



# TIDE

Transport  
Innovation  
Deployment  
for Europe



## **GUIDELINES FOR IMPLEMENTERS**

### **Financing schemes for charging infrastructure**

TIDE is a Coordination Action funded by the European Commission's DG Research and Innovation under the 7th Framework Programme for Research and Development.





Charging infrastructure and electric vehicles

Photo: Fraunhofer IAO

### Rotterdam, the Netherlands: charging infrastructure for electric vehicles (EVs)

At the end of 2014, Rotterdam has realised more than 1200 public and private charging stations at strategic locations combined with applicable parking places for private and company electric car users throughout the city. In the next years, Rotterdam aims to expand the charging network with another 2000 public points.

This will be done in three different ways: (a) on private property, (b) in public parking and (c) in the public street. On private property, owners have, until 2014, been compensated in the cost of a charging point. Also, one year of electricity has been sponsored. In municipal parking's and on street, a public charging station and parking space has been and will be provided to electric vehicle owners.

The goal is to provide the city in the short term with a reliable, recognisable and uniform network of public, semi-public and private charging stations throughout the city. Users are able to charge their vehicles everywhere they go. The payment system is accessible to all and includes advanced 'payment poles' on street as well as in parking areas. All charging stations are provided with clear and understandable explanatory symbols, can be locked and are user-friendly. All chargers are fed with green energy.

## What is it about?

### Characteristics

This measure aims to provide information about financing schemes for charging infrastructure to municipalities.

The erection of charging infrastructure is a necessary precondition for the market diffusion of electric vehicles. Therefore, great attention has to be assigned in particular to financing schemes for charging infrastructure.

**This guideline provides:**

- information on financing a public charging infrastructure;
- benefits and costs related to an installation of charging infrastructure;
- the identification of user/target groups and central stakeholders;
- an assessment of the individual potential for cities.

In general this measure seems to be transferable to a majority of cities in Europe, if tailored to the local context.

### Key benefits

**The key benefits of financing schemes for charging infrastructure can be summarized as follows:**

- they are a basis for a sufficient and sustainable build-up of charging infrastructure within a city;
- they accelerate the speed of market diffusion of electric vehicles.

## Check list

City size	No size restrictions. The actual scope and importance of the measure will be dependent on the city size.
Costs	Total costs depend on (1) the used technology and charging power and resultant costs per unit, (2) the locations of charging points and necessary construction works and operating costs, (3) the penetration rate of electric vehicles and the number of charging points.
Implementation time	<ul style="list-style-type: none"> <li>• Planning of schemes within a few months</li> <li>• Medium term implementation</li> </ul>
Stakeholders involved	<ul style="list-style-type: none"> <li>• Transport operators and authorities as well as public transport associations</li> <li>• Fleet operators</li> <li>• Interest groups</li> <li>• Local authorities</li> <li>• End customers</li> </ul>
Crucial factors	<ul style="list-style-type: none"> <li>• Urgency of matter</li> <li>• Requirements of political institutions</li> <li>• Commitment of authorities</li> <li>• Demand for charging infrastructure</li> <li>• Realizing cost efficiency and competitive capacity</li> </ul>
Undesirable secondary effects	Restrictions in usage for customers due to missing interoperability of charging infrastructure from various operators.

*“As world port city, Rotterdam accepts its responsibility for a sustainable future. The municipality is doing this by promoting electric transport, amongst other things. Electric vehicles are clean, quiet and efficient. Rotterdam wishes to accelerate the introduction of this form of transport. We are doing this by developing a good charging infrastructure for electric vehicles. We already have 2,000 charging points for electric cars in operation in the greater Rotterdam area and continue to implement this. We will continue to increase the electrification of our own fleet.”*

**Mr. Pex Langenberg,  
Vice Mayor for Harbour,  
Sustainability and Mobility  
of the City of Rotterdam**

*“From the perspective of improving the air quality in our world port city, it is obvious to implement EV’s as an important part of the strategy. As it is still a rather new technology, we see it as our task to stimulate this upcoming market by partly financing and regulating the implementation of the infrastructure.”*

**Ms. Wynanda Babb,  
Project leader sustainable mobility,  
City of Rotterdam**

## Benefits & Costs

### Benefits

The installation of charging infrastructure is a necessary precondition for the market diffusion of electric vehicles. While private parking spaces are the primary choice of charging, especially overnight, charging stations at (semi-)public spaces are important to promote electric driving and reduce the user's range anxiety. Fast charging increases the limited range of battery electric vehicles. Charging stations at employer's parking lots allow electric commuting in case the distance between home and work is more than half the vehicle's range.

#### Significant benefits are:

- sufficient and sustainable build-up of charging points within a city;
- making the use of charging points attractive and convenient for customers;
- integration of different stakeholders in the market for charging infrastructure products and services;
- increasing the overall appeal of a city and promotion of electric car sharing;
- the installation of a dense network of charging infrastructure is closely linked to the speed of market diffusion of electric vehicles;
- technical as well as economic viability are taken into account.

### Costs

The costs depend on several parameters and the overall complexity of the charging infrastructure.

Concerning the investment costs, the connection power and intelligence of a charging infrastructure have significant influence on the costs (necessary parts include the communication- and billing hardware, power electronics, charging cable, etc.).

Besides that, the location of the charging infrastructure plays an important role. With a given location and the scope and complexity of civil works, structural completion and the connection with the grid have a major influence on the costs. Furthermore, the administrative realization can become a cost driver.

In operation the maintenance costs depend mostly on the complexity of the installed charging infrastructure. To sum up, the annual maintenance costs are about 5 — 10 % of the overall investment costs.

## Users & Stakeholders

### Users and target groups

The key target groups of users are users of private owned vehicles as well as commercial vehicles. In general, users of electric vehicles want to charge their cars comfortable to extend their possible range and avoid to get stuck with discharged batteries.

**Private vehicles** are defined as vehicles which are registered to a private individual.

**Commercial vehicles** are defined as vehicles which are registered to a commercial owner. These include owners from different groups. For instance, there are vehicles from corporate fleets and different branches of economy, delivery services, car sharers, car rentals etc.



Public charging infrastructure  
Photo: City of Rotterdam

### Key stakeholders for implementation

There are several stakeholders involved in the implementation of a charging infrastructure.

**Infrastructure suppliers** provide the individual components for a charging infrastructure.

**The payment service providers** take care of the clearing and settlement of the charging process.

**The Civil engineering department's** role is to grant a permit for construction works in public space.

**The City planning** role is to locate the position of charging infrastructure.

**The Building authorities** primary task is to provide the required public space.

**The Regulatory agency** ensures that that the provided spaces are labeled with traffic signs.

**The Electric supply company** plays an important role, being responsible for the electrical connection to the energy grid and the supply of electricity.

After the actual implementation the **users** are the central group using the infrastructure to charge their electric vehicles.

## Assessing the potential for your city

### Is this something for us?

A suitable financing scheme for the implementation of charging infrastructure is crucial to its success. Possible issues are:

- willingness to provide public parking spaces for EVs;
- scalability of a charging infrastructure to different city sizes;
- combination of different business models with a charging infrastructure, e.g. electric car sharing.

To integrate electric mobility seamlessly into the urban environment it is vital to distribute the charging infrastructure in an effective way. Constraints can arise because of the complexity of the urban environment. As cities differ from one to another, the distribution of charging infrastructure has to be assessed individually for each city.

### Pre-assessing the costs and benefits

The main challenge for the installation of (semi-)public charging stations is the establishment of sustainable business and financing models, since the revenue on the electric power does usually not cover the cost for installation. At present, erecting new charging stations is seldom profitable; moreover it has to be supported by the municipality or country.

Nevertheless, municipalities, certain local businesses and other local based players can benefit from a vigilant investment in charging infrastructure. Apart from the avoided (local) carbon emissions in transport, electric mobility has an impact on the image of a municipality and a positive effect in the future competition for enterprises and residents.



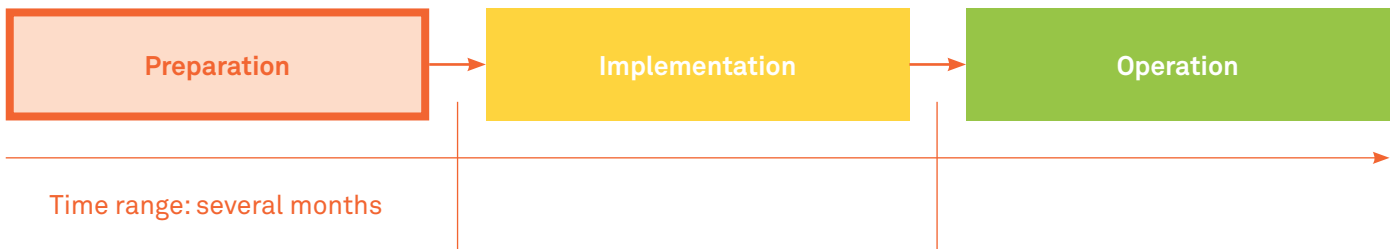
Electric carsharing

Photo: Autolib



# From plan to reality

## Preparation



This phase includes elementary preparation activities on which subsequent implementation and operation are based.

Preliminary questions and issues around the basic coverage of public charging infrastructure, construction and operation of the charging infrastructure should be resolved.

### Key aspects at this stage

#### Co-operation of stakeholders

At the planning phase, the local authorities have to assign a task group which is responsible for the planning of the infrastructure. Another task is to involve further stakeholders.

#### Assessment of location of charging spots

In the beginning a city should think about whether a charging infrastructure is required. It is important to develop a systematic approach to establish the charging infrastructure as a whole instead of conducting a random erection of charging points. Due to the competition of charging infrastructure and other public claimants, scarce spaces should be allotted on sight.

Crucial for the economic attractiveness is a location which is easy accessible, highly frequented and offers an interface for other services.

### Adequate integration into existing infrastructure and cityscape

Regarding the integration of charging infrastructure, different approaches have to be considered. One complex approach is to build up a wholly new charging infrastructure. Apart from that there is the possibility to integrate the charging infrastructure into an already existing infrastructure. This approach allows combining existing infrastructure like parking machines with an additional charging infrastructure.

### Technical requirements

The actual selection of charging infrastructure depends on the operator and its individual concept. Preliminary technical questions should contain the number of vehicles to charge and therefore the required number of charging points, the kind of plugs, the charging rate as well as the user identification and clearance of the charged electricity.



### Legal implementation

To ensure that the charging infrastructure can be erected, legal implementation has to be carried out. There are several alternatives to define specifications for a charging infrastructure, including a development plan.

### Non-discriminatory access to charging infrastructure

To secure that the charging infrastructure can be highly frequented the charge columns have to be easily accessible for all EV-users. Despite that a technical interoperable solution must be provided, allowing EV-users to charge their vehicles at infrastructure from various operators.

### Additional mobility offers and connection of several business models

It has been shown that the interconnection of different business models has a positive impact on the charging infrastructure. The introduction of electric car sharing for instance can help to increase the utilization of an existing/planned charging infrastructure.

Furthermore, an intermodal linkage between electric car sharing and public transport is likely to increase the utilization of a charging infrastructure.

### Stuttgart, Germany: build-up of a charging infrastructure for electric vehicles

In 2012 EnBW Energie Baden-Württemberg AG — one of the largest energy companies in Germany — and the city of Stuttgart built up an electric charging infrastructure. In and around Stuttgart are more than 300 charging points and by the end of 2013 there will be almost 500 charging points. Stuttgart will have the largest electric free floating car-sharing fleet in Europe, consisting of 500 car2go Smart Electric Drive e-mobility vehicles. This should make electric vehicles more accepted within the population.

In addition, EnBW tests different functionalities at the charging points to improve the user friendliness and analyses the requirements of users. This project allows EnBW to gather knowledge and data on how to operate a charging infrastructure profitably.

### Ready for implementation? ✓

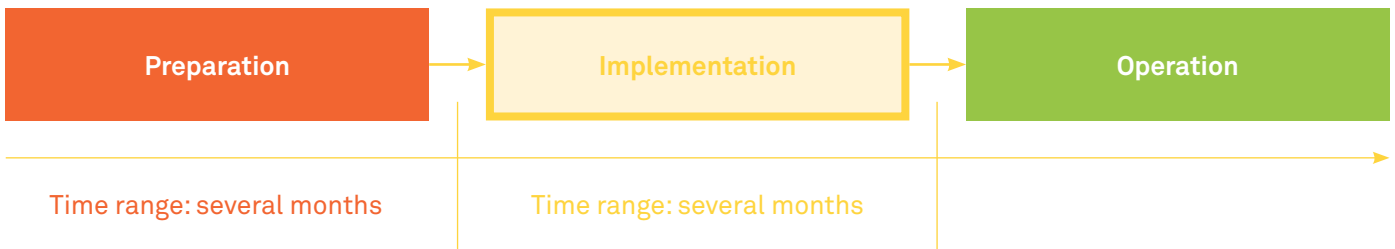
Location of charging infrastructure assessed?	
Adequate integration into existing infrastructure possible?	
Legal implementation required?	
Is access to charging infrastructure given?	
Are technical requirements clear?	
Possible connection to additional services possible?	
Stakeholder support obtained?	



Charging infrastructure for electric vehicles  
Photo: City of Rotterdam

# From plan to reality

## Implementation



This phase includes the actual erection of the charging infrastructure until the beginning of operation.

### Key aspects at this stage

#### Prepare and apply for necessary approvals

According to public-law an approval procedure has to be processed. Due to the complexity of the approval procedure, it is recommended to announce a contact person and to compile a detailed “checklist”. Of particular interest are approvals for special parking areas, civil engineering works, etc.

#### Co-operation of involved partners and local community

In order to accelerate the approval process and the total duration of implementation it is advisable to involve the consortium, contractors as well as other relevant stakeholders. Regular project progress reports help the stakeholders to have an overview of the status quo.

#### Technical implementation

Besides the location of charging infrastructure the technical set-up of a charging infrastructure depends on the scale of the measure. Once

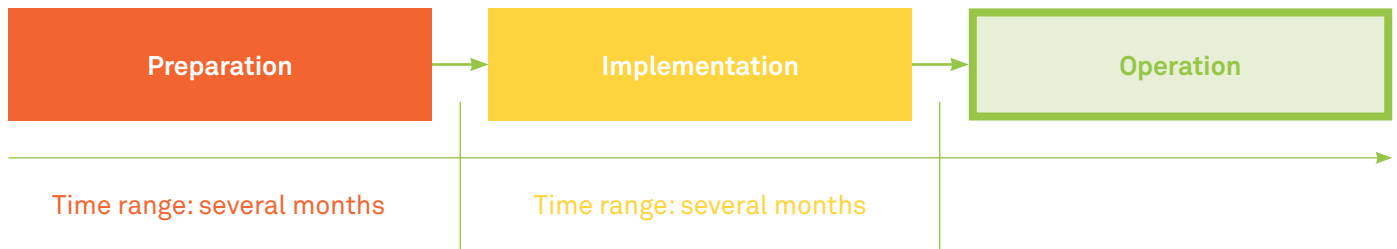
all necessary approvals are granted, the actual implementation can start. The general steps cover the acquisition of the individual elements for the charging infrastructure by the consortium. Subsequently, the civil engineering works are executed. Finally, the charging infrastructure elements are assembled and connected with the electric grid.

#### Marketing to make charging infrastructure well known in public

Prior to the completion of the charging infrastructure, public awareness has to be created. Marketing is very important when introducing the charging infrastructure to users.

## From plan to reality

### Operation



Following preparation and successful implementation it will be possible to proceed to full operation of the charging infrastructure.

#### Key aspects at this stage

##### Easy and comfortable handling of charging infrastructure

The use of the infrastructure has to be easy and comfortable with no limitation due to distracting factors.

##### Protection from vandalism and theft

A public charging infrastructure is exposed to vandalism and theft. The implementation of motion sensors might limit the threat; nevertheless a regular inspection and the involvement of the regulatory agency can discourage vandalism.

##### Servicing and maintenance

Regular maintenance of the charging infrastructure is important to provide the required level of service and performance.

##### Roaming and compatible charging infrastructure

Since there are several communication protocols for a charging infrastructure (as well as different plugs), it is important to have an inter-operable charging infrastructure.

##### Blocked charging spots by conventional combustion cars

Parking violation by conventional vehicles is a serious threat for EV-users who want to charge their vehicles. Based on legal decisions (at least in Germany), conventional cars are not allowed to be towed away from charging spots. For this reason, continuous work with media and stakeholder groups is necessary to overcome this problem.

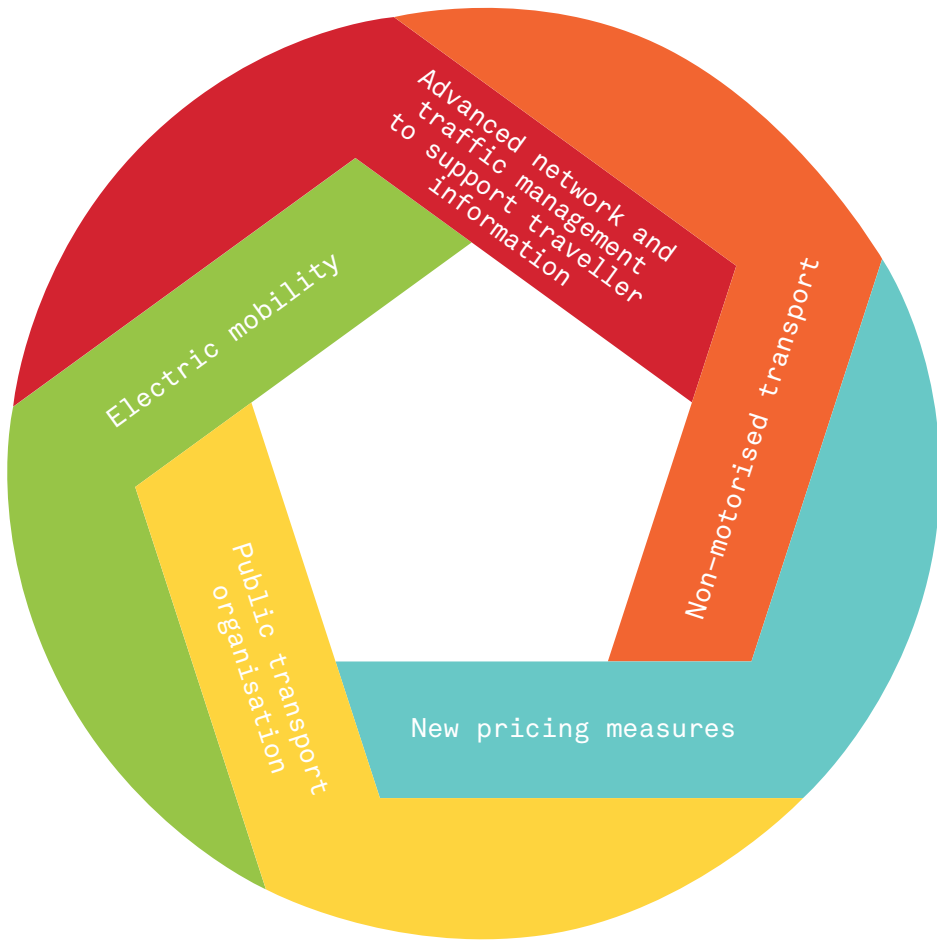
##### Regular evaluation of user needs

Especially at the beginning it is crucial to evaluate the user needs and assess public acceptance. Marketing as a continuous activity throughout all phases, can help to increase public awareness as well as to improve the acceptance of electric vehicles and the corresponding charging infrastructure.



Charging infrastructure in operation

Photo: City of Rotterdam



## Further information & contacts

### Further information

- **The EV–Project,**  
[www.theevproject.com/](http://www.theevproject.com/)
- **Electric mobility in Germany, NOW,**  
[www.now-gmbh.de/de/mediathek.html](http://www.now-gmbh.de/de/mediathek.html)
- **Technical Guideline Charging Infrastructure, VDE,**  
[www.vde.com](http://www.vde.com)

### Further TIDE training on this measure:

Webinars and e–learning courses

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### Contacts

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Prepared for the TIDE project by  
Fraunhofer IAO



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## About TIDE — Transport Innovation Deployment for Europe

The European TIDE project aims to foster a more favourable climate for cities and regions to integrate innovations in their urban mobility policies. This should lead to increased acceptance and take-up of new urban transport solutions and technologies. TIDE will help cities and regions to address common challenges in a collaborative and integrated way.

### Why should you care about innovation?

On several occasions, European cities have indicated that innovation can help to tackle challenges resulting from the economic crisis. Innovation can save costs as well as contribute to reaching urban policy goals. Still, cities lack resources to conclude a full innovation cycle.

Innovative ideas usually start in one or just a few places before they reach wider coverage. TIDE will help cities and regions across Europe to shorten the path towards the implementation of innovative measures by showing that it is not necessary to re-invent the wheel and much more effective to exchange on innovation and transfer successful solutions from one European region to another. TIDE thus offers a cost-efficient way of spreading innovation throughout Europe

### Our mission — Guided by your needs!

TIDE will enhance the broad take-up of 15 innovative urban transport and mobility measures throughout Europe and will make a visible contribution to establishing them as mainstream measures. The TIDE partnership is making a range of new and feasible solutions more easily accessible, to address key challenges of urban transport such as energy efficiency, decarbonisation, demographic change, safety, access for all, and new economic and financial conditions.

TIDE focuses on fostering awareness, advancing expertise via tried and new tools, practical work with cities, and costs and benefits. The needs of practitioners in European cities are thereby a guiding principle. TIDE is actively supporting 15 committed cities to develop implementation scenarios for innovative urban transport measures, setting the example to an even wider group of take-up candidates. These measures cover the following five TIDE themes: new pricing measures, non-motorised transport, advanced network and traffic management to support traveller information, electric mobility, and public transport organisation.

## The TIDE innovative transport measures

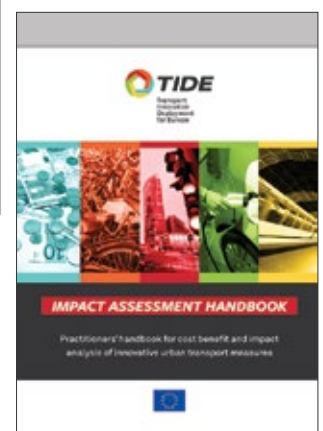
TIDE covers fifteen innovative measures across the five TIDE–themes.

<b>New pricing measures</b>	<ul style="list-style-type: none"> <li>• Road user charging in urban areas</li> <li>• Parking charge policies</li> <li>• Efficient and convenient pricing and charging for multimodal trips</li> </ul>
<b>Non–motorised transport</b>	<ul style="list-style-type: none"> <li>• Bicycle parking schemes</li> <li>• Creating people–friendly streets and public spaces</li> <li>• Fast cycling lanes</li> </ul>
<b>Advanced network and traffic management to support traveller information</b>	<ul style="list-style-type: none"> <li>• Open data server for applications–based traveller information</li> <li>• User–friendly human machine interface for traveller information</li> <li>• Advanced priority systems for public transport</li> </ul>
<b>Electric mobility</b>	<ul style="list-style-type: none"> <li>• Clean city logistics</li> <li>• Financing schemes for charging stations</li> <li>• Inductive charging for public transport</li> </ul>
<b>Public transport organisation</b>	<ul style="list-style-type: none"> <li>• Creation of public transport management bodies for metropolitan areas</li> <li>• Contracting of services focused on improving passenger satisfaction and efficiency</li> <li>• Marketing research as optimisation tool in public transport</li> </ul>

The **TIDE Innovation Toolbox** brochure highlights these fifteen inspiring transport measures and illustrates them with good practice examples, listing characteristics and benefits, key aspects for implementation, and useful references.

The **TIDE Practitioner Handbooks** on Transferability and Impact Assessment provide methods and examples to help understand the local potential for innovative measures in urban transport.

The **Guidelines for Implementers** are ten individual implementation guideline brochures addressing the full implementation process of ten of the fifteen TIDE innovative measures, as well as their costs and benefits, stakeholders to be involved, etc., illustrated with good practice examples.





## The mission of the TIDE project

is to enhance the broad transfer and take-up of 15 innovative urban transport and mobility measures throughout Europe and to make a visible contribution to establish them as mainstream measures.

TIDE focuses on 15 innovative measures in five thematic clusters: financing models and pricing measures, non-motorised transport, network and traffic management to support traveller information, electric vehicles and public transport organisation. Sustainable Urban Mobility Plans are a horizontal topic to integrate the cluster activities.

## The TIDE team

The TIDE consortium is composed of a variety of experts in the field of urban transport, bringing in the knowledge of the academic sector, the experience of cities, the expertise of consultants and the multiplier effect of European networks.



Donostia Udaia  
Ayuntamiento de San Sebastián



City of Rotterdam



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