los Angeles and pay the port a royalty for every electric truck it sells or leases worldwide. Those funds will be used to advance other Port Technology Advancement Program initiatives.

"E-Bus" and "E-Truck" photos provided by the City of Los Angeles.

EV SPOTLIGHT

SOCAL EV

Los Angeles is working with a regional collaborative–comprised of utilities, cities, and regional government agencies–known as SoCal EV, share regional EV data and research, jointly pursue grant funding opportunities, and coordinate a regional approach to the deployment of PEV charging infrastructure.

REALIZING THE EV MARKET POTENTIAL

The Mayor's Office, Los Angeles Department of Water and Power (LADWP), the C40-Clinton Climate Initiative, UCLA's Anderson School of Business and Luskin Center collaborated on a year-long research project to understand the potential EV market in Los Angeles by zip code, identify existing barriers for deployment, and consider monetary/non-monetary interventions. Phase II will examine best practices of EVSE installation in multi-unit dwellings and cost recovery models for public charging. *Download the study at www.luskin.ucla.edu/ev.*

SMART GRID DEMONSTRATION

The LADWP was awarded over $60 million in Smart Grid Demonstration federal funding, and provided a $60 million match, to develop, deploy and test advanced smart grid technologies in partnership with a consortium of top Southern California research institutes including USC, UCLA, and CalTech/Jet Propulsion Laboratory.

GLOBAL BEST PRACTICE

Since 2009, the City of Los Angeles has been working closely with the C40-Clinton Climate Initiative cities to understand and share global PEV best practice. // In January 2011, the City of Los Angeles and the City of Shanghai agreed to be Partner Cities and to cooperate and share data from their respective EV demonstration programs.

CONTACT

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MORE INFORMATION

socalev.com

All photos on this page provided by the City of Los Angeles.

PROMOTING PEV ADOPTION IN LA

In the past three years, the city has made tremendous strides to understand and prepare for the deployment of PEVs by taking a multifaceted approach:

BUILDING CODES

// City building codes contain EV-readiness requirements for all new construction as of Jan. 1, 2011.

REBATES & DISCOUNTS

// The LADWP provides an EV charging rate discount; $2,000 residential EVSE installation rebate; seven-day permit to plug guarantee for single family residential customers; a dedicated EV customer service team.

UPGRADES

// The LADWP has been upgrading the city's electrical infrastructure to support the increased power demand necessary for charging an electric vehicle. To date, LADWP has upgraded over 2,400 distribution transformers and replaced over 800 poles.

CHARGING STATIONS

// PEV charging on city property is currently free.

COLLABORATION

// The City has collaborated with the Southern California region on a number of grant opportunities to support EV research/deployment.

// The City worked with the region and industry stakeholders to develop and hold a series of EV 101 workshops for municipalities and residents.

// The city is working with the University of California at Los Angeles (UCLA) to understand the L.A.'s EV market potential and identify research and policy interventions.

NEW YORK CITY
NEW YORK, USA

ELECTRIC VEHICLES ARE AN IMPORTANT PART OF PlaNYC

// In 2007, New York City Mayor Michael Bloomberg announced the PlaNYC initiative to create a 2030 vision for the city and an agenda of objectives to prepare for population growth, foster economic growth and reduce carbon emissions.

// Air quality in New York City currently fails to meet federal standards for particulate matter (PM) and ozone. Since only 44 percent of New York City households own a vehicle (compared to 90 percent nationally), the city's transportation-emissions reduction goals are prioritized around public transit, walking and bicycle usage. However, electric vehicles will play an important role in the city's plan.

// Powered on New York City's grid, EVs are estimated to emit .55 lbs of CO_2 per mile, less than nearly all other vehicles. To meet its PlaNYC goal of a 30 percent reduction in CO_2 fleet emissions by 2017, the city is adding electric vehicles to its fleet.

[SNAPSHOT] NEW YORK CITY

= 100,000 people = 100,000 vehicles

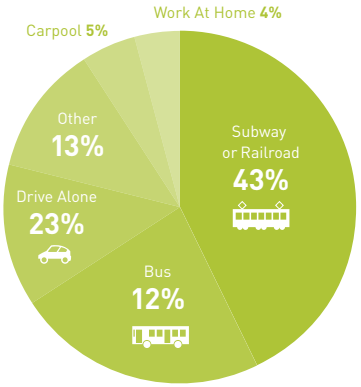
POPULATION

8,200,000

REGISTERED VEHICLES

1,800,000

TRANSPORTATION MIX*



CITY SIZE

469 mi²

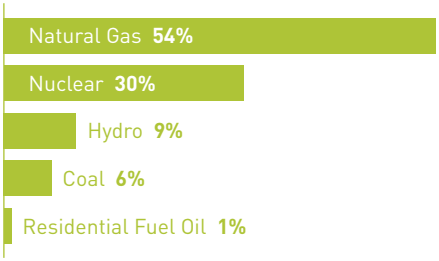
AVERAGE DAILY TRAVEL (MI)**

09.0

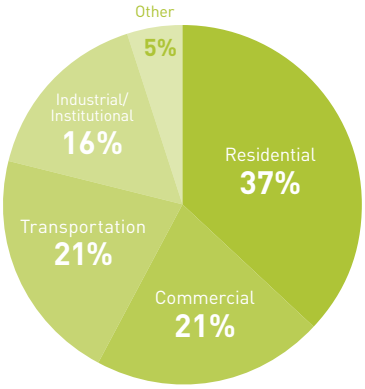
CONGESTION PLAN

Y

ELECTRICITY MIX†



CO2 EMISSIONS MIX††



EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
238 city fleet and private vehicles	Undetermined	75+/-	Undetermined

Source: American Community Survey 2007-2009. **City of New York website (2010). †/Source: Inventory of New York City GHG Emissions, Sep. 2011.*

CONDITIONS FOR EV

Despite the density and traffic-conditions of the city, New York is a good environment for integrating an EV infrastructure. Fifty percent of Manhattan drivers and 80 percent of Staten Island drivers have assigned parking, which could mitigate the difficulties of home charging for high rise and multi-unit tenants.

FINANCIAL INCENTIVES AND LAWS

NATIONAL // The federal government currently offers a tax credit of up to $7,500 for PEV purchases. **STATE** // EV/PHEV drivers have access to high-occupancy vehicle (HOV) lanes, regardless of the number of passengers. // All new light-duty vehicles procured by state agencies must be alternative fuel vehicles, except for designated police or emergency vehicles. **CITY** // Long Island Power Authority offers a $500 rebate to its customers who purchase EVs. // The New York City Private Fleet Program provides significant incentives for the purchase of medium- and heavy-duty electric vehicles.

FLEET STRATEGY

New York City is making strides toward integrating electrification into its 26,000-vehicle fleet. In 2011, the city purchased 50 Chevy Volts and 10 Ford Transit Connects and acquired 10 electric eStar trucks on loan from Navistar. The new acquisitions bring the entire electric fleet to 430 vehicles, which include neighborhood electric vehicles and scooters. // The city, Con Edison, Nissan and a private taxi company are testing six Leafs to determine the feasibility of EVs in New York City taxi fleets.

Photo credit: Spencer Tucker.

EV SPOTLIGHT

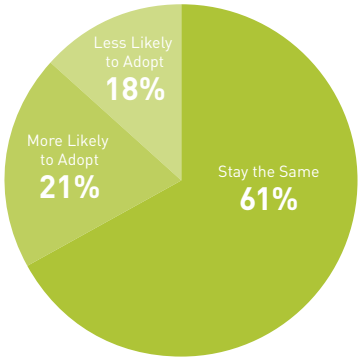
CHARGING INFRASTRUCTURE

New York City has over 73 public charging stations, mostly in commercial garages. Recently, The New York State Energy Research and Development Authority (NYSERDA) awarded several grants that will significantly increase the number of public charging stations in the city and throughout the state. // As part of their ChargePoint America program, Coulomb Technologies is offering free charging stations to New York City EV owners who agree to anonymous data collection.

UNDERSTANDING CONSUMER ADOPTION

In January 2010, New York City published an electric vehicle adoption study in partnership with McKinsey & Company. The purpose of the study was to understand the key drivers that could encourage early adoptions of electric vehicles. Findings: New York City has a strong segment of potential early adopters. // A lack of education and information inhibits demand. // There is low interest in public charging infrastructure. // Solving multi-family unit parking and charging could be a challenge. However, 59 percent of New Yorkers have designated parking spaces (at home or place of work).

Impact of Education on Likelihood of EV Adoption*



CONTACT

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MORE INFORMATION

nyc.gov/driveelectric

nyc.gov/PlaNYC

KEY ORGANIZATIONS AND STAKEHOLDERS

The following organizations are leading the city's EV efforts:

- **New York City government:** as part of PlaNYC, the city has committed greening its fleet, streamlining home installations, and ensuring public availability of charging stations
- **New York City and Lower Hudson Valley Clean Communities (NYCLHVCC):** focusing on infrastructure deployment as part of recently awarded Clean Cities Community Readiness and Planning Grant.
- **New York Power Authority:** working with Metropolitan Transit Authority and New York State Energy Research and Development Authority to electrify buses, trucks, delivery vans and airport vehicles.
- **ConEdison:** As part of the Nissan Leaf taxi pilot, the utility is working with building owners to install DC fast chargers at strategic locations. In addition, ConEd has developed a method for providing time-of-use electricity rates to EV owners without requiring an additional meter. The utility will create a dynamic pricing scheme that is separate from the whole-house electricity usage, negating the costs associated with installing an additional meter.

**Source: McKinsey EV Adoption Study, 2007. "Charging Infrastructure" photo credit: Spencer Tucker. "Understanding Consumer Adoption" photo credit: Nathan Pinsley.*

NORTH EAST ENGLAND, U.K.

LEADING THE WAY IN LOW CARBON TRANSPORT

// North East England encompasses Northumberland, County Durham, Tyne and Wear, and Teesside. According to research by the GreenCarWebsite.co.uk, people in this region are significantly more open to the concept of electric cars than in other parts of the country. In fact, 10 percent of EVs registered in the U.K. are in North East England, which has only 4 percent of the country's population.

// North East England has an extensive, long-established automotive industry that is home to some of the world's leading companies including Nissan, which has operated in the region since 1986. North East England produces one in three of all conventional cars currently made in the U.K. It is a result of this innovative automotive environment that the development and manufacture of low carbon vehicles have taken place.

// North East England is now at the forefront of low carbon vehicle development and has an international reputation in the field. The region offers a comprehensive package, including manufacturing and battery development, R&D, skills, training, as well as a leading supply chain–making it the place to be for low carbon vehicle (LCV) development and maintenance.

// The area's reputation is strengthened by the production of the Nissan Leaf at Nissan Sunderland's plant and the new £200 million battery plant that will produce 60,000 lithium-ion batteries each year.

Photo credit: Zero Carbon Futures.

[SNAPSHOT] NORTH EAST ENGLAND

= 100,000 people = 100,000 vehicles

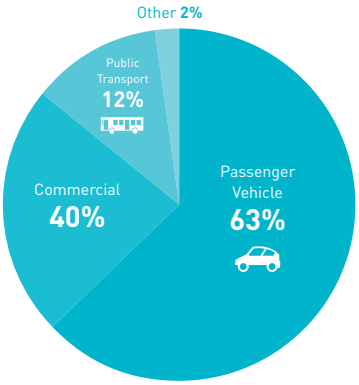
POPULATION

2,500,000

REGISTERED VEHICLES

1,125,750

TRANSPORTATION MIX



REGION SIZE

8,600 km²

Northumberland, County Durham, Tyne and Wear, and Teesside

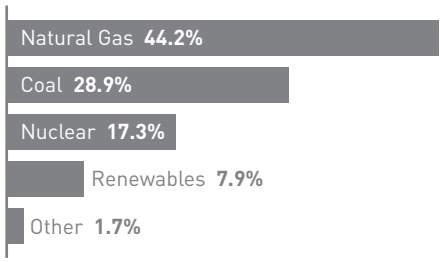
AVERAGE DAILY TRAVEL (MI)

25.0

Less than 25 miles per day.

[COUNTRY CONTEXT] U.K.

ELECTRICITY MIX*



CURRENT EVs/PHEVs

1,000

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
150	Undetermined	400	1,000 forecast for 2013

**Department of Energy and Climate Change (DECC). Photo provided by Charge Your Car North, Ltd.*

SPENDING & FINANCIAL INCENTIVES

NATIONAL // 20 percent, up to £8,000, off the cost of a plug-in van. // 25 percent, up to £5,000, off the cost of a plug-in vehicle. // 50–100 percent grants available for the purchase and installation of charging infrastructure.

INFRASTRUCTURE

NATIONAL // The U.K. Government, through its Plugged in Places program, has made £30 million available to match funds for eight pilot projects that will install EV infrastructure. The program has committed to installing up to 8,500 charging points.

FLEET STRATEGY

Research undertaken with the two main electric vehicle dealerships in North East England has shown that 85 percent of the current EVs sold in the region have been purchased by businesses as fleet and pool cars, a market that has become increasingly important to the region. In March 2012, North East England held its first fleet day in the region with *GreenFleet* magazine to further promote the benefits of EV ownership.

EVs IN NORTH EAST ENGLAND

Businesses in the region gain grants up to 100 percent for EV charging infrastructure. // Newcastle University's Transport Operations Research Group is currently studying the long term impact of Vehicle to Grid on battery lifetime. // The region has a major manufacturing sector, including Nissan, Smith Electric Vehicles, AVID and Sevcon, which support the creation of hundreds of jobs. With the manufacture of the Nissan Leaf, and the developing supply chain LCV, the sector is set to become a real economic driver.

EV SPOTLIGHT

CHARGE YOUR CAR

With over 300 public standard chargers, eight quick chargers and 80 home charging points already installed in the region, the North East is the most connected EV charging network in the U.K. The Charge Your Car project was one of the first Plugged in Places projects to receive funding from OLEV with the aim of making the region home to one of Europe's most advanced electric-vehicle charging networks. (*chargeyourcar.org.uk*)

SWITCH EV

Drivers in North East England are able to try before they buy thanks to an exciting project, Switch EV, which is placing 44 electric vehicles on the road. The project, now in its second year, is funded through the Technology Strategy Board's program and places EVs on lease for a six-month basis to companies, individuals, organizations and car clubs. The aim of the project is to understand driver experience. (*switchev.co.uk)*

EV CHALLENGES

The work to install an EV infrastructure has been against the backdrop of U.K. economic hardship, which has seen drastic cuts to both public and private bodies' funds and has led to a lower EV uptake than expected. // In April 2010 when the Charge Your Car project began there were no EV charging technical standards available, so the North East has worked closely with the IET (Institution of Engineering and Technology) and others to create appropriate guidance and Codes of Practice, resulting in the adoption of Type 2 connectors and practical advice on domestic earthing solutions for the U.K.

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zerocarbonfutures.co.uk

All photos on this page provided by Charge Your Car North, Ltd.

A LEADING EUROPEAN ELECTROMOBILITY METROPOLIS

// North East England places considerable emphasis on the low carbon vehicle sector as an economic driver and is focused on electric vehicle and battery development, including the future possibilities of hydrogen technology as well as alternative fuels.

MANUFACTURING

North East England is home to major EV manufacturers including Nissan.

TRAINING & SKILLS

Gateshead College's Skills Academy for Sustainable Manufacturing and Innovation will train work forces in all areas of electric vehicles from repair and maintenance to battery manufacture and repair. Sunderland University is the U.K.'s first university to offer an MSC in Low Carbon Vehicle Technology.

R&D

The region's five universities are conducting innovative research covering the construction and drivetrain aspects of LCV, information transfer and usage characteristics. Collaborative work is also ongoing with the TSB and CENEX, allowing the region to feature in major vehicle trials and research.

TESTING & TRIALS

The region is home to the only test track dedicated to LCVs.

PUBLIC EDUCATION/AWARENESS

The Plugged in Places program has a remit to support LCV public awareness and engagement. Together with the Energy Savings Trust, the program is putting on a range of activities in the region.

Zero Carbon Futures
Innovative Transport North East England

PORTLAND
OREGON, USA

A CITY WITH A BIG PICTURE TRANSPORTATION ELECTRIFICATION STRATEGY

// EVs are a part of a larger transportation electrification strategy–the Portland region has been electrifying transportation since the appearance of the first Metropolitan Area Express (MAX) light rail train in 1986. The success of MAX helped spawn the Portland Streetcar in 2001, and the Portland Aerial Tram is a recent addition to Portland's electrified transportation portfolio.

// Why electric vehicles? Portland's Climate Action Plan aims for a 40 percent reduction in CO_2 emissions, below 1990 levels by 2030. In addition to increased use of public transit, EVs will play a key role in this goal.

- The city seeks a 30 percent reduction in transportation related emissions by 2030.
- Transportation accounts for 38 percent of GHG emissions.
- Oregon spends $6.2B on annual oil imports.
- Plan calls for accelerated transition to plug-in vehicles and an extensive charging network by 2012.
- The EV industry could potentially add 8,000 to 19,000 new jobs by 2030.
- Switching to EVs will reduce SOx by 75 percent, NOx by 69 percent, and particulate matter (PM) by 31 percent.

[SNAPSHOT] PORTLAND

= 100,000 people = 100,000 vehicles

POPULATION

583,776

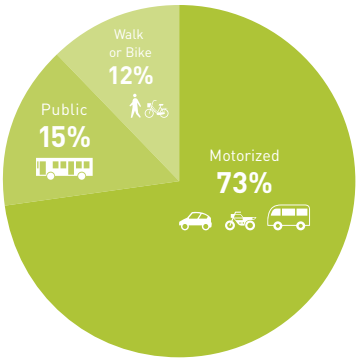
REGISTERED VEHICLES

527,000

CITY SIZE

145.4 mi²

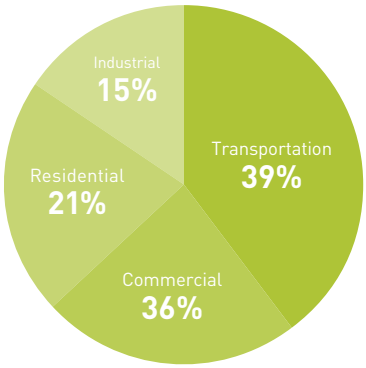
TRANSPORTATION MIX



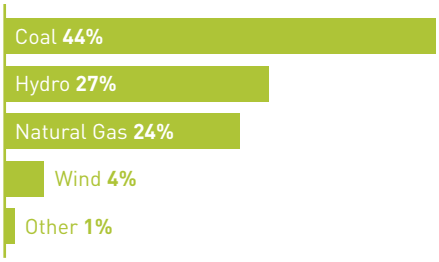
AVERAGE DAILY TRAVEL (MI)

18.5

CO2 EMISSION MIX*



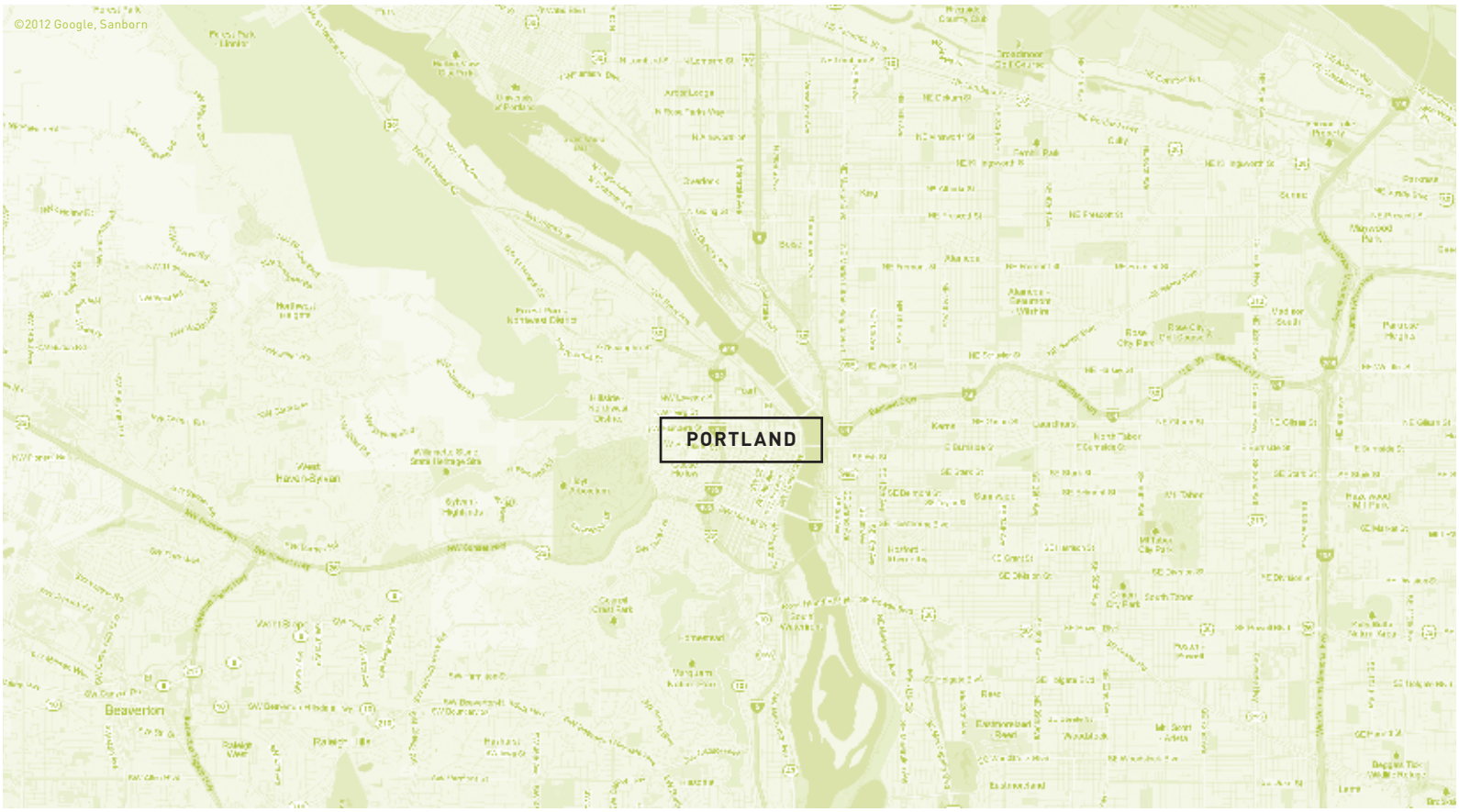
ELECTRICITY MIX



EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
1,300	City: Undetermined State: 30,000 by 2015	225	Undetermined

**Source (CO2 Emissions Mix): City of Portland and Multnomah County Climate Action Plan, 2009. EV & EVSE photo provided by Portland General Electric.*



CONDITIONS FOR EV

Conditions for EV use in Portland are extremely favorable. // Short commutes (average: 18.5 miles). // Affordable electricity prices. // A comparatively clean electricity system. // Good climate: warm, dry summers and wet, but mild, winters. // An environmentally concerned public: 58 percent support goals of Climate Action Plan; 22 percent desire more.

INFRASTRUCTURE

The EV Project, funded by the U.S. Department of Energy, will deploy 2,000 stations in Portland and the surrounding area by 2013. // Charging will be free to participants who agree to anonymous data collection. // Mostly Level 2 (220V) charging, but DC Fast chargers will be available in select areas.

SPENDING AND FINANCIAL INCENTIVES

NATIONAL // The federal government currently offers a tax credit of up to $7,500 for PEV purchases. **STATE** // Up to $750 for residential charging installations. // Up to 35 percent tax credit for businesses installing charging stations. // Businesses are eligible for up to 35 percent of the incremental cost between an ICE vehicle and an EV in Oregon Business Energy Tax Credits (BETC).

FLEET STRATEGY

STATE // Electrify 20 percent of vehicle fleet by 2030. // The Oregon Transportation Commission recently approved a program that designates $4 million for Oregon businesses interested in replacing diesel trucks with electric.

EV SPOTLIGHT

ELECTRIC AVENUE: A COLLABORATIVE EFFORT

Portland General Electric, Portland State University, and the City of Portland have committed to fostering sustainable urban mobility by constructing "Electric Avenue" in the south end of downtown Portland. This project aims to showcase the interplay among electric vehicles, charging infrastructure, integrated transit, public greenway space, and urban design. All parking spaces on Electric Avenue are reserved for vehicles in the process of charging, with a single DC Quick Charger available for up to one hour and Level II charging stations that serve seven parking spaces.

WEST COAST GREEN HIGHWAY

British Columbia is working with Washington, Oregon, and California to build an EV corridor that will stretch from Vancouver, B.C., to the Oregon-California border. The northern segment will be formed this year when a backbone of DC quick chargers becomes operational.

TOYOTA PLUG-IN PRIUS PROJECT

In July 2010, Toyota placed 160 Prius Plug-in Hybrid vehicles with program partners in the U.S. Ten of these vehicles were issued to Portland State University to demonstrate plug-in hybrid technology, educate and inform the public, evaluate performance and better understand the technology's benefits to future customers. // Over the next 18 months, PSU assigned vehicles to over 40 citizens around Oregon for 60-day stints to catalog experience, mileage efficiency, charging behavior, and to test the growing number of public EV charging stations in Oregon. These vehicles became available to the buying public in 2012.

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MORE INFORMATION

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evroadmap.com

All photos on this page provided by Portland General Electric.

A STATEWIDE EV STRATEGY

// The electric vehicle "movement" in Oregon has many participants but no single authority. In order to coordinate efforts, the governor established the Transportation Electrification Executive Council, a body of executives from the private, public and nonprofit sectors responsible for establishing projects and priorities to keep the electric vehicle agenda moving forward.

// In order to meet the state's goals of: 1) a fleet that is 20 percent EV by 2030; 2) 30,000 EVs on the road in Oregon by 2015; and 3) reducing vehicle miles travelled by 30 percent, Oregon is:

- Eliminating inspections for 90 percent of stations through Oregon's minor label permitting program.
- Educating drivers on available incentives.
- Adopting consistent signage and standards.
- Creating a program for garage-free dwellings.
- Integrating electrification in the trucking industry.

RESEARCH TRIANGLE NORTH CAROLINA, USA

A NATIONAL LEADER IN PLUG-IN ELECTRIC VEHICLES

// The Research Triangle community in North Carolina, recognized as a national leader in plug-in electric vehicle (PEV) readiness, includes the major cities of Raleigh, Durham, Cary and Chapel Hill–all which have made great strides toward accelerating consumer adoption of PEVs. From Raleigh's Comprehensive Plan, calling for the promotion of PEVs and charging stations within the city's fleet and for consumer use, to Durham's adoption of an Electric Vehicle and Charging Station Plan, which establishes specific goals and implementation strategies for PEV adoption, the Research Triangle area is considered one of the "hot spots" for PEVs. In fact, the Electric Power Research Institute estimates this region will have more than 18,500 cumulative PEV sales by 2020, more than other parts of North Carolina and the U.S.

// Advanced Energy and the Triangle J Council of Governments are currently developing the first Community-wide PEV Readiness Plan, funded by the U.S. Department of Energy through the Centralina Council of Governments. This plan focuses on: 1) Economic development, including expansion of the PEV industry in the state; 2) environmental benefits consisting of reduced dependence on fossil fuels and improved local air quality; and 3) Updating local policy to encourage, and not constrain, adoption of PEVs.

[SNAPSHOT] RESEARCH TRIANGLE

= 100,000 people

POPULATION

1,749,525

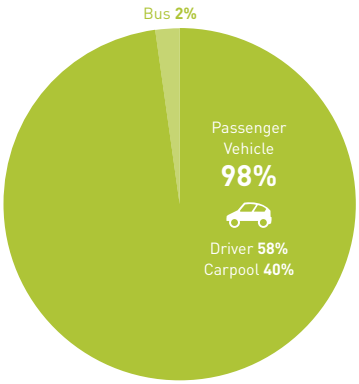
REGION SIZE

3,480 mi²

AVERAGE DAILY TRAVEL (MI)

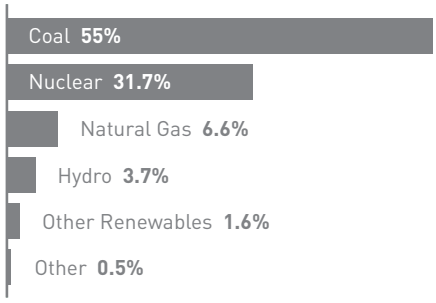
16.0

TRANSPORTATION MIX*



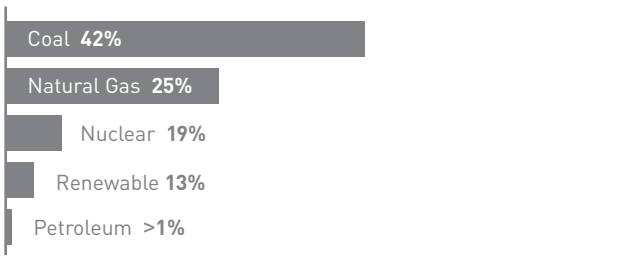
[STATE CONTEXT] NORTH CAROLINA

ELECTRICITY MIX**



[COUNTRY CONTEXT] UNITED STATES†

ELECTRICITY MIX**



CURRENT EVs/PHEVs††

25,408

EV/PHEV TARGET (2015)

1,000,0000

*Source: Campo LRTP. **Source: EIA, 2012. ††Source: EIA, 2011. ††Source: hybridcars.com, sales since Dec. 2010.

INFRASTRUCTURE

Between November 2010 and December 2011, the City of Raleigh installed 29 Electric Vehicle charging stations; 18 public charging stations and 11 fleet charging stations. The approximate cost of $303,272 was financed through grants from the American Recovery and Reinvestment Act and Clean Fuel Alternative Transportation. There was a $125,000 city match included. // Residents can find the locations of electric vehicle charging stations online at *maps.raleighnc.gov/sustainableraleigh/index.html#default*

SPENDING AND FINANCIAL INCENTIVES

NATIONAL // The federal government currently offers a tax credit of up to $7,500 for PEV purchases. **STATE** // Qualified EVs may use high occupancy vehicle (HOV) lanes, regardless of the number of passengers. // Electric vehicles are exempt from vehicle emissions inspection requirements. **CITY** // The City of Raleigh removed and reduced barriers to PEV adoption by addressing building codes, electrical codes, and city ordinances related to uniform standards, signage, parking, and fees for charging. The city also streamlined the permitting and inspections process for EVSE installation.

FLEET STRATEGY

The City of Durham has four PEVs for fleet operations, and Durham County plans to purchase up to two by 2013. Duke University, located in Durham, launched a WeCar vehicle sharing program in 2011 with four Chevy Volts available to Duke community members. The City of Raleigh converted several Toyota Prius fleet vehicles to allow for plug-in compatibility.

EV SPOTLIGHT

NISSAN LEAF PILOT PROJECT

Through a grant from the North Carolina State Energy Office, Advanced Energy recruited 40 Triangle drivers to purchase a Nissan Leaf and have their vehicle driving patterns tracked for two years. The data will help provide key insights into long-term trends in PEV driving habits and charging patterns.

PROJECT GET READY PARTICIPATION

Raleigh is one of three U.S. cities, and the only east coast city, to participate with the Rocky Mountain Institute Project Get Ready (PGR) initiative to prepare for the national roll out of plug-in and electric vehicles (PEVs). The City of Raleigh removed and reduced barriers to PEV adoption by addressing building codes, electrical codes, and city ordinances related to uniform standards, signage, parking, and fees for charging. The City also streamlined the permitting and inspections process for EVSE installation.

SOLAR-POWERED CHARGING STATIONS

The City of Raleigh and Progress Energy Carolinas recently embarked on a two-year R&D project to evaluate solar-powered EV charging stations. The project includes two charging stations in Raleigh connected to a solar photovoltaic (PV) array and battery system. This joint initiative has several goals: 1) test the ability to charge plug-in vehicles using solar energy and ability to store power in an on-site battery; 2) analyze the effect of a solar-powered charging station on the electric grid; 3) evaluate EV battery performance; 4) compare performance of two solar panel manufacturers side-by-side; and 5) monitor the influences of weather on solar power production. PowerWorks Electric designed and installed the system. In addition to collecting data, the trial will provide citizens and visitors the opportunity to observe both solar power and plug-in electric vehicles up close.

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MORE INFORMATION

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All photos on this page provided by Advanced Energy.

PEV DEPLOYMENT IN RALEIGH

// The Research Triangle's success in planning for PEVs is largely due to the committed efforts of key stakeholders. Each major city in the area has devoted significant staff resources and funding toward the preparation for PEVs. Advanced Energy, a Raleigh-based nonprofit organization, has served as a collaborative partner, supporting and guiding local governments to plan for and implement electric transportation initiatives. Other major stakeholders include the Triangle J Council of Governments Clean Cities Coalition, the N.C. Solar Center, and area electric utilities including Progress Energy and Duke Energy. The Research Triangle has also received assistance from national organizations such as RMI's Project Get Ready, which recognized Raleigh and the Research Triangle as one of the founding "Get Ready" communities.

// With the development of the Triangle's Community PEV Readiness Plan in 2012, the Triangle's municipalities and county governments will join together as regional stakeholders, with collaboration from the area's electric utilities, key businesses, major universities and other regional organizations.

ROTTERDAM
THE NETHERLANDS

ROTTERDAM HAS THE AMBITION TO BE THE LEADING EV CITY

// The Rotterdam Electric Program's main goal is to create the right conditions to speed the introduction of EVs in Rotterdam, the third largest port city in the world. The goal is to reach 1,000 EVs within five years and 200,000 EVs by 2025.

// The Rotterdam Electric Program supports the first 1,000 EV owners with an electric charging point. On private property, a charging point is partly subsided. Rotterdam is installing charging points at strategic locations in the city center and public parking areas.

// The city center of Rotterdam will be the icon area for EVs, where air quality is a big issue and therefore there are more opportunities for reductions to be achieved.

// Innovation is also part of the Rotterdam Electric Program– continued development of EVs will be supported by Rotterdam, stimulating innovative initiatives and pilot projects.

[SNAPSHOT] ROTTERDAM

= 100,000 people = 100,000 vehicles

POPULATION

1,200,000

612,502 in city

1.2 million in Rotterdam region

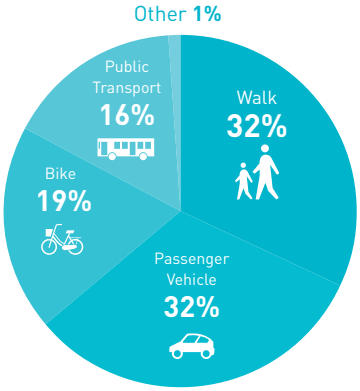
REGISTERED VEHICLES

211,305

CITY SIZE

326 km²

TRANSPORTATION MIX*



AVERAGE DAILY TRAVEL (KM)

20.0

KM/YEAR (CARS & TRUCKS)

3.5 billion

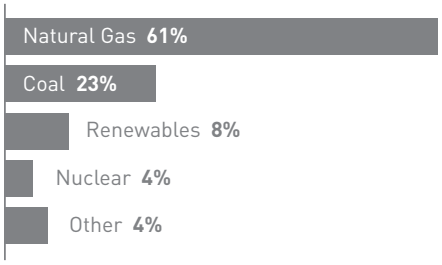
CONGESTION ZONE

Y

Commuters paid to shift driving to off-peak hours.

[COUNTRY CONTEXT] THE NETHERLANDS

NATIONAL ELECTRICITY MIX**



NATIONAL EV TARGET

2015: 20,000

2020: 200,000

2025: 1 million

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
1,000+ within 5 years (currently 1,124 EVs in the Netherlands)	200,000 by 2025	100	1,000 by 2014

*Cars, small trucks, heavy trucks, buses, motorbikes, scooters and 3-wheelers. Does not include (electric) bikes. **Source: IEA, 2009.*

INFRASTRUCTURE

CITY GOAL // The Rotterdam Sustainable Program targets 1,000 charging points by 2014. **NATIONAL STRATEGY** // A leading role for the private sector in roll out of charging infrastructure. // The national government creates preconditions and tackles bottlenecks. // Deployment of charging points on public and private land and centered in focus area.

CURRENT CHARGING POINTS (NATIONALLY)	NORMAL CHARGING POINTS	FAST CHARGING POINTS
Public Land	1,250	14
Semipublic Land	576	
Private Land	699	
TOTAL	2,525	14

SPENDING AND FINANCIAL INCENTIVES

CITY // 15 million for the coming four years. **NATIONAL** // There are several tax measures to stimulate electromobility and €9 million is available up to 2015 to implement the national Action Plan, which contains a range of activities to stimulate electromobility in focus areas and viable market segments, strengthen international collaboration and partnerships, and to roll out communication, research and monitoring. Besides this general economic policy, the national government offers opportunities to stimulate electromobility and aims to participate in European projects and welcomes opportunities for cooperation with other countries.

FLEET STRATEGY

Rotterdam's municipal fleet aims to be clean, a first mover, and to set an example for city inhabitants and other cities. The investment so far has resulted in over 100 EVs/plug-in EVs. By 2014, at least 25 percent (about 400 vehicles) of the fleet should consist of electric or hybrid vehicles.

"Fleet Strategy" photo provided by the City of Rotterdam.

EV SPOTLIGHT

iHNR-EV

The iHNR-EV Centrum (New Electric Drive Transportation Hub) is an experience center in which companies and consumers are able to test electric vehicles from multiple brands, enabling them to experience driving electric and being more sustainable.

EBUSZ

Rotterdam is undertaking a two-year pilot with Ebusz (Electric City buses). The goal of this pilot is to test, demonstrate and extend the driving radius of the electric buses and evaluate their effects on society.

ROTTERDAM TESTS ELECTRIC VEHICLES

Rotterdam Tests Electric Vehicles is a joint project of the City of Rotterdam, energy company Eneco, and grid manager Stedin to pilot 75 EVs in Rotterdam with the partners testing and monitoring EVs in their own fleets. The pilot is focused on energy efficiency, environmental impact, user experience and safety.

FLEX TUK TUK COMES TO OVERSCHIE

Flex Overschie is a new transportation concept that utilizes electric vehicles and involves solving unemployment problems and providing a sustainable “last mile” solution.

FREEDOM OF CHOICE WITH GREENWHEELS

Greenwheels acquired 25 EVs and set up charging infrastructure for its fleet, providing its 20,000 car-sharing customers the freedom to choose between electric and gas-powered vehicles.

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All photos on this page provided by the City of Rotterdam.

ROTTERDAM TEST ELEKTRISCH RIJDEN

SHANGHAI CHINA

MAKING NEW ENERGY VEHICLE DEVELOPMENT A PRIORITY

// Shanghai is committed to the development of new energy vehicles: plug-in hybrid, hydrogen fuel cell and electric vehicles. In 2006, Shanghai established the New Energy Vehicle Promotion Office of Shanghai to facilitate the industrialization of new energy vehicles. In 2009, new energy vehicles were listed as one of the nine new high-technology industrialization projects in Shanghai. In 2011, they were designated a strategic new industry with priority policy and financial support.

// Shanghai has been selected by the Chinese government as one of the 25 pilot cities for energy-efficient and new energy vehicle demonstration and as one of the six pilot cities for subsidy of private new energy vehicle purchase.

// In July 2010, at the first Clean Energy Ministerial (CEM) held in Washington, D.C., the Electric Vehicle Initiative (EVI) proposed by China and the U.S. received positive response from France, Germany, Japan, Spain, Sweden, Denmark, South Africa, Portugal and the IEA. An important goal of this initiative is to establish EV international pilot cities. In January 2011, China appointed Shanghai as the EV pilot city in China and the Jiading district of Shanghai as the EV international demonstration zone.

// The implementation plan of the Shanghai EV international pilot city is to: 1) spend three years building a demonstration base for exploring sustainable development of urban transportation; 2) organize automotive enterprise clubs and customer clubs; 3) set up three international communication platforms (EV pilot city forum, EV exhibition and EV Championship); and 4) construct four function centers (Commercial Mode Innovation Center, Demonstration Evaluation Center, Operation Service Center and Test Drive/Ride Center).

[SNAPSHOT] SHANGHAI

POPULATION

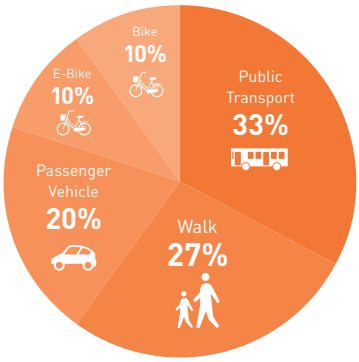
14,047,100
Registered population

23,026,600
Resident population

REGISTERED VEHICLES

1,702,500

TRANSPORTATION MIX*



CITY SIZE

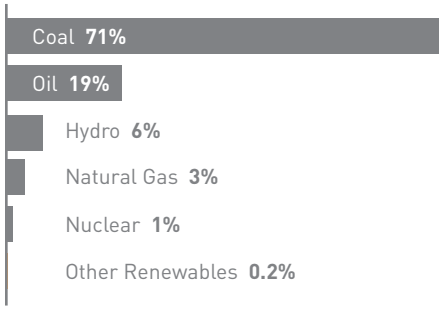
6,340.5 km²

AVG. DAILY CAR TRAVEL (KM)

39.0

[COUNTRY CONTEXT] CHINA

ELECTRICITY MIX*



CURRENT PLUG-IN/PURE EVs (through November 2011)

PLUG-IN HYBRID
Buses: 1,511
Passenger Vehicles: 635

BATTERY EV
Buses: 1,280
Passenger Vehicles: 4,095
Electric Bicycles: 130 million+

NATIONAL GOAL: PLUG-IN/PURE EVs (by 2015)

500,000

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
1,614* Public Service (69% EV) **19*** Private Sector (74% EV) *Energy Efficient Vehicles	**30,000-50,000** 90% passenger/ 10% commercial by 2015	**9** 7 Charging Stations 2 Swapping **687** Charging Poles 2 hydrogen refilling stations at the Expo Site and Anting and 2 movable hydrogen refilling stations	**5,000** Public Charging Poles by 2015

**Source: Land Transport Authority, 2011. **Source: EIA, 2008.*

INCENTIVES

The Chinese government provides national subsidies of 50,000 RMB for plug-in hybrid electric vehicles and 60,000 RMB for pure electric vehicles. In addition, the City of Shanghai offers 20,000 RMB and 40,000 RMB, respectively. Public service vehicles, such as light duty commercial trucks and buses, also receive subsidies. // These incentives are part of a larger effort to encourage the adoption of electric vehicles. Besides Shanghai, the Chinese government provides national subsidies to five other cities, including Beijing and Schenzhen. These demonstration cities also provide local subsidies of their own.

CHARGING INFRASTRUCTURE

Shanghai will maintain a ratio of 1.2-1.5 charging stations for every electric vehicle. To create an ecosystem of public charging, the EV Zone has installed 81 AC slow-charging poles. Twenty of these stations have been installed as part of a “park and ride” trial at the terminal station of metro line 11. In addition, the city has sited 700 future charging locations and the petroleum company, SINOPEC, has completed a “refilling and charging” station with four DC fast charging and six AC slow charging poles.

EV SPOTLIGHT

TEST-DRIVE/RIDE CENTER OF CHINA

Opened in May 2011, the Test Drive/Ride Center of China (Shanghai) EV International Pilot City is the core project of Shanghai EV International Pilot City and a non-profit service platform integrating high quality EV test ride/drive service and EV vehicle and technology exhibition and promotion. The center educates audiences about EV development, history and future trends, helps them understand the necessity of developing EVs, familiarizes them with relevant technology and features, and promotes the environmental benefits of EVs. Since it opened, 21,000 people have visited the center and nearly 10,000 people have test-driven EVs.

PROFESSIONAL DRIVING DEMONSTRATIONS

With vehicles provided by EV manufacturers, drivers will carry out year-long driving demonstrations on the roads of Shanghai, allowing the manufacturers to conduct tests and evaluations on EVs, and to collect and evaluate data on use and charging habits. In January 2012, an all-weather driving experience demonstration was conducted with Chevrolet Volt PHEVs. Volvo also plans to send its E-C30 fleet to the EV International Pilot City for demonstration.

FIXED ROUTE OPERATION DEMONSTRATIONS

In 2012, 33 electric buses will participate in a demonstration operation on specific routes in the Jiading international demonstration zone.

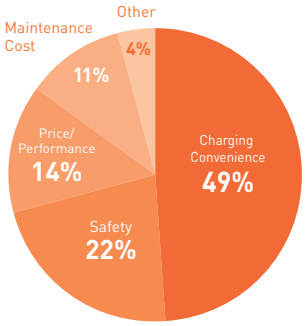
SHANGHAI TZGEV EV MULTI-BRAND DEALER

The Shanghai TZGEV EV multi-brand dealership was established in Jiading EV international demonstration zone, next to the China (Shanghai) EV Test Drive/Ride Center with investment from its principal shareholder, TZGEV Ltd. Brands sold include SAIC, Chery, Zotye, Lifan and BYD. The TZGEV EV multi-brand dealership provides the most mature model of new energy vehicle sales in China, with its sales and maintenance service covering all of Shanghai. Five battery EVs and five ROEWE 750D hybrid vehicles were sold by the end of December 2011.

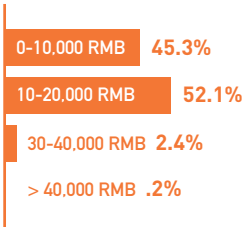
CONSUMER PREFERENCE

Visitors to the EV Test Drive/Ride Center were asked about their interests and preferences when purchasing an EV.

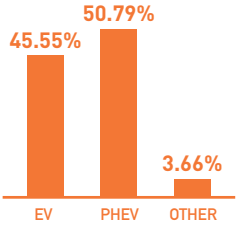
CONSUMER PRIORITIES



PRICE PREFERENCE



EV/PHEV PREFERENCE



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MORE INFORMATION

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STOCKHOLM SWEDEN

SEEKING TO BE FOSSIL FREE BY 2050

// Stockholm consists of 14 islands connected by 54 bridges and in 2010 was named the European Green Capital by the European Commission. The city has strong conditions for EV use: 1) an environmentally conscious population; 2) 90 percent of electricity is generated from hydro or nuclear sources; 3) a high capacity electricity production system; 4) electricity prices are low, resulting in reduced EV driving costs; and 5) 65 percent of households have access to engine block heaters and are already familiar with plugs in their vehicles.

// In May 2011, the Stockholm City Council adopted an EV/PHEV strategy with the goal of becoming a leading EV city and fossil free in the inner-city by 2030 and region-wide by 2050. This initiative is led by the Environment and Health Administration, the Stockholm Parking Company (municipal parking facilities), the Stockholm Traffic Authority (street parking), and the Stockholm Planning and Building Authority (fast charging and aesthetics). The city encourages development of device regulations and standards, such as clearer indoor charging regulations.

// Stockholm has been testing the performance of a fleet of 50 EVs throughout Sweden. The first evaluation shows that the EVs perform well and are recommended by 85 percent of the drivers. There are still some challenges remaining, such as attitudes towards EVs, availability of fast charging units, the cost of EVs and the need for new business models.

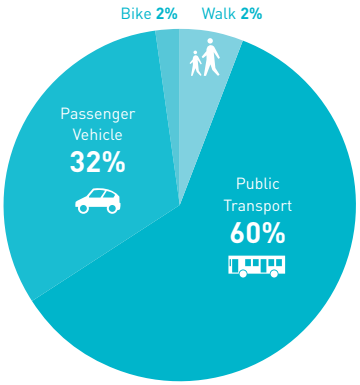
[SNAPSHOT] STOCKHOLM

= 100,000 people = 100,000 vehicles

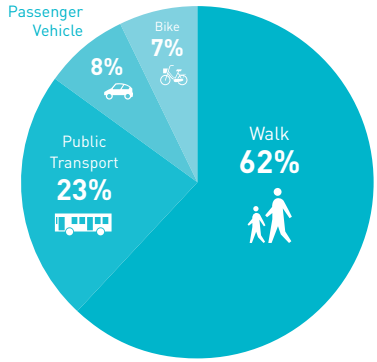
POPULATION

850,000

TRANSPORTATION MIX (TO CITY)



TRANSPORTATION MIX (IN CITY)



REGISTERED VEHICLES

280,000

CITY SIZE (LAND ONLY)

188 km²

AVG. DAILY CAR TRAVEL (KM)

40.0

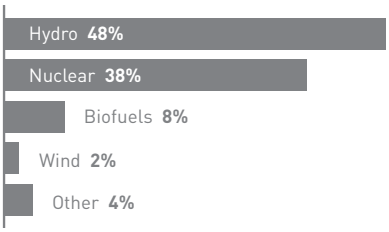
CONGESTION ZONE

Y

congestion charging & environmental zone for heavy vehicles

[COUNTRY CONTEXT] SWEDEN

ELECTRICITY MIX*



NATIONAL EV TARGET

2015: 6,000

EV & EVSE STATUS

EV TODAY	EV TOMORROW	EVSE TODAY	EVSE TOMORROW
100	1,500 by 2015	350	Undetermined

Source: IEA, 2009. Photo credit: Mosebacke Media.

NATIONAL INCENTIVES

EV owners are exempt from vehicle tax for the first five years. // Reduced tax on company vehicles if they are electric.

// Super Clean Car Premium: beginning January 2012, purchasers of EVs receive 40,000 SEK (€4,000) in state funding.

EV/PHEV PROCUREMENT

NATIONAL // On October 1, 2011, the City of Stockholm and Vattenfall coordinated a contract with six vehicle suppliers–with 296 other organizations (municipalities, county councils and private companies) participating. A grant of €5,000 was made available for the first 1,000 vehicles purchased through the procurement agreement. 850 cars and 400 trucks/vans will be purchased per year.

// **CITY** The City of Stockholm is procuring approximately 20 EVs each year for its fleet and is encouraging more national incentives.

STOCKHOLM'S CHARGING INFRASTRUCTURE

Opened in September 2011, Stockholm's newest parking garage Högalidsgaraget (near right) features 200 parking places equipped with EV charging units.

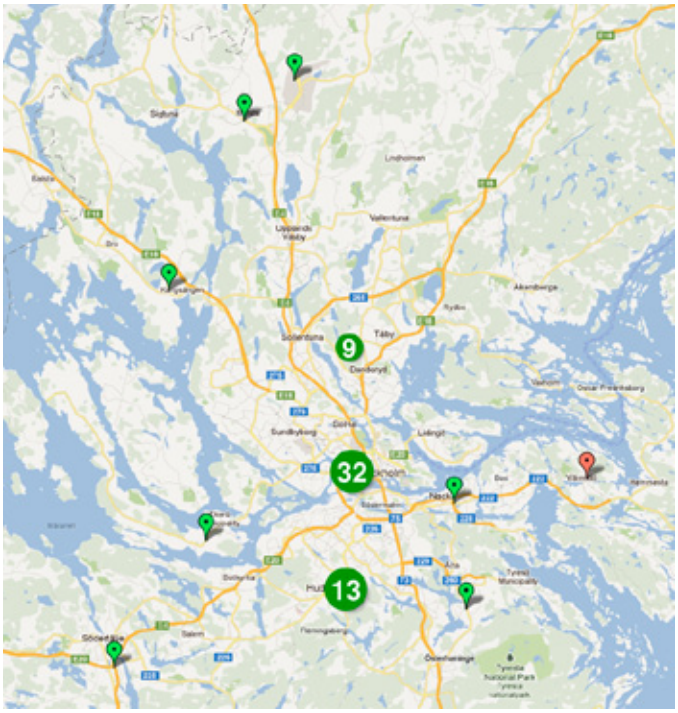
Photo credit ("Stockholm's Charging Infrastructure," left to right): Stockholm Parkering AB; Mosebacke Media.

EV SPOTLIGHT

CREATING A CHARGING INFRASTRUCTURE

As part of its goal to be fossil free by 2050, the City of Stockholm is developing an extensive EV charging infrastructure:

- The map (right) illustrates 100 locations offering 140 charging points for EVs: (52) 230V 16A, (80) 400V 16A, (6) 230V 10A.
- There are additional charging points located in neighboring towns, such as Uppsala, Södertälje, and along major routes such as the TEN-T Nordic Triangle (E4,E18,E20).
- There are countless engine block heaters, located in parking garages and private residences, which can be used to charge electric vehicles.
- New parking facilities are equipped with charging units.
- Private companies and electric utilities have shown great interest in vehicle electrification.
- To a large extent, private citizens purchase vehicles on the secondhand market. As EVs enter into the car sharing clubs, there will be more EVs available to consumers.



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Map from uppladdning.nu.

CONTRIBUTORS

COORDINATED BY

Rocky Mountain Institute (RMI) is an independent, entrepreneurial, nonprofit think-and-do tank. RMI emphasizes integrative design, advanced technologies, and mindful markets in fulfilling its mission to drive the efficient and restorative use of resources. RMI's strategic focus is to map and drive the U.S. transition from fossil fuels to efficiency and renewables by 2050. RMI's Project Get Ready works with cities and industry leaders to develop best practices for electric vehicle integration and adoption. With a network of over 25 cities and 40 strategic partners, this project seeks to identify challenges and opportunities for the seamless transition to vehicle electrification. *To learn more, visit rmi.org.*

The Electric Vehicles Initiative (EVI) is one of eleven initiatives of the Clean Energy Ministerial, a high-level multilateral forum to promote policies and programs that advance clean energy technologies. EVI seeks to facilitate the global deployment of 20 million electric vehicles (EVs), including plug-in hybrid electric vehicles and fuel cell vehicles, by 2020. EVI will enable progress toward this goal by encouraging the development of national deployment targets; launching pilot cities to promote EV demonstrations in urban areas, and share experiences and lessons learned; sharing information on funding levels and research and development programs to ensure that the most crucial global gaps in vehicle technology development are being addressed; exchanging information on EV deployment targets, as well as best practices and policies, to enable progress toward those targets; and engaging private sector stakeholders to focus on the benefits of public-private investments in technology innovation and EV procurement for fleets. *To learn more, visit cleanenergyministerial.org.*

The 17 Contracting Parties to the International Energy Agency's Implementing Agreement for Cooperation on Hybrid and Electric Vehicle Technologies and Programmes share the following objectives: 1) Provide governments, local authorities, large users and industries with objective information on electric and hybrid vehicles, and their effects on energy efficiency and the environment; 2) Collaborate on pre-competitive research projects and investigate the need for further research in promising areas; 3) Collaborate with other transport-related Implementing Agreements and other organizations with an interest in energy for transportation and vehicles; and 4) Serve as a platform for reliable information on hybrid and electric vehicles. *To learn more, visit ieahev.org.*

CONTRIBUTORS

WITH SUPPORT FROM

C40 is a network of large and engaged cities from around the world committed to implementing meaningful and sustainable climate-related policies and programs locally that will help address climate change globally. C40 works in an integrated partnership with the Clinton Climate Initiative (CCI) Cities program, which was started by the William J. Clinton Foundation. CCI Cities became the delivery partner of C40 in 2006. The closer alliance between the two organizations --- announced in the spring of 2011 -- brings significant resources and infrastructure that will enhance and accelerate their historic activities and positions the combined effort as one of the preeminent climate action organizations in the world. *To learn more, visit c40.org.*

The International Energy Agency (IEA) is an autonomous organization which works to ensure reliable, affordable and clean energy for its 28 member countries and beyond. Founded in response to the 1973/4 oil crisis, the IEA's initial role was to help countries co-ordinate a collective response to major disruptions in oil supply through the release of emergency oil stocks to the markets. While this continues to be a key aspect of its work, the IEA has evolved and expanded. It is at the heart of global dialogue on energy, providing authoritative and unbiased research, statistics, analysis and recommendations. *To learn more, visit iea.org.*

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GLOSSARY OF TERMS

Application Programming Interface (API): A set of protocols or formats used to enable communication between software components and an operating system. With regard to electric vehicles, APIs have been established for consumers, to remotely identify charging station locations.

Battery Electric Vehicle (BEV): A pure electric vehicle propelled by an electric motor powered by energy stored in an on-board battery.

DC Fast Charging: Also known as "quick chargers," DC charging stations provide a direct current of electricity to the vehicle's battery from an external charger.

Electric Vehicle Supply Equipment (EVSE): Frequently used in reference to an electric vehicle charger, EVSE includes the connectors, conductors, fittings and other equipment associated with delivering power from the grid to the vehicle.

Fuel Cell VEHICLE (FCV): A vehicle that runs on a fuel cell that generates an electrical current by converting the chemical energy of a fuel, such as hydrogen, into electrical energy.

Hybrid Electric Vehicle (HEV): A vehicle that combines a conventional internal combustion engine (ICE) propulsion system with an electric propulsion system to achieve improvements in fuel economy.

Level 1 Charging: The most basic charging type, utilizing a standard household plug to deliver electricity at 120 volts AC. Charging will typically take between 8-12 hours at 1-2 kilowatts (kW) of peak demand.

Level 2 Charging: Delivers electricity at 220 volts AC, enabling the full charge of a typical electric vehicle battery in 4-6 hours.

Internal Combustion Engine (ICE): An engine in which the combustion of liquid fuel and air occur at high temperature and pressure.

Kilowatt: A unit of power equivalent to 1,000 watts, 1,000 joules per second or about 1.34 horsepower.

Kilowatt Hour: A unit of energy defined as the amount of energy released if work is done at a constant rate of 1 kW for 1 hour. The unit is typically used by electricity company as the key metric for billing their customers.

Plug-in electric vehicle (PEV): A general term used to describe any car that uses a rechargeable battery to power an electric motor.

Plug-in Hybrid Electric Vehicle (PHEV): A hybrid electric vehicle with a high-capacity rechargeable battery that is capable of using electricity as its primary propulsion source. The internal combustion engine typically assists in recharging the battery or serves as a back-up when the battery is depleted.

Powered Two-Wheelers (PTW): Two-wheeled vehicles, such as scooters or motorcycles, that are powered by a liquid fuel or electricity.

Transportation Mix: The modal share of travel patterns reported within an urban area (expressed as share of trips or distance depending on the city), which is based on the city mobility survey methodology and may differ from one city to another.

Vehicle Miles Traveled (VMT): The number of miles traveled by a subset of vehicles for a period of one year. The term is often used to measure passenger vehicle usage in a specific city, state, or country.