



## WP 4: CONTEXTUAL DRIVERS FOR CO<sub>2</sub> REDUCTIONS IN PUBLIC TRANSPORT

Full Report

May 2012

# Notice

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# Table of contents

Chapter	Pages
<b>Executive summary</b>	<b>6</b>
<b>1. Introduction</b>	<b>10</b>
1.1. Ticket to Kyoto (T2K)	10
1.2. Optimizing policies and regulations for CO <sub>2</sub> reduction measures	11
<b>2. Study context</b>	<b>14</b>
2.1. A variety of public transport models	14
2.2. Transport sector carbon emissions and energy efficiency commitments	16
2.3. Policy and regulatory framework	19
2.4. Electricity markets – buying green electricity	25
2.5. Carbon markets	27
2.6. Context – summary and implications for T2K partners	32
<b>3. moBiel, Bielefeld</b>	<b>34</b>
3.1. Existing context	34
3.2. Proposed recommendations	38
<b>4. RATP, Paris</b>	<b>40</b>
4.1. Existing context	40
4.2. Proposed recommendations	46
<b>5. RET, Rotterdam</b>	<b>48</b>
5.1. Existing context	48
5.2. Proposed recommendations	54
<b>6. STIB, Brussels</b>	<b>56</b>
6.1. Existing context	56
6.2. Proposed recommendations	64
<b>7. TfGM, Manchester</b>	<b>66</b>
7.1. Existing context	66
7.2. Proposed recommendations	75
<b>8. WP4 drivers and challenges</b>	<b>76</b>
8.1. WP4 objectives	76
8.2. Summary of drivers and challenges	76
<b>9. WP4 recommendations</b>	<b>78</b>
9.1. Summary of recommendations	78
9.2. Company emission reporting and information provided to public transport users (R1)	79
9.3. Improvement to business case process and guidance (R2)	82
9.4. Capacity building and tools (R3)	84
9.5. Raising awareness of the need for public transport to remain a low carbon option (R4)	86
9.6. Investigating EU funding sources (R5)	88
9.7. Using ESCO and EPC models (R6)	91
9.8. Providing carbon neutral journeys by using carbon markets (R7)	95
9.9. Including GHG performance in procurement process and contracts (R8)	99
9.10. Joint procurement of low carbon vehicles (R9)	102
9.11. Land use planning and building regulations (R10)	105

9.12. Taking the recommendations forward

107

**Appendices 110**

**Appendix A. Contributors 112**

**Appendix B. Overview of electricity markets in T2K partner countries 113**

B.1.	In Belgium	113
B.2.	In France	113
B.3.	In Germany	114
B.4.	In the Netherlands	114
B.5.	In the UK	115

**Appendix C. Long list of options development and initial assessment 116**

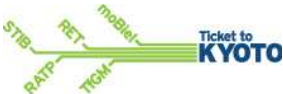
C.1.	Challenges and options	116
C.2.	Initial assessment of potential options	116

**Tables**

Table 1.	WP4 study outputs	11
Table 2.	Overview of operations and governance models across the five partners	15
Table 3.	Gross electricity generation in T2K partner countries (% of TWh in 2009)	17
Table 4.	Summary of transport sector commitments	17
Table 5.	Trends in energy prices in Europe, Diesel oil	18
Table 6.	Trends in energy prices in Europe, Electricity <sup>12</sup>	18
Table 7.	Overview of possible abatement measures and responsibilities	19
Table 8.	Effort sharing targets for T2K partner countries	20
Table 9.	Roadmap 2050 sectoral reductions	21
Table 10.	National overall targets for the share of energy from renewable sources in gross final consumption of energy in 2020 for the five T2K partner countries	22
Table 11.	Overview of mechanisms to encourage renewable energy production	22
Table 12.	Approach to hosting JI projects in T2K partner countries	28
Table 13.	Carbon market evolution, total market value (\$ billion)	32
Table 14.	moBiel energy costs	35
Table 15.	RET energy consumption, 2010	49
Table 16.	Bus Service Operators Grant (BSOG) rates in England, March 2011	67
Table 17.	Summary of carbon prices and sensitivities for appraisal, £/tCO <sub>2</sub> e in 2011 prices	69
Table 18.	TfGM climate change and energy targets	70
Table 19.	WP4 study outputs	76
Table 20.	Challenges identified during workshops	77
Table 21.	Summary of WP4 recommendations	78
Table 22.	Comparison of carbon performance by mode in the UK	87
Table 23.	Pros and cons of main offset projects	97
Table 24.	Recommendations – quick wins and long term actions	107
Table 25.	Challenges and potential options	118
Table 26.	Initial assessment of options	122

**Figures**

Figure 1.	Methodology overview	12
Figure 2.	Automotive diesel oil price trends (EU27, taxes included, current prices, € per litre) <sup>12</sup>	18
Figure 3.	moBiel energy costs in 2011	35
Figure 4.	STIB energy use in 2010 (GWh)	57
Figure 5.	STIB energy costs in 2010	57
Figure 6.	EPC/ESCO process overview	91



# Executive summary

## Ticket to Kyoto

The Ticket to Kyoto Project has been established to reduce CO<sub>2</sub> emissions in public transport through more environmentally friendly behaviour and changes in infrastructure. The project's five partners are:

- moBiel, Bielefeld, Germany;
- RATP, Paris, France;
- RET, Rotterdam, Netherlands;
- STIB (Project Lead), Brussels, Belgium; and
- TfGM, Manchester, United Kingdom.

The project will run over four years (2010 to 2014) and is being co-financed by the INTERREG IVB North West-Europe Programme. Its key goal is to "introduce the principle of low CO<sub>2</sub> emissions as the new standard for public transport providers".

## Optimizing policies and regulations for CO<sub>2</sub> reduction measures

To reach this goal the project has identified five key actions plans that will be delivered within a series of five work packages (WP). Atkins, in partnership with Frontier Economics and Edinburgh Napier University, has been commissioned to assist the partners with work package 4 - Optimizing policies and regulations for CO<sub>2</sub> reduction measures.

WP4 focuses on the interactions between public transport operators and authorities and their stakeholders, including local government, suppliers, maintenance operators, as well as the policy and legal context within which they operate.

The study has been undertaken in four stages – inception, analysis, recommendations, and reporting. A key element of the study has been a series of workshops undertaken in each of the partner cities to inform the analysis and recommendations.

## Study context

The analysis stage confirmed that there is quite a distinct range of operational and governance models for public transport delivery across the five T2K partner cities. It also highlighted the differences in scale of population and public transport operations. The smallest operator, moBiel, delivers services to approx. 55 million passengers per year, and the largest, RATP, supports 3.5 billion passengers per annum. These differences of scale also translate in variations in budgets and spend on energy.

Emissions from the transport sector represented 24% of EU greenhouse gas emissions in 2009, with road transport by far the largest contributor. In European urban areas, public transport is responsible for approx. 10% of transport related greenhouse gas emissions. Across Europe, 40 to 50% of public transport is already powered by electricity (up to 66% in Germany). Buses however still account for 50 to 60% of the total public transport offer in Europe and 95% of buses run on fossil fuels.

The overall carbon emissions for public transport operations vary depending on the type of fuels available for vehicles and the energy mix on offer for the electrified network (reported emissions also depend on national reporting rules). This means that each of the T2K partners face different priorities when trying to reduce carbon emissions. For example, in France, the high proportion of nuclear and hydro power results in relatively low carbon electricity which means that initiatives which aim to further reduce the carbon intensity of the energy used are not as interesting as in Holland, Germany or the UK.

The five partners are all influenced by a range of carbon reduction commitments and have already implemented various energy efficiency and carbon reduction measures, including new initiatives through the other T2K work packages. Although EU level targets and initiatives do not specifically target the public transport sector at present, some important regulations on vehicle, fuel and building efficiency and procurement support the partners' effort to improve their energy efficiency and reduce emissions.

In this context, there is an opportunity for T2K partners to develop packages of measures (individually or together) and show explicitly how these packages could contribute to EU and national level targets. In the long run, this could provide a solid foundation for attracting new sources of funding. This could build on work

undertaken by the partners in WP1 and WP2 where partners have piloted projects to reduce energy use and emissions from their vehicle operation, public transport networks and buildings.

T2K partners are already aware of their ability to reduce their indirect carbon emissions through the purchase of green electricity (with RET, STIB and TfGM already procuring green electricity). The choice of a green tariff is generally perceived as a clear signal that the organisation is taking action to reduce its emissions and encourage the production of renewable energy through the market mechanisms available. It is however important to note that green tariff definitions vary between countries and suppliers and that, in some countries, company reporting guidelines do not recognise the purchase of green electricity as a carbon emission reduction measure on par with internal energy efficiency.

T2K partners are not currently directly involved in carbon trading on international or EU markets although some of them are already indirectly involved through their purchase of green electricity. Although theoretically possible for some partners, the option of raising revenue by generating carbon credits from public transport sector investment is probably not viable at present. This could change however if a European domestic offset mechanism is set up in the future. T2K partners could however decide to take part in carbon trading as buyers of carbon credits to offset their emissions.

## Best practice

Discussions with partners supported by research undertaken at the analysis stage have provided many examples of current or emerging best practice in the following areas:

- well developed **carbon footprinting** work for example with RATP (page 42) and STIB (page 60);
- examples of **national or local regulations** supporting better understanding of energy use and further investment in emission reduction,
  - with the example of regulations in France requiring **emission reporting** at the organisation level but also for individual journeys to better inform users (page 79);
  - improving building performance through “**green leases**” in France, where building owners and tenants have to work together to improve energy efficiency (page 24); and
  - local UK **planning rules** requiring a significant proportion of the energy needs of new developments to be met through on site renewable energy generation (page 105);
- improved knowledge of energy use and prices, leading to
  - reduced energy costs where precise estimates can be provided in advance as investigated by STIB (page 57); and
  - improved **business case (cost benefit analysis) processes**, taking account of energy price volatility and carbon price as per UK guidance (page 81);
- use of sustainability criteria including those related to energy efficiency and carbon performance in the **procurement process**,
  - with example criteria from STIB (page 61) and RET (page 50); and
  - incentives for the public sector to implement green procurement in France (page 98);
- **financial incentives and disincentives** to support further investment in energy efficiency and carbon emission reduction,
  - **within the region**, with STIB’s example of the financial incentive attached to the achievement of the eco-label for its sites (pages 59 and 62); and
  - at the national level, with the UK example of the Climate Change Levy and Carbon Reduction Commitment (**taxation** - page 70) and the Green Bus Fund (financial support - page 102);
- use of **market mechanisms** to incentivise energy efficiency and carbon reduction investment, with examples such as
  - the white energy efficiency certificates in France (page 23);
  - the development of a French domestic offset mechanism (page 28); or
  - the alternative model of a city wide cap and trade mechanism adopted by Tokyo (page 29); and
- use of **carbon markets** to provide carbon neutral journeys to users (pages 94 to 97); and
- opportunities to **access capital funding** to support energy efficiency investment through
  - EU support schemes including Intelligent Energy Europe, the European Local ENergy Assistance (ELENA) and the European Energy Efficiency Fund (**EEEF** – pages 87 to 89);

- revolving funds for public sector investment in energy efficiency (page 73); and
- the development of Energy Performance Contracting (**EPC**) and Energy Services Companies (**ESCOs** – pages 44, 61 and 90 to 93).

## Drivers and challenges for T2K partners

When energy use and CO<sub>2</sub> emission reduction are considered, **a similar set of drivers** can be found across all five T2K partners. These include:

- achieving financial savings;
- attracting additional public transport users, especially from private car users; and
- demonstrating the organisation's commitment to environmental and climate change targets.

T2K partners are **faced with important challenges** when considering initiatives to reduce energy use and CO<sub>2</sub> emissions. Although some differences appear between countries and operating models, many of the following challenges are shared across the five partners:

- trade-off between high short term costs and potential long term benefits;
- access to capital and credit market failure;
- balancing public transport emission reduction with wider transport sector policy objectives;
- split responsibilities and incentives;
- informational failures and uncertainty;
- carbon price externality;
- policy and regulatory frameworks;
- technology risk;
- high search and transaction costs;
- path dependency (lock-in);
- inertia and behavioural barriers; and
- market approach versus planning approach.

## Recommendations

A long list of 30 potential options to support further energy efficiency and carbon reduction investment for the public transport sector was generated and tested at the second round of stakeholder workshops. Using a multi-criteria deliverability framework the stakeholders prioritised the options they considered as having the most practical merit for further development.

From the long list of 30 options the ten listed below have been developed to help T2K partners deliver further energy savings and CO<sub>2</sub> emission reductions:

- R1 Company emission reporting & information provided to public transport users
- R2 Improvement to business case process and guidance
- R3 Capacity building and tools
- R4 Raising awareness of the need for public transport to remain a low carbon option
- R5 Investigating EU funding sources
- R6 Using ESCO and EPC models
- R7 Providing carbon neutral journeys by using carbon markets
- R8 Including GHG performance in procurement process and contracts
- R9 Joint procurement of low carbon vehicles
- R10 Land use planning and building regulations





# 1. Introduction

## 1.1. Ticket to Kyoto (T2K)

### 1.1.1. T2K partners

The Ticket to Kyoto Project has been established to reduce CO<sub>2</sub> emissions in public transport through more environmentally friendly behaviour and changes in infrastructure. The project's five partners are:

- moBiel, Bielefeld, Germany;
- RATP, Paris, France;
- RET, Rotterdam, Netherlands;
- STIB (Project Lead), Brussels, Belgium; and
- TfGM, Manchester, United Kingdom.

### 1.1.2. T2K goal

The project will run over four years (2010 to 2014) and is being co-financed by the INTERREG IVB North West-Europe Programme. Its key goal is:

***'Introducing the principle of low CO<sub>2</sub> emissions as the new standard for public transport providers'***

To reach this goal the project has identified five key actions plans that will be delivered within the following work packages (WP).

- **WP1 - Achieving quick wins**  
The five partners already have implemented some "quick win" energy saving measures (easy to achieve in the short term without large investments) and will share results and know-how. The partners will also implement additional "quick wins" as part of the T2K project such as training and awareness raising to change behaviours and small investments like eco-drive, energy challenges at depots, etc<sup>1</sup>.
- **WP2 - Investing in infrastructures to reduce CO<sub>2</sub> emissions**  
60% of the T2K budget (around €7,2 million) is dedicated to investments focusing on braking energy recovery, energy savings in stations and infrastructure, heat recovery and producing power locally.
- **WP3 - Developing strategic CO<sub>2</sub> plans for 2020**  
In 2012 and 2013, each partner will prepare its own strategic CO<sub>2</sub> plan for the period to 2020. To do so, the partners will start by building a common CO<sub>2</sub> footprinting method, define common indicators, improve energy metering within partner organisations and develop a standard CO<sub>2</sub> calculator to inform users on CO<sub>2</sub> emissions produced when they use public transport in the five partner cities.
- **WP4 - Optimizing policies and regulations for CO<sub>2</sub> reduction measures**  
Considering the interactions between public transport companies and their stakeholders including local governments, suppliers, maintenance operators, as well as the policy and legal context within which they operate.
- **WP5 - Mobilising people and industry through public campaigns**  
Involving T2K partners' internal and external stakeholders to reduce energy use and CO<sub>2</sub> emissions through awareness raising campaigns and events and sharing best practice on communication strategies on these subjects across the five partners.

<sup>1</sup> A report summarising the quick wins implemented by the partners was published on the T2K website in June 2011 (see [www.tickettokyoto.eu/en/publications](http://www.tickettokyoto.eu/en/publications))

## 1.2. Optimizing policies and regulations for CO<sub>2</sub> reduction measures

### 1.2.1. Work package 4 commission

Atkins, in partnership with Frontier Economics and Edinburgh Napier University, were commissioned to assist the partners with work package 4 - Optimizing policies and regulations for CO<sub>2</sub> reduction measures. The brief for the commission specifies five principal outputs, as summarised on Table 1 below.

**Table 1. WP4 study outputs**

Outputs from WP4 brief	Location of information in this report
A review of how the carbon market operates in the five partner countries	Chapter 2
Analysis of the business models that support CO <sub>2</sub> reductions in the five countries	Chapter 2 and individual partner chapters (3 to 7)
Analysis and recommendations on best practice for incentives and contractual requirements for suppliers to drive CO <sub>2</sub> reduction	Individual partner chapters (3 to 7) for best practice case studies Chapter 9 for recommendations
Analysis and recommendations on how risk is best allocated to support the adoption of innovative equipment and processes	Chapter 9 with recommendations on alternative funding arrangements (including risk allocation)
Recommendations, which are feasible to be implemented in all the partner countries, on how to 'unlock' funding for measures that reduce CO <sub>2</sub>	Chapter 9 with recommendations on alternative funding arrangements

### 1.2.2. Methodology

The study team have undertaken the commission in four stages illustrated in Figure 1 overleaf.

### 1.2.3. This report

This report documents the findings of the study, including all evidence and information identified through the study process.

It supplements a summary report produced to disseminate the findings across the five partners.

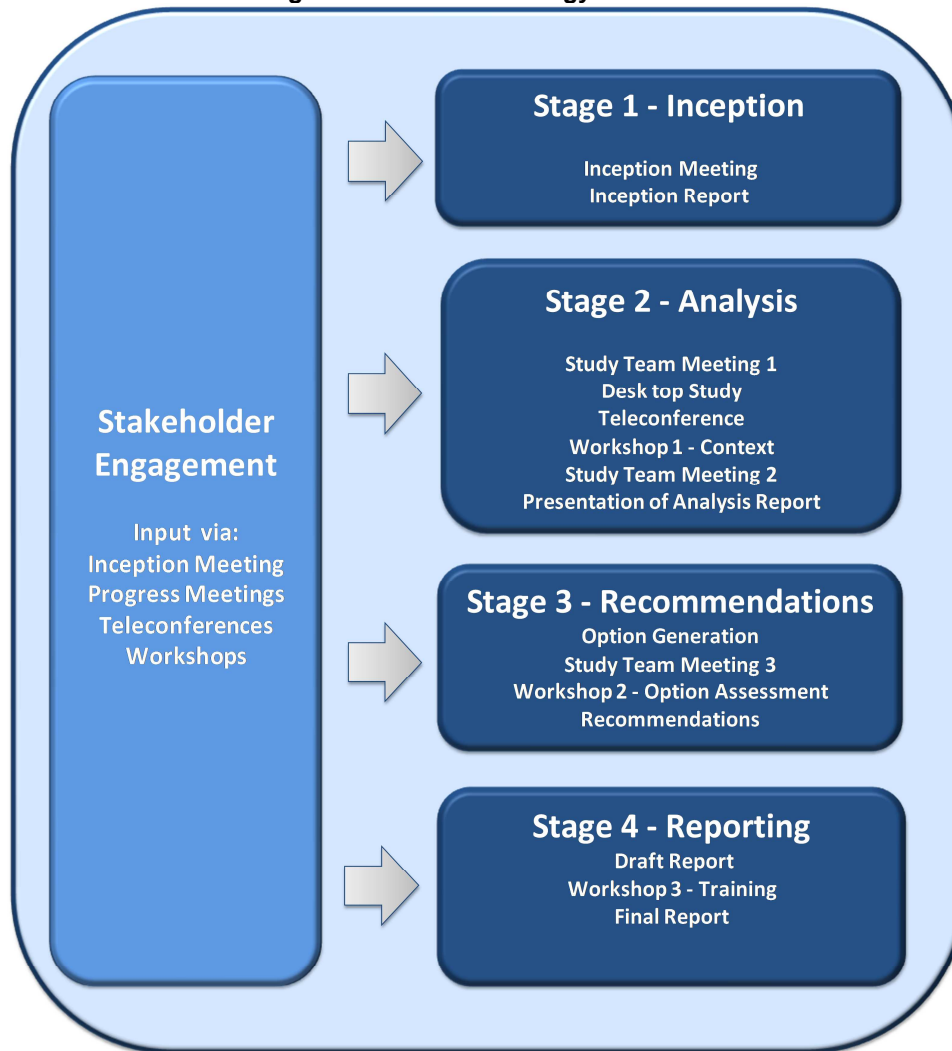
This report builds on the analysis of existing operating models, governance arrangements, carbon markets and business models to identify the challenges facing the five partners in terms of energy efficiency and carbon emission reduction (Chapter 2).

Individual partners' operational context and challenges are presented in individual partner chapters (Chapters 3 to 7). The classification of challenges is adapted from a classification of market failures and barriers undertaken for DEFRA<sup>2</sup>.

Challenges are then summarised in Chapter 8 of this report, leading to the identification of options and recommendations to address the challenges (Chapter 9).

<sup>2</sup> Making the right choices for our future, An economic framework for designing policies to reduce carbon emissions, DEFRA, March 2009

**Figure 1. Methodology overview**





## 2. Study context

### 2.1. A variety of public transport models

#### 2.1.1. Public transport services and EU policy

The 2001 White Paper “European transport policy for 2010: time to decide” set the principles of EU policy relating to contracts for the award of public transport services, including those in urban areas:

- use of the tendering procedure within a clear legal framework defined at Community level;
- granting of exceptions or exclusive rights where necessary;
- awarding financial compensation to operators responsible for performing public service tasks.

Under EU regulations<sup>3</sup>, options for public transport services include:

- **Internal operator** - Unless prohibited by national law (as in the UK where an arm's length approach to public sector operations is required), any competent local authority (or group of local authorities), providing integrated public passenger transport services, may decide to provide public passenger transport services itself or to award public service contracts directly to a legally distinct entity over which the competent local authority exercises control similar to that exercised over its own departments (dominant public influence). The operator will then not be able to take part in competitive tenders for the provision of public transport services outside the territory of the local authority.
- **Third party operator** - Where a public authority chooses to entrust the operation of its public transport services to a third party, it must select the operator in accordance with European Community law on public contracts and concessions and the principles of transparency and equal treatment.
- **Direct award for small contracts** – For operations with value of less than €1 million per annum or less than 300,000 km of public transport services per annum.

The regulation<sup>3</sup> also limits the duration of public services contracts (concessions/franchises) to no more than 10 years for coach and bus services and 15 years for rail, metro and tram services (with possibilities of extensions for a maximum 50% of the original duration). It also states that the awarding authority can choose the operator on the basis of price but also on social, environmental and quality standards.

The regulation<sup>3</sup> came into force in 2009 (with transitional arrangements also in place) and the five T2K partners are at different stages with regard to its implementation.

#### 2.1.2. Overview of public transport services models across the T2K partners

The table below summarises operational and governance models for public transport delivery across the five T2K partner cities.

As well as differences with regard to governance arrangements and operator status, the table highlights the differences in scale of population and public transport operations. The smallest operator, moBiel, delivers services to approx. 55 million passengers per year, and the largest, RATP, delivers 3.5 billion passengers per annum. These differences of scale also translate in variations in budgets and spend on energy.

Responsibilities also differ, with:

- four public transport operators (moBiel, RATP, RET and STIB), working as internal operators or third party operators (or in transition from internal to third party); and
- TfGM, the executive arm of the Greater Manchester transport authority, which does not operate services directly but contracts with operators to deliver tram and supported bus services.

<sup>3</sup> Regulation 1370/2007 covering all public transport services by rail and road where compensation for public service obligation is paid and/or exclusive rights are granted

**Table 2. Overview of operations and governance models across the five partners**

Partners	moBiel	RATP	RET	STIB	TfGM
Population	325,000	12 million (Greater Paris)	1.3 million (Greater Rotterdam)	1.1 million (Brussels Capital Region)	2.6 million (Greater Manchester)
Scale	55 million pax p.a. (set to double by 2030) in Bielefeld urban area 700 staff	3.5 billion pax p.a. in Greater Paris Region 56,000 staff (companywide)	185 million pax p.a. in Rotterdam metropolitan area 3,000 staff	311 million pax p.a. in the Brussels metropolitan area 6,500 staff	280 million pax p.a. in Greater Manchester Approx. 550 staff
Transport modes operated	Tram services (with some parts underground) Bus services	Regional rail services (in part) Metro lines Tram lines (3 out 4 lines) Bus services (in part)	Metro lines Tram lines Bus services Ferry service	Metro lines Tram lines Bus services	TfGM does not operate services directly Tram lines Supported bus services Some influence over regional rail
Public transport operations	moBiel is responsible for planning, operation and maintenance of tram & bus infrastructure and services	RATP operates the services (RATP Operations) and owns and maintains the infrastructure (RATP Infrastructure)	RET operates the services and maintains the infrastructure	STIB operates the services and maintains the infrastructure	TfGM owns the tram network & bus infrastructure and enters into agreements with private sector operators who run tram and bus services
Governance and operator status	The local authority is Stadt Bielefeld (the City of Bielefeld) moBiel, a publicly owned company, is the “preferred operator” for bus and tram services in the city	STIF is the Region’s transport authority RATP is a publicly owned company and the internal operator for the Region but the provision of services will be put out to tender in the coming years (third party operator)	The responsible authority is Stadsregio Rotterdam (City Region) RET, a publicly owned company, was the internal operator for SRR but the provision of services will be put out to tender in the coming years (third party operator)	Brussels Capital Region (Transport Minister) is the transport authority (with Bruxelles Mobilité as its executive arm) STIB is the internal operator for the Brussels Capital Region	TfGM is a public body, governed by elected representatives from the ten Greater Manchester local authorities Tram and bus operations are a mix of concessions (franchises) and open market (majority of bus services)
Financial information (approx, budget definition, can vary)*	moBiel budget €66.6 million (72% covered by PT operations revenue)	RATP annual income: €4.2 billion RATP financial: €183 million	RET budget: €488 million & financial results: €10 million	STIB annual budget: €600 million p.a. (55% covered by operations revenue)	TfGM annual budget: £274 million (ITA budget)
Energy costs (approx. per year)*	Electricity: €2.4 million Fuel: €2.9 million	Electricity: €90 million Fuel (incl. support fleet): €88 million HVAC: €10 million	Electricity: €10 million Fuel (incl. support fleet): €7.7 million	Electricity: €20 million Fuel (incl. support fleet): €13 million	Electricity: £ 3 million p.a. (£1 million for tram traction & £1 million for traffic signals)

\* Based on the most recent data available

## 2.2. Transport sector carbon emissions and energy efficiency commitments

### 2.2.1. Transport sector carbon emissions

Emissions from the transport sector represented 24% of EU greenhouse gas emissions in 2009<sup>4</sup>, with road transport by far the largest contributor. Transport is the second biggest emitter after the energy sector and emissions from transport were still increasing up to 2008 when other sectors were managing to reduce their emissions. According to the European Environment Agency<sup>4</sup>, greenhouse gas emissions from transport decreased in 2008 and 2009, but this is “*mainly due to the effects of the economic recession*” and “*emissions may grow again once economic growth resumes*”<sup>5</sup>.

In European urban areas, public transport is responsible for approx. 10% of transport related greenhouse gas emissions<sup>6</sup>. Across Europe, 40 to 50% of public transport is already powered by electricity (up to 66% in Germany)<sup>7</sup>. Buses however still account for 50 to 60% of the total public transport offer in Europe and 95% of buses run on fossil fuels<sup>8</sup>.

For public transport, the objective to reduce energy use (and associated costs) and carbon emissions needs to be balanced with the wider objective to reduce overall transport sector emissions by encouraging more users to switch from the private car to public transport and low carbon modes. Initiatives to encourage this change in behaviour can result in increases in energy use and emissions for the public transport sector through the provision of additional services and equipment. It is therefore important to consider public transport sector emissions on a per passenger km basis.

The transport sector mainly emits CO<sub>2</sub> directly, through vehicles burning fossil fuels, and indirectly, through electricity used to power trains, metros and trams. The balance between these two main sources of emissions might change in the future as the transport sector becomes more electrified (additional public transport services and electric vehicles).

This means that overall carbon emission for the sector are very dependent on the type of fuels available for vehicles and the energy mix on offer for the electrified network. This is also the case for public transport emissions considered through T2K. As a consequence, carbon footprints across the five partners will vary depending on the fuels and energy mix available and the resulting carbon intensity of electricity in each country (shown in Table 3) and from European providers.

This will also vary according to company greenhouse gases reporting rules in place in each country. As noted later in this report, some partners are able to report electricity emissions in line with data provided by their electricity provider (and therefore including the benefits of green energy purchased) whilst others are required to use the average carbon intensity for their national energy production.

The differences in electricity mixes and resulting carbon intensity can result in different priorities for T2K partners when trying to reduce carbon emissions. For example, in France, the high proportion of nuclear and hydro power results in relatively low carbon electricity. This means that initiatives which aim to further reduce energy consumption and energy carbon intensity do not deliver as many benefits as in Holland, Germany or the UK.

In Germany, the decision was taken in 2011 to phase out nuclear power by 2022. Nuclear power provided 23% of Germany's electricity in 2010 and the change might result in different carbon intensities for German electricity depending on the sources to be used to replace nuclear power.

<sup>4</sup> Source: Laying the foundations for greener transport TERM 2011: transport indicators tracking progress towards environmental targets in Europe, European Environment Agency, 2011

<sup>5</sup> Although the European Environment Agency also notes that “*there is evidence that in some countries car use has reached saturation levels and is now in decline. Between 1999 and 2009, distance travelled by car per capita increased by only 2.6 % in the EU-15. Usage peaked in Denmark in 1999. In France, Spain and the United Kingdom the peak year was 2002, and for Switzerland it was 2004. The phenomenon has been observed elsewhere, first in Japan, which has seen a decline since 1990, and more recently in both Australia and the United States*”.

<sup>6</sup> Source: Towards low/zero-carbon urban mobility in Europe, UITP, November 2011

<sup>7</sup> Source: UITP Mobility in Cities Database, Average for 44 European cities above 250,000 inhabitants

<sup>8</sup> Source: Latest Figures on the Urban Bus Fleet in the European Union, UITP, 2007



**Table 3. Gross electricity generation in T2K partner countries (% of TWh in 2009)**

Energy source <sup>9</sup>	Belgium	France	Germany	Netherlands	UK
Renewable	6%	13%	16%	10%	7%
Nuclear	52%	76%	23%	4%	18%
Gases	33%	4%	14%	63%	45%
Petroleum products	0%	1%	2%	1%	1%
Solid fuels (coal mainly)	6%	5%	42%	21%	28%
Other	3%	1%	3%	1%	1%
Electricity carbon intensity (gCO <sub>2</sub> /kWh) <sup>10</sup>	224.8	70.9	672.2	413.3	508.5

### 2.2.2. Carbon reduction commitments

In 2007, EU leaders made a unilateral commitment to reduce emissions in Europe by at least 20% by 2020 (on 1990 levels) and offered to increase this commitment to 30% by 2020 if other major emitting countries were to commit to reduce emissions under a future international climate agreement.

The EU “Roadmap for moving to a competitive low-carbon economy in 2050”, published in 2011, aims to cut the EU’s greenhouse emissions by 80% by 2050 (compared with 1990 levels). The Roadmap describes how this can be achieved through improvements in energy efficiency, including for the transport sector, and the production of “clean” electricity. Sectors outside the EU Emission Trading Scheme (EU ETS) have for the first time been given emission reduction targets at European level (as described below).

At the regional and local levels, many conurbations have already developed climate change strategies and adopted greenhouse gas reduction targets. Most have however adopted area wide targets with only a few adopting a breakdown of targets per sector (including the transport sector). A summary of transport sector targets of relevance to T2K partners is presented in Table 4 (and in individual partner chapters).

**Table 4. Summary of transport sector commitments**

Target type	moBiel	RATP	RET	STIB	TfGM
National transport sector target	21% reduction in CO <sub>2</sub> by 2012 (on 1990 levels)	20% reduction in CO <sub>2</sub> by 2020 to get back to 1990 levels	As per EU level targets	As per EU level targets	UK Climate Change Act target (all sectors)
Regional/local target	City of Bielefeld target of 40% reduction in emissions by 2020 (on 2005 levels) across all sectors	STIF regional transport strategy target to reduce transport emissions by 20% by 2020 (on 2005 levels)	City of Rotterdam Climate Initiative: 50% reduction in emissions by 2025 (on 1990 levels)	Brussels Region EU Covenant of Mayors target for all sectors: 20% reduction in emissions by 2020 (on 2005 levels)	Greater Manchester Climate Change Strategy target of 48% reduction in emissions by 2020 (on 1990 levels)
T2K partner target		Reduction in GHG emissions of 6% by 2012 and 15% by 2020 (on 2004 levels, adjusted for additional services)	50% reduction in emissions by 2025 (on 1990 levels)		TfGM Climate Change Strategy and Action Plan: 13.5% reduction in CO <sub>2</sub> by 2015 (proposed target of 35% reduction by 2016)

<sup>9</sup> Source: EC (ESTAT, ECFIN), EEA, June 2011 ([www.energy.eu/country\\_overview](http://www.energy.eu/country_overview))

<sup>10</sup> Source: Technical Paper, Electricity-specific emission factors for grid electricity, Econometrica, August 2011 (electricity specific factors derived from IEA composite electricity/heat factors)

### 2.2.3. Energy efficiency commitments

Carbon emission reductions are however not the only driver as energy costs have been rising sharply in the past years and public transport sector organisations are under pressure to reduce these costs. Many initiatives resulting in carbon emission reduction aim to achieve a reduction in energy use in the first place, through improved efficiency and reduced energy demand.

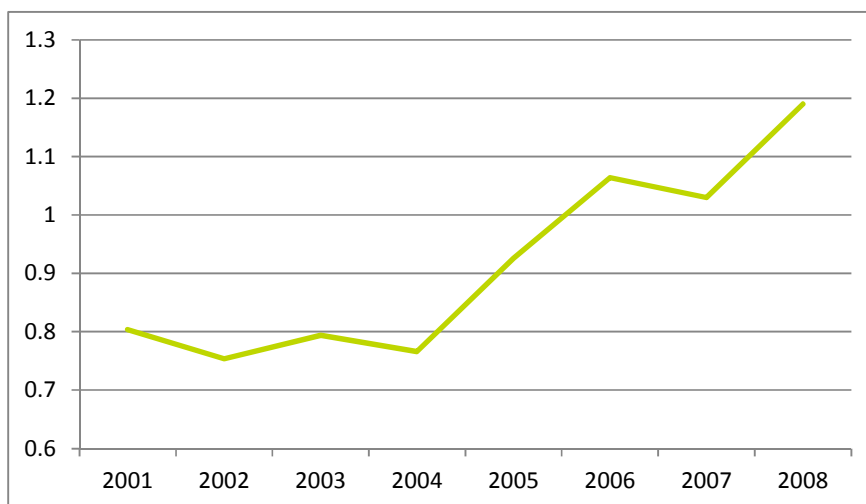
Although energy costs (electricity, gas, fuel and heating) generally represent only a small proportion of T2K partners' overall budgets<sup>11</sup> (between 1 and 6%, as shown in Table 2 above), energy consumption is generally identified as a key cost reduction area.

Board level awareness of the cost of energy has increased in the past years as a result of sharp increases in the cost of electricity and fuel as shown in the Tables and Figure below. Energy prices have also shown a high degree of volatility which means that public transport operators and transport authorities are exposed to large financial and operational risks which can be reduced if their energy use is reduced and alternative sources of energy become available.

**Table 5. Trends in energy prices in Europe, Diesel oil<sup>12</sup>**

Automotive diesel oil	2001	2002	2003	2004	2005	2006	2007	2008
Average price (EU27, taxes included, current prices, € per litre)	0.804	0.754	0.794	0.766	0.926	1.064	1.030	1.190

**Figure 2. Automotive diesel oil price trends (EU27, taxes included, current prices, € per litre)<sup>12</sup>**



**Table 6. Trends in energy prices in Europe, Electricity<sup>12</sup>**

Electricity	2007 (July to Dec)	2008 (Jan to June)	2008 (July to Dec)
Prices for industry (EU27, excise taxes included, current prices, € per 100 kWh)	9.45	9.78	10.29

This has resulted in T2K partners adopting energy efficiency targets alongside carbon reduction ones with, for example:

- RATP Energy Efficiency Action Plan aiming to reduce energy use and associated greenhouse gases emissions by 6% by 2012 and 15% by 2020 (on 2004 levels); and
- TfGM Energy Strategy and Action Plan target of a 2.9% reduction in energy use per annum.

<sup>11</sup> Although this needs to be considered with caution as budget definitions vary between partners

<sup>12</sup> Source: EU Energy in figures 2010, Directorate General for Energy and Transport

## 2.2.4. Delivering energy efficiency and carbon abatement initiatives

The five T2K partners (as many other public transport organisations) have already implemented various energy efficiency and carbon reduction measures, including new initiatives through the other T2K work packages. These include:

- energy use measuring and monitoring (footprinting, metering);
- driver training and behaviour (metros, trams and buses);
- energy efficient traffic and network management (lower speeds, shorter trains, route rationalisation);
- energy efficient rolling stock (regenerative braking, vehicle specification, hotel loads);
- electrification and reduction of electrification losses on the network;
- buildings energy efficiency (stations and interchanges, depots, metro tunnels); and
- low carbon fuels and energy (green energy, biofuels, production of low carbon/renewable energy).

Further work on energy efficiency and carbon reduction strategies is being undertaken by T2K partners through work package 3.

The responsibilities for delivering these initiatives are often split between various stakeholders and organisations within the public transport sector. Funding sources and strategic decisions on investment priorities are also often split between T2K partners and other organisations at the local, regional and national (or even EU) level. This is briefly summarised in Table 7 showing the importance of governance and operational arrangements when considering energy efficiency and carbon emission reduction.

**Table 7. Overview of possible abatement measures and responsibilities**

Activity	CO <sub>2</sub> source	Possible emission reduction measures	Who needs to be involved
Vehicle operations	Emissions from trains, trams, metros, buses and ferries (direct from fuel use or indirect from electricity use)	Vehicle specifications for new and refurbished stock (lower emission engines, lighter vehicles, regenerative braking capability) Energy source/fuels used (green energy, sustainable biofuels) Network conditions and driver/users behaviour (running speeds, stops, acceleration/deceleration, energy efficient traffic management, use of regenerative braking, hotel load management) Improved vehicle maintenance	Investors and vehicle owners (incl. leasing companies) Vehicle manufacturers EU and national governments (standards) Operators Energy and fuel suppliers Network owners, contractors operating and maintaining the network Drivers and users
Public transport network	Energy losses on electric networks	Reduction of losses from electricity transmission (conductor resistance, transformer losses and leakage across insulators, etc)	Network owners, organisations operating and maintaining the network (incl. sub-contractors)
Building management	Energy use at stations, stops, depots and offices	Reduction of energy used through lighting, air conditioning, building insulation, passenger facilities (waiting rooms, lifts and escalators, etc) Production of renewable energy	Building owners and users (incl. sub-contractors), organisations maintaining the buildings Energy providers Third party investors

## 2.3. Policy and regulatory framework

From international work to secure a successor agreement to the Kyoto Protocol to EU level targets, action plans and regulations, energy efficiency and carbon reduction in the transport sector are supported by the wider policy framework. This section provides a summary of relevant EU policy and regulatory instruments which have an impact on the public transport sector in terms of energy efficiency and greenhouse gases emissions, once implemented in national and regional law.

Although the recent United Nations negotiations on Kyoto's successor agreement in Durban (COP17) have succeeded in setting up a roadmap towards a new treaty including the US as well as China, India and Brazil by 2020, there is still no firm agreement on future international targets and mechanisms. It is therefore

important to note that, in the period to 2020, this will result in uncertainties on international targets and mechanisms. This could also have an impact on EU targets and carbon markets, including the EU Emission Trading System (ETS).

### 2.3.1. EU Climate Change Policy

EU members at the time of the Kyoto Protocol (EU 15) are on track to meet the target to reduce emissions by 8% by 2012 (on 1990 levels). EU leaders have however made a more challenging unilateral commitment that, by 2020, Europe would:

- cut its emissions by at least 20% (on 1990 levels);
- source 20% of its energy consumption from renewable sources; and
- achieve a 20% reduction in primary energy use by improving energy efficiency.

These targets are known as the “**20-20-20**” targets and EU Leaders have also reserved the possibility to increase the emission reduction target to 30% if other major emitting countries in the developed and developing worlds commit to do their fair share under a future global climate agreement.

The latest assessment published in Roadmap 2050<sup>13</sup> states that the EU is on track to achieve a 20% reduction in emissions by 2020 but that only half of the 20% energy efficiency target will be met by 2020 (through the implementation of current policies).

The adoption of these climate change targets has led to the development of a wide range of policies and measures, including the Emissions Trading System (EU ETS) which aims to reduce greenhouse gas emissions from industry.

For sectors outside the EU ETS (transport, buildings, agriculture and waste), the “**Effort Sharing Decision**” establishes annual binding greenhouse gas emission targets for Member States for the period from 2013 to 2020. This aims to achieve an overall 10% reduction in emissions from the covered sectors by 2020 (on 2005 levels), with each Member State contributing according to its relative wealth (as shown in Table 8<sup>14</sup>). Member states are then left to decide on national targets and policies to achieve these targets. Effort Sharing targets have generally not been translated into specific transport sector targets with the following exceptions amongst T2K partners:

- Germany has adopted a transport sector target of a 21% reduction in CO<sub>2</sub> emissions by 2012 (on 1990 levels); and
- France has a transport sector target of a 20% reduction in CO<sub>2</sub> by 2020 to get back to 1990 levels.

**Table 8. Effort sharing targets for T2K partner countries**

T2K partner country	Effort sharing target (by 2020, on 2005 levels)
Belgium	-15%
France	-14%
Germany	-14%
Netherlands	-16%
UK	-16%

Member States can use project credits (such as the Clean Development Mechanism described below) to meet their individual targets (the use of international project credits is however limited annually to 3% of 2005 emissions in non-EU ETS sectors and subject to additional conditions)<sup>15</sup>.

The EU Commission’s **Roadmap for moving to a competitive low carbon economy in 2050**<sup>16</sup> identifies the key elements to shape the EU’s climate action to 2050. The approach is based on the view that

<sup>13</sup> Roadmap for moving to a competitive low carbon economy in 2050, Communication from the European Commission, March 2011

<sup>14</sup> Source: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0136:0148:EN:PDF>

<sup>15</sup> These conditions means that of the five T2K partner countries, only Belgium would be able to consider using CDM credits at present (source: [http://ec.europa.eu/clima/policies/effort/faq\\_en.htm](http://ec.europa.eu/clima/policies/effort/faq_en.htm)). Member States also have the ability to trade project credit allowance and domestic over-compliance.

<sup>16</sup> Communication from the European Commission, March 2011

innovative solutions are required to mobilise investments in energy, transport, industry and information and communication technologies, and that more focus is needed on energy efficiency policies.

For the first time at EU level, the Roadmap aims to set sector specific emission reduction targets and a transport sector target is identified (including aviation but excluding maritime emissions and without specific references to the public transport sector). The scenarios considered in the Roadmap recognise that transport emissions have increased in the last years. The transport sector target therefore allows for a slower growth in emissions up to 2030 followed by a sharp decrease to 2050, as shown in Table 9.

In its **2011 Transport White Paper**<sup>17</sup>, the European Commission notes that the transport sector will need to reduce its dependence on oil and reduce CO<sub>2</sub> emissions through improved vehicle energy efficiency and more efficient use of transport infrastructure (through better information and market measures, including the full application of “user pays” and “polluter pays” principles<sup>18</sup>). The public transport sector is mentioned in the White Paper, noting that *“large fleets of urban buses, taxis and delivery vans are particularly suitable for the introduction of alternative propulsion systems and fuels. These could make a substantial contribution in reducing the carbon intensity of urban transport while providing a test bed for new technologies and opportunity for early market deployment”*.

**Table 9. Roadmap 2050 sectoral reductions**

GHG reductions compared to 1990	2005	2030	2050
Total	-7%	-40 to -44%	-79 to -82%
<b>Sectors</b>			
Power (CO <sub>2</sub> )	-7%	-54 to -68%	-93 to -99%
Industry (CO <sub>2</sub> )	-20%	-34 to -40%	-83 to -87%
<b>Transport (CO<sub>2</sub>, incl. aviation, excl. maritime)</b>	<b>+30%</b>	<b>+20 to -9%</b>	<b>-54 to -67%</b>
Residential and services (CO <sub>2</sub> )	-12%	-37 to -53%	-88 to -91%
Agriculture (non CO <sub>2</sub> )	-20%	-36 to -37%	-42 to -49%
Other non CO <sub>2</sub> emissions	-30%	-72 to -73%	-70 to -78%

### 2.3.2. Sector specific directives of relevance for T2K partners

This section provides an overview of sector specific EU directives which are of relevance for T2K partners when considering energy efficiency and carbon emission reduction.

#### Energy supply

EU directives require:

- member states to produce a set proportion of energy from renewable sources (including biomass, bio liquids and biogas)<sup>19</sup>, as shown in Table 10 below, so that the EU as a whole can achieve the following targets;
  - 20% of energy from renewable sources by 2020; and
  - 10% share of renewable energy specifically in the transport sector (from biofuels, biogas, hydrogen and electricity from renewable sources);
- member states to place an obligation on energy providers, including transport fuel suppliers, to provide and promote energy/fuel efficiency<sup>20</sup>; and
- fuel providers to lower the greenhouse gas intensity of fuels by 6% by 2020<sup>21</sup>.

<sup>17</sup> Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, European Commission, March 2011

<sup>18</sup> This is in line with EU level proposals to implement a carbon tax on fuels through changes to the Energy Taxation Directive (with a minimum tax level across all member states) Source: europa.eu

<sup>19</sup> Renewables Directive 2009/28/EC

<sup>20</sup> Energy End-Use Efficiency and Energy Services Directive 2006/32/EC

<sup>21</sup> Fuel Quality Directive 2009/30/EC on the specification of petrol, diesel and gas-oil

**Table 10. National overall targets for the share of energy from renewable sources in gross final consumption of energy in 2020 for the five T2K partner countries<sup>22</sup>**

Country	2005 share	2010 share <sup>23</sup>	2020 target share
Belgium	2.2%	6.7%	13%
France	10.3%	14.4%	23%
Germany	5.8%	17%	18%
Netherlands	2.4%	9.5%	14%
United Kingdom	1.3%	6.7%	15%

The reduction in greenhouse gas intensity of fuels will benefit T2K partners as they procure fuels from their providers as providers are obliged to sell fuels which comply with EU standards and specifications.

With regard to the production of renewable energy, the five T2K partner countries have developed different approaches summarised in Table 11<sup>24</sup>. This is of interest to T2K partners as mechanisms such as feed-in tariffs and tradable green certificates for the production of renewable energy can support their investment in renewable energy production by reducing the pay-back period and providing medium to long term revenue streams. Taxation of energy use or resulting emissions can also provide a powerful incentives to reduce energy use and emissions by improving the business case for investment in these areas.

**Table 11. Overview of mechanisms to encourage renewable energy production**

Main mechanisms	Description	T2K partner countries where implemented
Quota system supported by traded certificates <sup>25</sup>	Electricity suppliers are obliged to provide a set proportion of the electricity they sell from renewable sources To do so, electricity suppliers can produce renewable energy themselves or buy green certificates from renewable energy providers (corresponding to a set amount of renewable energy produced and sent to the grid)	Belgium ("certificats verts") France ("certificats verts") Netherlands UK (Renewable Obligations Certificates - ROCs)
Feed-in tariffs	Contract offered to renewable energy producers whereby a minimum (or set) price is guaranteed for the renewable energy they produced for a set period of time, thereby improving return on investment for renewable technology Tariffs vary: <ul style="list-style-type: none"> <li>between countries</li> <li>between energy sources (photovoltaic, hydro, biomass, biogas, geothermal, offshore wind, onshore wind, and Combined Heat and Power)</li> <li>according to installation size</li> <li>in time as tariffs are revised to reflect installation</li> </ul>	France ("tarifs d'achat") Germany ("StrEG") Netherlands <sup>26</sup> UK

<sup>22</sup> Source: [http://ec.europa.eu/energy/renewables/targets\\_en.htm](http://ec.europa.eu/energy/renewables/targets_en.htm)

<sup>23</sup> Source: The State of Renewable Energies in Europe, 11<sup>th</sup> EurObservER Report, Dec 2011

<sup>24</sup> Source: [www.res-legal.de](http://www.res-legal.de)

<sup>25</sup> These certificates are support certificates and need to be distinguished from Guarantee of Origin certificates. Support certificates are linked to an obligation for electricity suppliers to provide a set proportion of the electricity they sell from renewable sources. The price paid by electricity suppliers to buy these certificates provides a subsidy to renewable energy. Support systems are national only at present and imported renewable electricity is excluded. Guarantee of Origin certificates are tracking instruments to provide proof to a user that a given share or quantity of electricity was produced from renewable sources. This is meant solely for disclosure when green electricity is purchased from electricity providers. Source: RECS international

<sup>26</sup> Dutch support mechanisms have changed over time, with a premium tariff (added to the wholesale market price for the period of 10 years) one of the main instruments used with strong variations in the level of support provided. Sources: Energy Research Centre of the Netherlands, Netherlands Renewable Energy Fact Sheet Europa.eu



Main mechanisms	Description	T2K partner countries where implemented
	costs, etc	
Support for renewable energy production	Various types of support mechanisms implemented (including grants, subsidies, tax relief, etc) at national as well as regional and local levels	All partner countries
Energy use and carbon taxation	In the UK, commercial and industrial users are subject to a Climate Change Levy (CCL), a tax on the consumption of fossil energy (electricity from renewable sources is exempt) Large public and private organisations (together responsible for around 10% of the UK's emissions) are also subject to the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme. The Scheme includes a payment (tax) per tonne of CO <sub>2</sub> from 2012 (based on emissions from electricity use at present) and publishes each organisation's carbon performance	UK (see TfGM section for more detail) <sup>27</sup>

### Green certificates in the Brussels Region

In the Brussels Region, green electricity producers receive green certificates ("certificats verts") issued by Brugel ("Commission de Regulation pour l'Energie")\*. The certificates can be sold on a virtual market (independently from the electricity produced) to any interested buyer and are valid for a five year period.

Buyers are generally electricity providers as they are required to hold a number of green certificates corresponding to the amount of green electricity sold to their customers (at least 3% in 2011 and 3.25% in 2012, with a penalty of €100 per missing certificate which effectively limits the maximum value of certificates). Between 2004 and 2011, the average price of a green certificate varied between €81 and €92. Green energy producers can also sell all certificates directly to ELIA (Belgium's transmission system operator) at a fixed price of just above €20 per certificate.

STIB could obtain green certificates to sell to electricity providers on the market if it produced renewable energy and sold it to the grid (rather than using it on its own network). STIB could also potentially buy green certificates on the virtual market directly to offset its emissions. The €90,000 currently spent per annum to secure 30% green electricity for the high voltage supply would be equivalent to approx. 1,060 green certificates (assuming a price of €85 per certificate) and almost 230 tonnes CO<sub>2</sub>\*. It is however important to note that there is currently more demand than green certificates available and that the system was developed with electricity providers in mind as green certificates buyers.

When considering buying green certificates, it would be more cost efficient for STIB to offset its emissions by purchasing EUAs, CERs or VERs on the carbon market. The amount of €90,000 currently used to purchase 30% green electricity for the high voltage supply would buy approx. 11,250 certificates (assuming a relatively high price of €8/certificate) equivalent to 11,250 tonnes of CO<sub>2</sub>e saved.

Sources: Bruxelles Environnement, Brugel, [www.greentax.be](http://www.greentax.be)

\*The principle is that one certificate represents 217 kg of CO<sub>2</sub> emissions avoided although certificates are attributed differently depending on the size of the installation and the energy source.

<sup>27</sup> A carbon tax was proposed in France but abandoned in 2010. The French Government has however declared its support to the implementation of a carbon tax across the EU.

### White certificates (CEE) in France

In France, a system of tradable “white certificates” for energy savings measures is in place.

Energy providers (electricity, heat, fuels) are required to achieve a set level of energy efficiency improvements. They can invest themselves to encourage users to save energy and support their customers’ investment in energy efficiency but they can also buy “white certificates” to meet this requirement. A penalty of €0.02 per missing kWh is set if providers fail to meet their energy efficiency requirements.

Certificates are issued to local authorities and housing associations when they invest and achieve energy efficiency improvements for their operations such as building insulation, energy efficient lighting/heating/warm water, HVAC, low resistance tyres, eco-driving or freight modal shift. RATP is able to take part through a third party arrangement.

Some interventions are considered standard and a set amount of certificates will be issued when they are implemented. For example, for the investment to train a bus driver in eco-driving, 3,000 certificates should be issued for a year (equivalent to €12 at the current market value of €0.004 per certificate). Proof of the amount of savings achieved is required for non-standard interventions.

*Source: ADEME and RATP*

### Carbon Emissions Reduction Target (CERT) in the UK

The Carbon Emissions Reduction Target (CERT) requires all domestic energy suppliers with a customer base in excess of 50,000 customers to make savings in the amount of CO<sub>2</sub> emitted by householders. Suppliers meet this target by promoting the uptake of low carbon energy solutions to household energy consumers, thereby assisting them to reduce the carbon footprint of their homes.

*Source: UK Department of Energy and Climate Change*

### Energy efficient vehicles

In 2009, the EU adopted a regulation on CO<sub>2</sub> standards for new passenger cars<sup>28</sup>, with binding targets for 2012/2015 and 2020. An agreement on a similar regulation for vans was reached in December 2010. Work is also underway on a revised test cycle to measure vehicle emissions to ensure that these standards result in reductions in CO<sub>2</sub> in real-world driving conditions. This will help T2K partners and their sub-contractors to reduce emissions from their support fleets as fleets are renewed.

The Clean Vehicles Directive<sup>29</sup> will also have an impact on emissions from buses as fleets are renewed as it covers vehicles purchased by entities providing a transport service to the public, irrespective of whether the entities are public or private.

The Directive requires that energy and environmental impacts linked to the operation of the vehicles to be procured over their whole lifetime are taken into account in purchasing decisions (including energy consumption, CO<sub>2</sub> emissions, NO<sub>x</sub>, non-methane hydrocarbons and particulate matter). This can be achieved by:

- setting technical specifications for energy and environmental performance;
- including energy and environmental impacts as award criteria in the purchasing procedure; or
- using a monetised value of CO<sub>2</sub> and other air pollutants<sup>30</sup>, with the value for carbon emissions set between €30 and €40 per tonne of CO<sub>2</sub><sup>31</sup>.

<sup>28</sup> Regulation No 443/2009

<sup>29</sup> Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles 2009/33/EC

<sup>30</sup> Source: [http://ec.europa.eu/transport/urban/vehicles/directive/clean\\_vehicle\\_portal\\_en.htm](http://ec.europa.eu/transport/urban/vehicles/directive/clean_vehicle_portal_en.htm)

<sup>31</sup> The Directive sets the values of CO<sub>2</sub> at €0,03-0,04/kg, NO<sub>x</sub> at €0,0044/g, NMHC at €0,001g and particulate matter at €0,087/g (in 2007 prices)



### Clean Vehicles Directive – examples of monetisation of impacts

Comparison of buses, assuming 800,000km over lifetime and fuel consumption at 57 litres/100 km, where emission cost difference is due to levels of NO<sub>x</sub> emissions:

- Euro IV lifetime emission costs: €104,424
- Euro V lifetime emission costs: €74,328

Using this methodology, electric cars are shown to be approx. €5,000 cheaper than conventional petrol cars due to lower lifetime emissions (which compensates for the additional purchase cost).

*Source: Presentation by Franz Söldner, European Commission, Directorate General Energy and Transport*

### Energy efficient buildings

EU directives and regulations<sup>32</sup> also support improvements in the energy efficiency of new and refurbished buildings. It also requires public procurement of buildings and services to include energy efficiency standards, in line with the view that public sector should lead by example through the procurement process as expressed in Public Procurement for a Better Environment<sup>33</sup> and the Energy Efficiency Plan 2011<sup>34</sup>.

This has been translated into various regulations and policy instruments to improve the energy efficiency of buildings in the member states, for example through building regulations and planning requirements.

### Green building leases in France (“Baux verts”)

In France, new “green” requirements are applicable to new commercial building leases (above 2,000 m<sup>2</sup>) from 2012 (and from 2013 for existing leases). Both parties are required to provide each other with information on the building’s energy (and water) use and to develop an action plan to improve the building’s energy and environmental performance. The lease holder is required to provide access to the building to the owner for energy efficiency improvements to be implemented.

*Source: Ministère de l’Écologie, du Développement durable, des Transports et du Logement*

## 2.4. Electricity markets – buying green electricity

T2K partners generally procure their electricity through traditional procurement methods, appointing a provider to provide electricity for a set period (or several providers appointed onto a panel for a longer period with annual mini-competitions). TfGM uses the services of an energy trader to procure its electricity and moBiel buys electricity from its mother company Stadtwerke Bielefeld.

T2K partners have very limited influence on electricity markets (described in more detail in Appendix B) but they are already procuring (RET, STIB, TfGM) or potentially interested in procuring (RATP) green electricity. In 2004, the European Commission noted that “if all public authorities across the EU demanded green electricity, this would save the equivalent of 60 million tonnes of CO<sub>2</sub>, which is equivalent to 18 % of the EU’s greenhouse gas reduction commitment under the Kyoto Protocol”<sup>35</sup>.

<sup>32</sup> Directive 2002/91/EC, Directive 2010/31/EU as well as proposals for a new Energy Efficiency Directive (COM (2011) 370 final) which includes requirements for public bodies to purchase energy efficient buildings, products and services. Public bodies would have to progressively reduce the energy consumed on their own premises by carrying out every year the required renovation works covering at least 3% of their total floor area. Source: Consultation Paper, Financial Support For Energy Efficiency In Buildings, European Commission, February 2012

<sup>33</sup> Communication from the European Commission, July 2008

<sup>34</sup> Communication from the European Commission, March 2011

<sup>35</sup> Source: Buying green! A handbook on environmental public procurement, European Commission 2004

When requiring green electricity from an electricity supplier, T2K partners can generally obtain<sup>36</sup>:

- either a green tariff, where the supplier sources the agreed amount of electricity from renewable sources<sup>37</sup> (since it is not possible to track the source of the electricity once on the grid, this is done by using Renewable Energy Guarantees of Origin – REGOs)<sup>38</sup>;
- or a green fund, where the supplier guarantees to invest in environmental projects to reduce carbon emissions (this can be the supplier investing directly or indirectly into renewable energy generation or carbon credits bought on the international market).

When procuring green electricity, it is important that T2K partners check how this green electricity is provided as definitions vary. All EU countries already require electricity suppliers to provide a set proportion of their electricity from renewable sources and requiring a green tariff should mean that the supplier provides green electricity over and above this minimum legal requirement (to ensure that the choice of a green tariff actually results in additional renewable electricity being produced). If the supplier uses an offset mechanism, the carbon credits bought should be of sufficient quality to ensure that an actual reduction in emissions is achieved (see the section on carbon markets below). There is also some criticism of tariffs which use already established renewable generation (such as older hydro capacity) as this is not new investment in additional renewable capacity (although the increase in demand for green electricity and the limited availability of existing sources should still result in additional investment in renewable capacity).

#### **Electrabel – AlpEnergie tariff**

Electrabel is STIB's current electricity provider for high and low voltage. Electrabel's main green tariff for large users is AlpEnergie through which the electricity used by its customers is matched with hydro electricity produced in France. Electrabel states that the AlpEnergie tariff has been developed to meet the requirements of large energy users as renewable energy production in Belgium remains limited (Electrabel offers a green energy tariff to households using renewable energy generated in Belgium).

*Source: Electrabel*

Although the purchase of green electricity can be seen as a positive step by T2K partners to reduce their carbon footprint, not all T2K partners are able to claim the benefits of their green tariff when reporting their carbon emissions. In France and in the UK, national guidance for company emission reporting states that emissions from electricity consumption must be calculated using national emission factors published centrally<sup>39</sup>. In the UK, green electricity and carbon credits purchased as offsets can be shown as a separate item in the organisation's report but do not result in reduced CRC payments.

<sup>36</sup> Sources: DirectGov.uk, OFGEM, uswitch.com

<sup>37</sup> Defined as energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases by Renewable Energy Directive 2009/28/EC

<sup>38</sup> REGOs are transferable certificates which demonstrate that electricity has been produced from renewable sources. REGOs allow electricity suppliers to trade renewable electricity between EU countries and users to purchase higher proportions of green electricity. One REGO represents one kilowatt hour of electricity and is issued by competent bodies designated by the Member States. REGOs must be provided by a credible independent third party that certifies the origin of the electricity and that it has not already been sold elsewhere.

<sup>39</sup> Source: Méthode pour la réalisation des bilans d'émissions de Gaz à effet de serre conformément à l'article 75 de la loi n°2010-788 du 12 juillet 2010 portant engagement national pour l'environnement (ENE), Ministère de l'Écologie, du Développement Durable, des Transports et du Logement, September 2011 and UK Environment Agency (CRC) and DEFRA Guidance on how to measure and report your greenhouse gas emissions, 2009

## 2.5. Carbon markets

Carbon markets can be divided in three main categories described in more detail below:

- With international and EU mechanisms within the compliance market:
  - project-based market for compliance with the Kyoto Protocol (CDM and JI);
  - allowance-based market as with the EU ETS cap and trade system; and
- the voluntary market, trading Voluntary Emission Reductions (VERs).

### 2.5.1. Kyoto Protocol and mechanisms

Through the Kyoto Protocol, developed nations (Annex I countries, excluding the United States) agreed to legally binding targets for greenhouse gases emission reduction. The Protocol also set up “flexible mechanisms” for Annex I countries to meet their commitments (based on offsetting through mitigation projects), allowing the use of:

- international emission trading (IET), where nations emitting less than their quota can sell allowances to other nations;
- tradeable carbon credits, where an Annex I country sponsors an emission reduction project in
  - another Annex I country through Joint Implementation (JI, “mise en œuvre conjointe”, resulting in Emission Reduction Units - ERUs); or
  - a non-Annex I country through the Clean Development Mechanism (CDM, “mécanisme de développement propre”, resulting in Certified Emission Reductions - CERs).

Both CDM and JI generally require the application of a baseline and monitoring methodology in order to determine the amount of CERs (or ERUs) generated by a mitigation project. For the transport sector, currently approved methodologies include bus rapid transit (BRT), energy efficiency and fuel switch through retrofit and technology for improved driving<sup>40</sup>. Examples of public transport projects which secured CERs include the TransMilenio Bogotá (BRT), with an expected income from sale of CERs until 2026 between 130 and 350 million US\$<sup>41</sup>, and the New Delhi metro.

#### CDM projects

CDM projects are not directly relevant for T2K partners as they would not be able to generate CERs through investment in energy efficiency or emission reduction as this is reserved to non-Annex I countries. CERs are potentially relevant for T2K partners if they decided to buy carbon credits to offset their emissions as noted below.

#### JI projects

Approaches to JI projects differ amongst the five T2K partner countries as shown in Table 12.

France and Germany allow JI projects (outside EU ETS sectors) to be hosted in the country under specific conditions (including the demonstration of additionality). One German project was in the transport sector, for BSH Bosch Siemens Hausgeräte GmbH to reduce road freight for its operations and transfer to rail<sup>42</sup>. A methodology to obtain credits from car sharing projects was developed in France<sup>43</sup> and a project to switch fuel for buses in Lille was initially developed as a JI project<sup>44</sup>.

In theory, moBiel and RATP could therefore generate JI credits (ERUs) through investments in energy efficiency and carbon reduction. A change in national or regional rules would be needed for other T2K partners to be able to take part. In practice however, it would be very difficult for T2K partners to generate ERUs.

<sup>40</sup> Source: CDM Methodology Booklet, UNFCCC, 2011

<sup>41</sup> Source: The CDM in the Transport Sector, Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities, GTZ, 2007

<sup>42</sup> Source: [www.dehst.de/EN/Climate-Projects/JI-CDM-Project-Data-Base/ji-cdm-project-data-base\\_node.html](http://www.dehst.de/EN/Climate-Projects/JI-CDM-Project-Data-Base/ji-cdm-project-data-base_node.html)

<sup>43</sup> See [www.developpement-durable.gouv.fr/Liste-des-methodes-referencées-et.html](http://www.developpement-durable.gouv.fr/Liste-des-methodes-referencées-et.html) (in French)

<sup>44</sup> Source: Clapp C., A. Leseur, O. Sartor, G. Briner, J. Corfee-Morlot (2010), “Cities and Carbon Market Finance: Taking Stock of Cities” Experience with Clean Development Mechanism (CDM) and Joint Implementation (JI)”, OECD Environmental Working Paper No. 29, OECD

**Table 12. Approach to hosting JI projects in T2K partner countries**

Belgium (Brussels Region)	France	Germany	Netherlands	UK
Not hosting JI projects <sup>45</sup>	Host country ("projets domestiques") <sup>46</sup>	Host country (except for LULUCF <sup>47</sup> projects) <sup>52</sup>	Not hosting JI projects <sup>48</sup>	Decision taken not to host JI projects <sup>49</sup>

An important barrier for T2K partners is the need to prove "additionality". Carbon projects generating credits must be "additional", meaning that T2K partners would need to prove that the reductions in emissions achieved are in addition to those that would have happened anyway, had the offset funding not been available<sup>50</sup>. Credits are awarded based on the difference between baseline scenario emissions and actual emissions after the project is implemented. The baseline assumptions have to take account of legislation in place in the country where the project is being implemented. This means that if national legislation is already ambitious in terms of emission reduction, as is often the case for EU countries, it is difficult to accept any project as "additional"<sup>51</sup>.

To avoid double counting and to help with the assessment of additionality, German guidance notes that in case of a JI project funded in Germany, through German public funding mechanisms, the share of emission reduction financed by this support is considered part of the reference scenario. The project can therefore only earn credits for the share of emission reduction which is not financed through public funding (additional reduction). The use of public funding is however allowed if it is only used to hedge against possible investment risks, as a financial guarantee<sup>52</sup>. Similar rules are in place in France. This would reduce the amount of credits T2K partners could generate in most cases.

OECD led research<sup>53</sup> into the use of JI and CDM in urban areas noted a number of common barriers explaining why the use of credits has been limited in urban based projects. These barriers, also relevant for T2K partners, include:

- split responsibilities with regard to greenhouse gases emission reduction (city, region, state);
- lack of knowledge about carbon market possibilities and lack of specific capacity to develop, monitor and bring projects to approval;
- quantification difficulties of typical urban projects such as transportation;
- high transaction costs due to long time frames, administratively complex procedures, and the typically smaller scale of urban projects, set against strong budget constraints;
- low returns in terms of carbon credits (amongst the ten projects reviewed for the OECD research, revenue from carbon credits rarely covered more than 50% of project costs and for transport projects, carbon credits coverage was 1 to 2% of operating costs for the Transmilenio Bus Rapid

<sup>45</sup> The Brussels Region has chosen to make use of CERs through the World Bank's Community Development Carbon Fund but has not implemented the required legislation to host JI projects. Source: Plan d'Allocation 2008-2012 de la Région de Bruxelles-Capitale, February 2008 and Plan d'amélioration structurelle de la qualité de l'air et de lutte contre le réchauffement climatique 2002 – 2010, IBGE

<sup>46</sup> Source: [www.developpement-durable.gouv.fr/Procedure-de-referencement-des.html](http://www.developpement-durable.gouv.fr/Procedure-de-referencement-des.html)

<sup>47</sup> land use, land-use change and forestry

<sup>48</sup> Source: Joint Implementation for International Emissions Reductions through Electricity Companies in the EU and CEE Countries, Netherlands Country Profile Report, Ecofys

<sup>49</sup> In the UK, the decision was taken not to host JI projects as targets set by the Climate Change Act 2008 are ambitious and require significant emission reduction efforts across all sectors. Source: UK Guidance on project approval and authorisation to participate in Joint Implementation (JI), Department for Energy and Climate Change, June 2011

<sup>50</sup> Source: A short guide to Carbon Offsetting, UK Department for Energy and Climate Change, 2010

<sup>51</sup> It is potentially easier to demonstrate additionality for a project in a new EU country as the Linking Directive (2004/101/EC) allows emission baselines for new EU countries to take account the delay agreed with some new countries in adopting EU targets and regulation

<sup>52</sup> Source: German Manual for JI Host Country Approval – Guidance for Applicants, DEHSt, March 2009

<sup>53</sup> Source: Cities and Carbon Market Finance: Taking Stock of Cities' Experience with Clean Development Mechanism and Joint Implementation, OECD Environmental Working Paper No. 29, OECD, Clapp C., A. Leseur, O. Sartor, G. Briner, J. Corfee-Morlot, 2010

project in Bogota (Columbia) and approx. 13% of capital costs for the then abandoned bus fuel project in Lille (France)); and

- risk of projects underperforming in terms of carbon reductions verified and credits ultimately delivered (amongst the ten OECD case studies, some projects received less than half of the expected credits).

It is also important to note that as there is currently no clear post-2012 agreement under the UNFCCC framework to replace the Kyoto Protocol, there is some uncertainty as to the future of CDM and especially JI<sup>54</sup> mechanisms.

#### **JI in France – Domestic offsets (“projets domestiques”)**

The French “projets domestiques” mechanism is based on JI but is really a domestic offset mechanism for France to incentivise greenhouse gases reductions in non-EU ETS sectors (including transport).

The projects are first approved by the French Designated Focal Point (for CDM and JI) and are then recognised by a partner country (the investor country). The investor country does not conduct its own assessment of the projects and is involved primarily to ensure the scheme's compatibility with the Kyoto Protocol. France, as the host country, issues the ERUs and transfers them to the investor country which immediately passes them back to France. The ERUs are then issued to the project promoter (who can then sell them) or an equivalent payment is made by the Caisse des Dépôts.

Due to the cumbersome JI mechanism which has to be used, take up and the number of projects which have received credits have been relatively low so far.

RATP investigated the potential for the mechanisms to support some investment in energy efficiency and renewable energy production but concluded that the potential financial gain from the sale of credits would be very low and might not cover resource costs initially required to obtain the credits.

Sources: Caisse des Dépôts, [www.mondaq.com/article.asp?articleid=77370](http://www.mondaq.com/article.asp?articleid=77370) and *Effet de serre: bilan des actions mises en œuvre et perspectives, Rapport de commissionnement de C.Bouhot, RATP, 2008*

#### **Domestic offsets in Europe**

Although not currently in place, a mechanism similar to the French domestic offsets could be developed across Europe for sectors outside the EU ETS, with generated credits traded on the EU or international market. This is made possible by Article 24a of the EU ETS Directive<sup>55</sup> and T2K partners could potentially lobby EU institutions and national governments for such a mechanism to be implemented, covering emissions from the public transport sector. This could become especially relevant if JI is not included in the successor agreement to the Kyoto Protocol.

### **2.5.2. EU Emission Trading System**

The EU Emissions Trading System (EU ETS) launched in 2005, is a European cap and trade scheme. It sets a cap, limiting the total amount of greenhouse gases that can be emitted by the factories, power plants and other emitters included in the system.

Within the set cap, companies receive emission allowances (EUAs) which they can sell or buy from one another as needed. Installations can emit more than their allocation by buying allowances from the market. Similarly, an installation that emits less than its allocation can sell its surplus allowances. Installations are required to surrender allowances to account for their actual emissions at the end of each year. The limit on the total number of allowances available ensures that they have a value. Additionally, the number of allowances is reduced over time so that total emissions fall. In 2020 emissions will be 21% lower than in 2005.

The EU ETS operates in 30 countries (the 27 EU Member States plus Iceland, Liechtenstein and Norway). It covers CO<sub>2</sub> emissions from installations such as power stations, combustion plants, oil refineries and iron and steel works, as well as factories making cement, glass, lime, bricks, ceramics, pulp, paper and board.

<sup>54</sup> The JI mechanism requires Annex I countries to have assigned amount units (AAUs) to convert to ERUs to be able to create credits. However, new AAUs will not exist after 2012 without a new Kyoto type framework. Source: OECD as above

<sup>55</sup> Source: Domestic Offsets under Article 24a, Climate Focus for CDC Climat, 2010



Between them, the installations currently in the scheme account for almost half of the EU's CO<sub>2</sub> emissions and 40% of its total greenhouse gas emissions.

The EU ETS will be further expanded to the petrochemicals, ammonia and aluminium industries and to include additional gases from 2013. A series of important changes to the way the EU ETS works will also take effect in order to strengthen the system from 2013.

Although airlines joined the scheme in 2012, the remainder of the transport sector (including public transport) is currently excluded from the EU ETS. T2K partners do not participate in the EU ETS. The ETS does however have an indirect impact on T2K partners as it affects electricity costs as well as the production of hydrogen, concrete, copper, aluminium and insulation materials also used in public transport vehicles and infrastructure.

#### **Alternative approach – a city wide cap and trade scheme for Tokyo**

The City of Tokyo, which covers 12 million inhabitants, has taken the lead in regulating municipal emissions by introducing the first mandatory cap and trade system in Japan as part of its climate change strategy.

Starting in 2010, the Tokyo Emission Trading Scheme (ETS) will target 1,255 private organisations from the industrial and commercial sectors. Office buildings, factories, department stores, hospitals and hotels are covered by the scheme under which companies that cannot meet the reduction target will have to buy credits from those that can, or will face fines and bad publicity.

This is the first ETS in the world to have such a territorial approach. The ETS cap has been established according to Tokyo's own emission reduction target of a 25% reduction by 2020 (on 2000 levels).

Tokyo ETS was approved by business groups, companies, NGOs and Tokyo's Chamber of Commerce and Industry during a wide public consultation exercise. Monitoring and reporting will be undertaken on an annual basis.

*Source: Cities and Carbon Market Finance: Taking Stock of Cities' Experience with Clean Development Mechanism and Joint Implementation, OECD Environmental Working Paper No. 29, OECD, Clapp C., A. Leseur, O. Sartor, G. Briner, J. Corfee-Morlot, 2010*

### **2.5.3. Voluntary market**

Outside the EU ETS and Kyoto Protocol mechanisms, there is a significant voluntary market through which companies looking to offset their emissions can buy Voluntary Emission Reductions (VERs).

The voluntary market is far less regulated than the Kyoto and EU mechanisms. This makes it simpler and cheaper, with lower transaction costs, but also means that the integrity of VERs is variable, leading to lower prices being paid for VERs than for CERs, ERUs or EUAs. Various standards close to those required for CERs are in place however including the Voluntary Gold Standard or the Voluntary Carbon Standard. The voluntary market has also developed carbon credit registries, which track carbon credit transactions and their ownership.

Examples of transport projects which have resulted in the sale of VERs include<sup>56</sup>:

- Philippines - replacement of old motorcycles with electric vehicles;
- USA, Portland Office of Sustainable Development – traffic management through improve signal timing; and
- USA, City of Portland – car sharing (pooling) database.

To obtain VERs, additionality also needs to be demonstrated. As explained above, this would preclude T2K partners from generating VERs through their investment in energy efficiency and carbon emission reduction. T2K partners could however decide to purchase VERs or develop their own offset programme, for example by investing some of their budgets in forest protection and tree planting programmes.

<sup>56</sup> Source: [www.carboncatalog.org](http://www.carboncatalog.org)

### Transport emissions offset programme – Norfolk County Council, UK

Norfolk County Council took the decision when preparing its Local Transport Plan 2 (local transport strategy for the local authority area) that the strategy should “*deliver carbon neutral transport schemes by mitigating or sequestering projected increases in CO<sub>2</sub> emissions for transport improvements that result in additional traffic being induced onto the network*”.

The Local Transport Plan team developed offsetting schemes with the Council’s Environmental team, supporting woodland projects in the local area and working in partnership with the Forestry Commission and community woodland management structures.

Two new woodlands were planted during the LTP2 period as a result of this programme. In total 16,000 new trees were planted. Based on a carbon absorption rate of 4.1 tCO<sub>2</sub> over the lifetime of each tree, this equates to a total of 49,200 tCO<sub>2</sub> removed.

This type of domestic offset is recognised by the UK Government. The Government has issued guidance on reporting greenhouse gas removals and emissions from domestic woodland creation to ensure suitable reporting and avoid any double counting issues. The guidance document notes that “in the years immediately following planting woodland creation may result in some emissions and little or zero GHG removals” and that this should be explained in the organisation’s annual report, also showing the expected level of offset in the future.

*Source: Consultation Paper: Devolving local major transport schemes, UK Department for Transport, January 2012 and Guidance on reporting greenhouse gas removals and emissions from domestic woodland creation, DEFRA, July 2011*

### 2.5.4. Carbon trading

European Union Emission Allowances (EUAs, under EU ETS), Emission Reduction Units (ERUs, under JI initiatives) and Certified Emission Reductions (CERs, under CDM initiatives), representing one tonne of CO<sub>2</sub>e reduced, can be sold privately (primary market) or on climate exchanges<sup>57</sup> (secondary market). VERs are mostly sold through bilateral processes.

EUAs were trading at approx. €8.5 in November 2011. CERs have traded between €6 and €30 between 2008 and 2011. Prices can vary significantly depending on wider macro-economic and political factors. VERs prices are generally lower although they vary significantly as well, also depending on standards.

There are various exchanges trading in carbon allowances, including the Chicago Climate Exchange, Commodity Exchange Bratislava, the European Energy Exchange, ICE Futures Europe, NASDAQ OMX Commodities Europe and PowerNext. The fact that CERs are traded in these markets means that there is more certainty for investors as they know that they will be able to sell them and have a good idea of future prices at least in the medium term.

Table 13<sup>58</sup> provides an overview of volumes traded and corresponding monetary values for the main carbon trading mechanisms, showing the importance of EU ETS trading. As noted above, it would be difficult for T2K partners to generate revenue through the sale of credits for their projects at present; although this might change if a European domestic offset mechanism is developed in the future.

Carbon trading can however be of relevance for T2K partners if they decide to buy carbon credits to offset their emissions. This option is considered in more detail in the recommendations presented in Chapter 9. It is however important to note that carbon credits purchased as offsets are not always accepted as direct reductions in emissions for company reporting purposes. For example, in the UK carbon credits can be shown as “purchased offsets” in the organisation’s report but do not result in reduced CRC payments. A similar regime is in place in France<sup>59</sup>.

<sup>57</sup> CERs generated by CDM projects can be exchanged into EUAs at a 1:1 ratio

<sup>58</sup> Source: State and trends of the carbon market, World Bank 2011

<sup>59</sup> Source: Méthode pour la réalisation des bilans d’émissions de gaz à effet de serre conformément à l’article 75 de la loi n°2010-788 du 12 juillet 2010 portant engagement national pour l’environnement (ENE), Ministère de l’Écologie, du Développement Durable, des Transports et du Logement, September 2011 and UK Environment Agency (CRC) and DEFRA Guidance on how to measure and report your greenhouse gas emissions, 2009

**Table 13. Carbon market evolution, total market value (\$ billion)**

Year	EU ETS allowances	Other allowances	Primary CDM	Secondary CDM	Other offsets	Total
2005	7.9	0.1	2.6	0.2	0.3	11
2006	24.4	0.3	5.8	0.4	0.3	31.2
2007	49.1	0.3	7.4	5.5	0.8	63
2008	100.5	1	6.5	26.3	0.8	135.1
2009	118.5	4.3	2.7	17.5	0.7	143.7
2010	119.8	1.1	1.5	18.3	1.2	141.9

#### **Why is emission trading cost effective? A view from the UK Carbon Trust**

By using emission trading, organisations can decide whether to

- reduce their emissions internally, taking into account the costs of their internal abatement opportunities;
- buy credits and allowances from other parties, taking into account the price of those allowances and credits;
- abate their emissions beyond what is required, generating a surplus of emissions reductions that could be sold to other parties.

Through a market-based mechanism with price signals, organisations can take decisions on which is the most cost-effective strategy to follow to reduce their emissions.

*Source: adapted from The Carbon Trust three stage approach to developing a robust offset strategy, Carbon Trust, 2006*

## **2.6. Context – summary and implications for T2K partners**

### **Public transport sector carbon emissions and energy efficiency**

In 2009, transport sector emissions represented 24% of total EU greenhouse gases emissions<sup>60</sup>. For the first time, the Commission's Roadmap for 2050<sup>61</sup> has set specific transport sector targets for emission reduction, taking account of the fact that transport emissions are likely to increase further in the coming year, requiring a sharp cut in emissions post 2030.

Public transport sector (buses, trams, metros and trains) emissions are however not generally considered within EU or national policy. They represent a small share of overall transport sector emissions (approximately 10%) and almost half of the sector is already electrified. Public transport is also usually seen as a solution to help reduce transport sector emissions as a whole by supporting strategies to encourage modal shift from the private car.

At the regional and local levels however, public transport sector emissions can still represent a significant challenge and efforts to reduce energy use and emissions from the sector are usually welcome by regional and local authorities. Rising energy prices and the financial risk attached to their volatility have also raised the interest in energy efficiency as a way to reduce operating costs.

Successful energy efficiency and carbon reduction interventions usually require organisations to be able to plan for the long term, including energy and carbon considerations early in the planning and design stages, and coordinate efforts from the planning stage through construction/implementation and maintenance. Governance structures have a strong influence on T2K partners' ability to do so.

### **Governance models influence T2K partner's ability to invest in energy and carbon reduction**

T2K partners operate under a range of governance models:

<sup>60</sup> Source: Laying the foundations for greener transport TERM 2011: transport indicators tracking progress towards environmental targets in Europe, European Environment Agency, 2011

<sup>61</sup> Roadmap for moving to a competitive low carbon economy in 2050, Communication from the European Commission, March 2011



- single internal operators in their area (moBiel, STIB);
- single operators transferring to third party operator systems (RATP, RET); and
- open market with some supported services operated by third party operators (TfGM).

The differences in governance models mean that funding arrangements also differ between the partners, for operational costs as well as for investments in vehicles or networks. As a result, there is a need to tailor the approach to CO<sub>2</sub> reduction and energy efficiency to each partner as the most cost efficient solutions depend on the governance structure, location and services delivered, national energy mix, etc.

In spite of these differences however, T2K partners identify similar challenges when considering improvements to their energy efficiency and carbon performance. These challenges are identified in individual partner chapters and explored in detail in Chapter 8. Key shared challenges linked to governance, funding and decision making structures include:

- split responsibilities and decision making (the organisation making a decision on infrastructure investment and specification is often not the same as the organisation managing the infrastructure and paying the energy bills);
- difficulties in accessing capital to invest in energy efficiency and carbon reduction interventions (linked to public sector funding rules, cost saving and investment priorities and long term return on investment for some interventions); and
- uncertainty which undermines decision making on energy efficiency and carbon reduction investment (changing political context, changing operator status for RATP and RET, refurbishment of buildings linked to ownership/lease status, length of concessions/franchises).

The policy and regulatory framework can however help partners to overcome these challenges when energy efficiency and carbon emission reduction figure as key objectives.

### **The role of the policy and regulatory framework, electricity and carbon markets**

Although the public transport sector does not figure in EU priorities to reduce emissions, the transport sector as a whole is identified as a key target for emission reduction.

Regulations on the efficiency of cars and vans, the carbon intensity of fuels, vehicle procurement and the energy efficiency of buildings will help T2K partners to reduce their energy consumption and carbon footprint. When implemented at national and regional levels, incentives for the production of renewable energy as well as taxes linked to energy use and carbon emissions can also support the partners by improving the business case for investment in energy efficiency and carbon reduction interventions.

In this context, there is an opportunity for T2K partners to develop packages of measures (individually or together) and show explicitly how these packages could contribute to EU and national level targets (e.g. 20-20-20 targets, Effort Sharing, Roadmap 2050). In the long run, this could provide a solid foundation for attracting new sources of funding (as explored in Chapter 8).

T2K partners are already aware of their ability to reduce their indirect carbon emissions through the purchase of green electricity (with RET, STIB and TfGM already procuring green electricity). The choice of a green tariff is generally perceived as a clear signal that the organisation is taking action to reduce its emissions and encourage the production of renewable energy through the market mechanisms available. It is however important to note that not all green tariffs offer the same guarantees and that, in some countries, company reporting guidelines do not recognise the purchase of green electricity as a carbon emission reduction measure on par with internal energy efficiency.

T2K partners are not currently directly involved in carbon trading on international or EU markets although some of them are already indirectly involved through their purchase of green electricity. Although theoretically possible for some partners, the option of raising revenue by generating carbon credits from public transport sector investment is probably not viable at present. This could change however if a European domestic offset mechanism is set up in the future. T2K partners could however decide to take part in carbon trading as buyers of carbon credits to offset their emissions (as discussed in Chapter 9).

## 3. moBiel, Bielefeld

### 3.1. Existing context

#### 3.1.1. Governance

The City of Bielefeld (Stadt Bielefeld) is responsible for the development of high level five year transport plans (including minimum network requirements, timetable and line parameters) for the city and appoints the public transport operator.

moBiel is the appointed operator for the city and retains decision on spending to support and improve the public transport network within the five year transport plan requirements. moBiel can decide on timetable and service changes although major changes are referred to the City.

moBiel belongs to Stadtwerke Bielefeld (SWB), an electricity producer<sup>62</sup>, which is in turn owned by the City of Bielefeld. The City owns 50.1% of SWB's shares at present and there are plans for the City to regain full ownership of SWB in the future by buying out the shares currently owned by a private sector company. moBiel and SWB share the same Chief Executive Officer (CEO), appointed by City councillors. Councillors also sit on SWB's administrative board, which also includes representatives from the staff and the current private owner.

Stadt Bielefeld provides political leadership but decision making within SWB and moBiel is relatively autonomous. The two organisations are structured on a private company model. SWB provides support services to moBiel (human resources, IT, etc).

This is a common model in Germany which allows for profits made by the electricity producer to be re-invested into public services in the area. moBiel operates at a loss (around €17 million per annum) but this is substantially offset by SWB. This allows for public transport services to be provided with a relatively modest level of subsidy from the City. This ownership model allows moBiel to invest with longer term returns, with financial support from SWB.

In Germany, transport infrastructure investment is usually co-funded by each individual federal state. New infrastructure is built and owned by the City of Bielefeld and operated and maintained by moBiel (through a concession agreement).

#### 3.1.2. Public transport services

For both bus and tram services, the City of Bielefeld selected moBiel as its "preferred operator" for public transport services (rather than "single operator" which would have secured moBiel's position in Bielefeld but forced moBiel to leave all other public transport markets they currently operate in) and decided not to go to tender. The City has no plans to open the provision of public transport services to competition at present. The tram concession runs until 2028 (25 year period for current concession although this could be reduced in the future) and represents 66% of public transport patronage in the city.

moBiel employs 700 staff to deliver the services and sub-contracts just over 20% of the bus network to private operators. The proportion of services which can be operated by the private sector is limited through an agreement with moBiel's union representatives. These operators provide their own vehicles and sign service level agreements with moBiel. Around 1% of bus services accessing the city are operated by other operators (concessionaires) as they originate from beyond the city boundaries.

moBiel also has a 25% share in WestfalenBahn, a train operating company running services in the Münster/Osnabrück/Bielefeld region. Since 2010, moBiel is also responsible for bus concessions (franchises) operated by Deutsche Bahn and originating outside Bielefeld. moBiel will completely take over these concessions in 2018.

Within Bielefeld, moBiel owns all vehicles (tram and buses). Vehicle purchasing is mainly led by moBiel, with moBiel staff deciding on specifications. moBiel is responsible for the maintenance of public transport vehicles and infrastructure in Bielefeld. Ownership of the infrastructure is shared between moBiel (approx. 2/3 of the network) and the City of Bielefeld (expensive parts of the network such as tunnels), with moBiel paying a lease to the City for the use of City owned infrastructure. Additional infrastructure investment is funded equally by the City and moBiel, with support from the federal state.

<sup>62</sup> SWB also provides water and district heating in Bielefeld and around 50% of the electricity produced is sold outside Bielefeld to other users in Germany

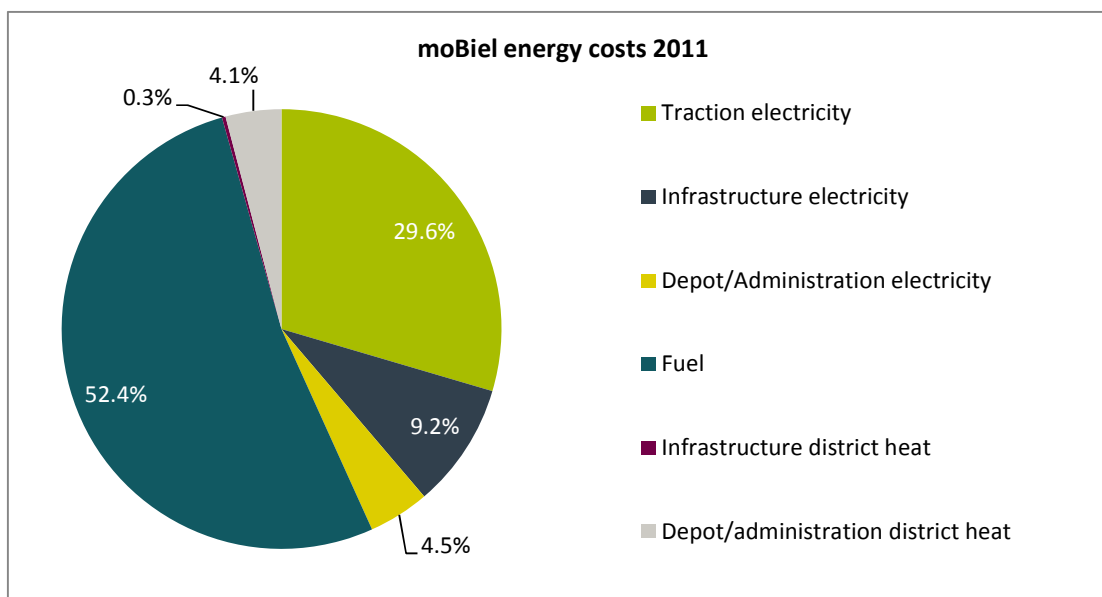
### 3.1.3. Energy sources and use

In 2010, moBiel used 17 million kWh (for the light rail system, covering 5 million km) and 2.4 million litres diesel (bus services, covering 4.7 million km).

**Table 14. moBiel energy costs**

Energy source	Electricity	Fuel	Heating
Cost (2011)	€2.4 million	€2.9 million	€0.24 million

**Figure 3. moBiel energy costs in 2011**



#### Electricity

The electricity used on the tram network and at depots and buildings is provided by SWB, moBiel's mother company (without any specific requirements for low carbon or green energy). The supplier is facing an important challenge in the coming years due to the decision by the German government to replace electricity from nuclear power with alternative sources by 2022 (SWB will end nuclear power production in 2018).

moBiel is then invoiced by SWB for the energy used by the company's buildings and network. moBiel is currently investigating the best way to ensure that energy recovered through regenerative braking on the tram network is taken into account through the invoicing system. Currently this recovered energy is sent back to the grid rather than reused on the network. The goal is to reduce demand on the electric network by using the recovered energy, rather than feedback the energy into the network. Energy use metering is limited at present, but will be improved through the Ticket to Kyoto project.

moBiel and SWB have installed photo-voltaic panels on the tram depot building at the Sieker site. The site is owned by SWB and the investment in photo-voltaics was made by SWB with financial support through national renewable energy support mechanisms ("Gesetz für den Vorrang Erneuerbarer Energien" - EEG).

#### Fuel

Buses run on diesel (with biodiesel as per EU requirements) and as fuel costs increase, there is a general agreement that efficient vehicles should be procured. moBiel has chosen not to use additional biofuels (above EU regulations) but to focus on vehicle efficiency and eco-driving techniques instead. The purchase of new buses is supported by funds from each federal state, which usually require vehicles to meet the latest Euro standards.

#### Forecasting energy costs

When assessing an investment proposal, a steady increase of energy costs is generally considered, but up to now other factors (e.g. labour costs) were more relevant for decision making.

An increase of 4% for diesel prices is considered in business cases. No increase in the price of electricity is considered at present. Also, there is a life-cycle approach for procurement of vehicles and infrastructure, but only for monetary values like energy prices. CO<sub>2</sub> has no monetary value in the business case at present.

There have been successful efforts to get insured against higher energy costs but insurance premiums are getting too expensive to maintain this strategy.

#### **Impact of fuel prices – moBiel's experience after Hurricane Katrina**

Fuel costs rose sharply in the aftermath of Hurricane Katrina. This sharp rise led the planning department to consider fuel costs when planning bus services, routes and timetables for the first time. One of the suggestions was to replace traditional buses by smaller vehicles for evening services.

Although this was not implemented, it shows that sharp unexpected increases in energy costs can have an impact on service planning.

*Source: moBiel*

### **3.1.4. Targets and policies**

National emission reduction targets for Germany aim to reduce CO<sub>2</sub> emissions by 21% by 2012 (on 1990 levels). This is a very challenging target, especially as this will need to be delivered at the same time as a shift from nuclear to other sources of electricity production. This is expected to be achieved by an increase in the use of gas power plants (also with a shift from coal), reduction in energy use and an increase in renewable energy production. Large scale carbon capture and storage is not currently considered in Germany.

Sector specific targets have also been adopted nationally, each sector, including transport, is required to achieve a 21% reduction in emissions. This is also a challenging target for the transport sector as it remains the only sector where emissions are still growing at present.

National targets are supported by a series of instruments including fuel and electricity taxes (moBiel is not exempted) and HGV taxes (road pricing linked to distance driven). Electricity producers also have to declare their carbon footprint as part of their duty to inform consumers. Electricity companies have developed marketing programmes offering support to insulate buildings to attract private customers.

The City of Bielefeld has adopted carbon emission reduction targets, aiming for a 40% reduction in emissions by 2020 (on 2005 levels) and for 20% of electricity to come from renewable sources. These targets do not include sector specific goals but SWB has adopted the City's carbon reduction objectives.

By 2020, SWB will have invested €380 million into renewable energies and modernising facilities to reduce CO<sub>2</sub> emissions in the same period. By 2020, a share of 20% renewable energy and over 30% CHP (cogeneration of heat and power) will result in a 40% decrease in CO<sub>2</sub> emissions.

moBiel and Stadtwerke Bielefeld are part of the City of Bielefeld's climate awareness campaign. Climate awareness has been at the heart of a moBiel marketing campaign ("Klima Kampagne") for the last two years (passengers acting as "climate angels").

### **3.1.5. Future steps**

Decarbonising public transport in Bielefeld is part of the long term strategy which also includes increasing the proportion of trips by public transport, resulting in higher energy demand for moBiel operations.

As many other urban areas in Europe, Bielefeld is faced with some air quality issues and a low emission zone (or equivalent) has been considered. This could result in further incentives to purchase low emission vehicles.

Improvements made at the Sieker depot are the first example of new, energy-efficient infrastructure for moBiel. Energy efficiency consideration is becoming more and more prevalent when planning and designing new buildings and stations but challenges remain to ensure that this is seen as an important decision making criteria.

### 3.1.6. Challenges

The challenges listed below were identified during discussions held with moBiel and its partners.

#### Trade-off between high short term costs and potential long term benefits

The scale of investment required to reduce energy consumption and carbon emissions is often too high when compared to the potential financial savings (at least in the short to medium term).

Usually the barriers to investment are mainly economic rather than technical. New technologies can however add significantly to costs when it is not possible to retro-fit existing systems and therefore new systems need to be installed for whole buildings/stations (for example lighting). The ability to upgrade existing systems in over time, through planned maintenance, should help to reduce investment costs and increase returns on investment.

Energy costs are only a small part of public transport operational costs, staff salaries being a much more important part of moBiel's overall budget.

#### Balancing public transport emission reduction with wider transport sector objectives

In the long term, the City aims to increase public transport provision to encourage more people to switch from private car use to public transport. This will result in higher energy use for moBiel but lower energy use and carbon emissions for the transport sector and the Bielefeld area as a whole. The aim is therefore to improve energy efficiency per passenger kilometre.

There is however some uncertainty when planning for the future of public transport services as Germany will see its overall population decrease and age. This might result in more disperse settlements but could also result in large parts of the population moving back to more urban areas.

The objective to encourage people to use public transport rather than the private cars can result in increased energy use and CO<sub>2</sub> emissions for the public transport sector as shown in the following examples.

- Old tram vehicles are being replaced with more powerful vehicles bought recently. The new vehicles offer additional capacity which will be useful to tackle traffic management issues on the network (due to current bottlenecks). However the choice of these new vehicles has required additional investment in the network to provide sufficient electricity for their operation and has resulted in an increase in energy consumption. The new vehicles have been “de-rated” (the engines’ maximum thrust has been reduced to lower than originally designed values) to reduce energy use.
- Improvements to passenger facilities at stations and stops are resulting in increased energy consumption for example with the provision of lifts, escalators, screens to provide travel information, etc.

There is also a view that CO<sub>2</sub> reductions should not result in public transport users having to pay higher fares as this could result in social impacts and more people might choose to use the private car.

#### Path dependency

The choice of new vehicles and infrastructure is important as they have a long term impact on energy consumption as tram vehicles and infrastructure are long-lived assets.

#### Informational failures, uncertainty and inertia

When planning for and appraising proposed new investment, future energy cost assumptions used are usually quite conservative. This is due to the uncertainty about future energy prices as well as a degree of inertia which results in existing methods being applied without challenge.

Actual energy price data from the past years shows that increases can be much higher than taken into account in the appraisal process. This results in the business case being less convincing for energy efficiency and carbon reduction initiatives. The risk of energy cost volatility should be better recognised in the appraisal process.

#### Policy and regulatory framework and inertia

CO<sub>2</sub> reduction is not part of the contract between moBiel and the City at present and there are no emission reduction targets in contracts between moBiel and its suppliers. This could however be considered in the future when contracts come up for renewal.

When considering energy recovery on the network, moBiel has been faced with an invoicing and tax issue. The simplest thing for moBiel to do is to sell the recovered energy back to its energy supplier (about 10% back to the grid) and receive a discount on its overall invoice.

The current tax regime for electricity does not allow this to happen, as this would result in moBiel paying less tax (calculated on 90% of the energy initially bought). This results in the business case for investment in regenerative braking being less attractive.

### 3.2. Proposed recommendations

Recommendations for T2K partners are described in detail in Chapter 9. Based on moBiel's challenges and discussions with moBiel staff, recommendations of particular relevance to moBiel include:

- lobbying for stronger requirements on emission reporting, company reporting (with a well defined scope), supported by joint budget and accounting for energy use and carbon emissions (which will improve visibility of impacts and savings within the organisation);
- improvement to appraisal and business case processes and guidance to better take account of volatility of energy prices, cost of carbon and whole life cost of investment decisions;
- capacity building and tools (for example, rules of thumb for carbon and whole life cost assessment) for T2K partners on energy efficiency and carbon reduction;
- raising awareness of the need for public transport to remain a low carbon option and of the potential for financial savings through energy efficiency investment; and
- exploring the potential to procure low carbon vehicles jointly (reduced costs, risks, etc).





## 4. RATP, Paris

### 4.1. Existing context

#### 4.1.1. Governance

“Syndicat des Transports d’Ile de France” (STIF) sets the transport policy for the Greater Paris area (“Ile-de-France”). STIF is composed of elected representatives from the Greater Paris regional assembly and the eight sub-regional assemblies (“Conseils Generaux”).

RATP (“Regie Autonome des Transports Parisiens”), a publicly owned company (owned by the French state), is the main public transport operator for the Region.

The majority of public transport funding comes from the Greater Paris Region through STIF (allocated through a contract between STIF and RATP over a four year period). RATP decides on service specifications (timetables, frequency, speed), in collaboration with STIF. Decisions to cut or significantly change services would be referred to STIF.

Additional funding sources include the French Central Government (through national-regional planning “Contrat de Plan Etat-Region”). RATP receives transport contributions from employers in the Greater Paris Region (“versement transport”), contributions from local authorities served by RATP services and collected fares and fines (fare levels are set by STIF).

#### 4.1.2. Public transport services

RATP operates 14 metro lines, two RER (regional train) routes<sup>63</sup>, three tram lines and more than 350 bus routes across the Greater Paris Region, used by 3 billion passengers per annum.

RATP is undergoing fundamental changes at present as it is changing status, from an internal operator for the Greater Paris Region to a third party operator, with public transport provision in the Region being progressively open to competition. This results in the following key changes:

- From January 2012, the company’s accounts are to be divided into two distinct sets of accounts: one set for the infrastructure (going to “RATP Infrastructure”) and one set for the operational activities (“RATP Operations”). RATP Infrastructure and RATP Operations will share the debt burden (€5.4 billion in 2011).
- STIF will become the owner of all RATP rolling stock from 1<sup>st</sup> January 2012 to allow the transfer of rolling stock to a new operator if operating contracts change hands in the future. Rolling stock specifications remain with RATP at the moment but this activity will probably be taken over by STIF in the future as it becomes the rolling stock owner. Maintenance responsibilities will remain with the operator.
- Other assets had to be divided between STIF, RATP Infrastructure and RATP Operations. This has been progressed for the end of 2011, identifying
  - RATP Infrastructure assets, which include stations, tunnels and rail depots, lifts and escalators but exclude travel information, ticket machines and booths;
  - rolling stock (bus, metro and tram) which STIF will have to buy from RATP if the operator changes (at residual value price);
  - bus and tramway infrastructure (depots, tramway tracks and tramway line side infrastructure<sup>64</sup>) which STIF does not have to buy from RATP if the operator changes but can decide to acquire (RATP is required to maintain the buildings to a specified standard but investments in energy efficiency are not required); and
  - office buildings (and other company owned real estate) which will remain RATP’s.
- In 2012, RATP will be renegotiating its four year contract with STIF in a competitive environment for the first time, as the Greater Paris public transport market progressively opens to

<sup>63</sup> in collaboration with SNCF (the national rail operator)

<sup>64</sup> This will have an impact on opportunities to improve energy efficiency on the tram network (split responsibilities)



competition. New bus routes are already subjected to the competitive process, with RATP and other operators able to bid to run them. Existing bus routes will be opened to competition from 2024, 2029 for trams and 2039 for the Metro.

### 4.1.3. Energy sources and use

RATP spends approx. €90 million on electricity, €88million on fuel (buses and fleets) and €10 million on HVAC (heating, ventilation and air conditioning) per annum.

#### Electricity

RATP procures 90% of its electricity through a procurement process by which suppliers are selected to be part of a panel (every 3 year) and then subject to annual mini-competitions to provide energy for a year. EDF was the main provider until 2010 but this changed in 2011 and 2012 (Eon and Enel).

EDF provided a high proportion of electricity from nuclear and hydro. The energy mix provided by the new suppliers includes a higher proportion of high carbon density energy which means that RATP's carbon footprint will become worse if the suppliers' mix is taken into account to calculate the footprint. There is however a view that the French electricity mix (national emission factors) should be taken into account rather than information from suppliers which might change every year when the electricity actually used is produced in France.

RATP does not procure an energy mix with higher proportion of green energy as the view is that the French Government and the national energy regulating body ("Commission de régulation de l'énergie") are best placed to make choices to support the production of low carbon and renewable electricity and that if RATP were to request more renewable electricity, this would result in someone else having to buy high carbon intensity energy. The view is that the regulating body is best able to support an optimum energy mix for all users in France. Procuring additional green energy could also require the use of a trader and this could result in the information on the energy mix provided being less reliable.

#### Fuels

A similar procurement process is in place for diesel oil for buses, with a panel of suppliers appointed for a three year period and mini-competitions to select the next supplier for a six month period.

A lower tax rate is applied on biodiesel and RATP runs some buses (from two depots) on a higher blend of biodiesel (B30, first generation from agricultural products produced in France). Buses running on B30 represent approximately 7% of RATP bus kilometres.

#### Forecasting energy costs

Business case work to assess the viability of investments usually assumes an increase in energy cost of 2% per annum. This is based on appraisal guidance used for transport projects in France<sup>65</sup>. It is however very low when compared to actual increases in the last few years of approximately 7% per year (as observed by RATP in negotiated contracts with suppliers).

For transport projects which require an environmental impact assessment ("étude d'impacts"), recommendations<sup>65</sup> included in applicable appraisal guidance set a price of €100 per tonne of CO<sub>2</sub> for the period between 2000 and 2010 (based on the cost of carbon through international market mechanisms). The guidance recommends taking a 3% annual increase for this cost from 2011.

Work undertaken by RATP on its carbon footprint has included the development of assumptions for potential budgets to be dedicated to CO<sub>2</sub> reduction for the organisation based on three criteria:

- RATP's CO<sub>2</sub> emission reduction target and carbon price: €200,000 per annum;
- Stern's assumptions on the cost of action as a proportion of GVA: between €4 and 12 million per annum; and
- financial risk for RATP: between €1 and 2 million per annum.

<sup>65</sup> Transports : choix des investissements et coût des nuisances, Commissariat General du Plan, 2001

#### 4.1.4. Targets and policies

The French Government has adopted a target of a 75% reduction in greenhouse gas emissions by 2050 (on 1990 levels). EU level targets also require a 14% reduction in emissions by 2020 (on 2005 levels) for non EU ETS sectors (including transport). For the transport sector, the target set at the national level is a 20% reduction in emissions by 2020, to get back to 1990 emission levels.

The regional climate change strategy adopted in 2011<sup>66</sup> notes that transport sector emissions in the Region will need to decrease by between 60 and 75% for the national target to be met. The regional transport strategy<sup>67</sup> developed by STIF aims to reduce transport sector emissions by 20% by 2020 (on 2005 levels), through energy efficient technologies, a small reduction in traffic (-2% in 2020 when compared to 2010) and increases in public transport use (+20%), walking and cycling (+10%).

The 2008-2012 contract between STIF and RATP includes the following environmental objectives:

- improving energy efficiency (for example through eco-driving and regenerative braking);
- developing the use of biofuels for buses;
- developing the use of renewable energy sources for RATP buildings;
- developing carbon footprinting for public transport services; and
- implementing eco-design principles for buildings, infrastructure, rolling stock and equipment.

The contract does not set targets for the reduction of RATP's carbon footprint.

RATP has developed its own Energy and Climate Change Strategy ("Politique Energie-Climat"), adopted by the organisation's board in 2005. The strategy sets the following objectives:

- develop an action plan focused on energy efficiency and use in RATP operations by 2006, considering bus services, rail services, stops and stations and buildings (offices and depots). The action plan will aim to reduce energy use and associated greenhouse gases emissions by at least 6% by 2012 and 15% by 2020 (compared with 2004 levels and adjusted for additional services);
- implement a cross-sector action plan for energy efficiency and climate change from 2006 to promote the consideration of these issues across all processes. To this effect, the following actions are identified:
  - project management guidelines will be reviewed to ensure that energy strategy objectives are taken into account and improve environmental management;
  - all increases and decreases in CO<sub>2</sub> emissions will be accounted for and given a monetary value for project appraisal and procurement processes;
  - RATP will develop a workplace travel plan to reduce staff CO<sub>2</sub> emissions;
  - RATP will use its Energy and Climate Change Strategy as a selling point in competitive processes;
  - energy efficiency will be a key element of the organisation's marketing and communications;
  - research and development activities on energy efficiency and climate change will be developed further, with a focus on buses (as the most polluting mode); and
- further develop tools and methodologies as required to support action plans, including RATP carbon footprinting ("Bilan Carbone<sup>®</sup>"), investigating opportunities to use "energy certificates", developing its long term vision with the objective to reduce emissions by 75% by 2050 and developing indicators to monitor energy risks.

#### 4.1.5. Future steps

##### Separation between RATP Infrastructure and RATP Operations

In the future, RATP Infrastructure will procure the electricity for the network and invoice network users on a pro-rata basis. At first, RATP Operations will be the main user but as the network becomes subject to competition, other operators might use the network. STIF will be responsible for the purchase of vehicles.

This split of responsibility will result in a lack of incentives to invest in energy efficiency and carbon reduction. For example, savings achieved through energy efficiency will benefit the operator but this will not result in further investment in efficient vehicles as STIF will be responsible for vehicle procurement. Another example is the future investment in driverless rail services. This will result in lower costs for the operator (staff and potentially energy) but in higher investment and maintenance costs for RATP Infrastructure.

<sup>66</sup> Plan Regional pour le Climat d'Ile-de-France, 2011

<sup>67</sup> Plan de Deplacement Urbain de l'Ile-de-France

## Vehicle procurement

RATP has already implemented a whole life cost approach to its vehicle procurement. This is seen as important for rail rolling stock but even more important for buses as the cost of fuel used during the vehicle's life represents between 30 and 40% of buses' whole life cost (lower for rail rolling stock). Energy consumption requirements are generally taken into account by RATP when buying other goods as well (IT for example). This procedure could however change when the responsibility for vehicle purchasing is transferred to STIF.

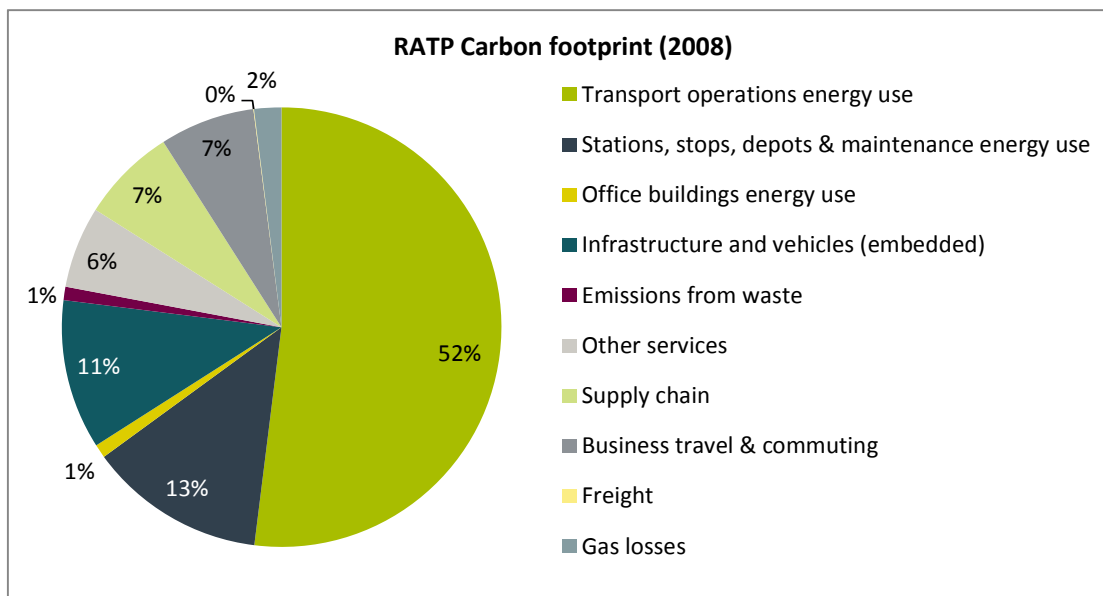
Although the whole life cost cycle approach is generally well used and results in energy efficiency being considered, CO<sub>2</sub> emissions are not always considered. At present, CO<sub>2</sub> emissions are being considered for buses, through the implementation of the Clean Vehicles Directive, but the value attributed to CO<sub>2</sub> emissions remains relatively low. RATP has opted for the inclusion of technical criteria and maximum emission criteria in requirements rather than using the monetised value of CO<sub>2</sub> emissions.

## Measuring and communicating on CO<sub>2</sub>

In France, carbon reporting will become compulsory from December 2012<sup>68</sup> for private sector organisations with more than 500 staff, public sector organisations with more than 250 staff, regional, sub-regional and local authorities with more than 50,000 inhabitants and central government. Footprinting work will need to be updated and published every three years.

### RATP Carbon Footprint ("Bilan Carbone<sup>®</sup>")

The scope of activities selected for footprinting work includes all RATP activities on the Greater Paris network: public transport operations, buildings and offices (including staff restaurant), infrastructure and vehicle maintenance, staff travel, freight movements between suppliers and RATP, emissions from waste and sub-contractor emissions. Embedded emissions from materials procured by RATP are accounted for. Embedded emissions for tramway lines T1, 2 and 3 are included (recent infrastructure). Metro and RER infrastructure embedded emissions are excluded. Main sources of carbon emissions for RATP in 2008 were as shown in the figure below.



Energy use is the most important source of emissions (66%), followed by infrastructure and vehicle embedded emissions due to the scale of RATP infrastructure and rolling stock. 2008 results showed a 8% decrease in RATP emissions (on 2005 levels), with energy efficiency and emission reduction initiatives more than offsetting the increase in RATP's offer of services.

Source: RATP Bilan Carbone<sup>®</sup>

<sup>68</sup> Décret d'application concernant le bilan des émissions de gaz à effet de serre (BEGES), 11 juillet 2011

The guidance document published by the French Government states that emissions from electricity consumption must be calculated using emission factors published by the French Agency for the Environment and Energy Efficiency (ADEME). This means that emission data provided by electricity providers and related to the electricity mix they provide to their customers can't be used for the footprint. This also means that any green electricity procured by the organisation will not contribute to reductions in emissions as shown in the published reports. The same principle is applied to offsets through the purchase of carbon credits<sup>69</sup>.

From December 2013, transport providers, including RATP as a public transport provider, will need to inform users on the quantity of CO<sub>2</sub> released by their journeys. Providers will be allowed to use default values at first (until July 2016) but will need to develop their monitoring tools to provide a more exact assessment of the impact of their services in the future<sup>70</sup>. RATP has already developed its monitoring and passenger information to meet these new legal requirements (leading T2K Work Package 3), for example by developing data on emissions by mode (RER, metro, tram, bus) to inform users.

### Valuing CO<sub>2</sub>

RATP has started to work with sub-contractors to identify the impact of design and construction material choices on CO<sub>2</sub> emissions. Verification is difficult at present and CO<sub>2</sub> is currently not included as a criteria in the procurement process on this type of work. This could be important in the coming years as STIF and RATP are involved in the development of major transport infrastructure in the Region (planned investment of €32.4 billion by 2025<sup>71</sup>).

### 4.1.6. Challenges

The challenges listed below were identified through discussions with RATP.

These discussions also led to the identification of three key points which need to be addressed to encourage investment in energy efficiency and low carbon initiatives:

- Energy prices - what assumptions are made on prices when investment/procurement decisions are taken?
- Carbon price - how are carbon emissions valued within the appraisal process?
- Investment depreciation (write-off) – what are the rules on the depreciation period for investment in low carbon and energy efficiency?

It was felt that these questions would need to be addressed through T2K Work Package 4, allowing benchmarking on these issues between the five partners.

### Access to capital and credit market failure

The main challenge identified when considering energy use and carbon emission reduction for RATP is the lack of funding to invest in energy efficiency and carbon reduction initiatives. The same issues were identified when discussing public transport sector emissions in urban areas outside Paris, where RATP operates.

RATP Infrastructure and RATP Operations are sharing the total RATP debt (€5.4 billion in 2011). The objective for RATP Infrastructure is to become self-financing and pay the interest on the remaining debt (with funding from STIF). For RATP Operations, the objective is to reduce its share of the debt so that the organisation can start to generate a profit by 2039 (when the rail network becomes subject to competition). This will be done through increased productivity, STIF taking responsibility for rolling stock purchases, company tax exemption (as RATP is state owned, the state also does not require the payment of profits). RATP's net income was approx. €200 million in 2010 and future income will be used to support further investment and repay the debt.

<sup>69</sup> Source: Méthode pour la réalisation des bilans d'émissions de Gaz à effet de serre conformément à l'article 75 de la loi n°2010-788 du 12 juillet 2010 portant engagement national pour l'environnement (ENE), Ministère de l'Écologie, du Développement Durable, des Transports et du Logement, September 2011

<sup>70</sup> Décret n°2011-1336 du 24 octobre 2011 relatif à l'information sur la quantité de dioxyde de carbone émise à l'occasion d'une prestation de transport

<sup>71</sup> Grand Arc and Paris Express, Source: Rapport d'activité et développement durable, RATP, 2010

### Energy contracting in the Greater Paris Region

SIPPEREC is an arm's length organisation set up by local authorities from the Greater Paris Region to manage their duties with regard to electricity provision and the electric infrastructure (owned by SIPERREC in Greater Paris). SIPERREC offers energy services to its local authority members, supporting them in the development, delivery and maintenance of renewable energy investments (focused on solar PV and geothermal energy) and advising them on energy efficiency (including on street lighting).

For renewable energy investments, two models are available to member local authorities:

- if the local authority pays for the initial investment, a contract is signed between the local authority and SIPPEREC for SIPPEREC to manage the project and receive payment for the electricity generated (from EDF). This is then repaid to the local authority minus the cost of maintenance for SIPPEREC; and
- if SIPPEREC funds the investment, SIPPEREC receives payment for the electricity generated (from EDF) and shares any surplus with the local authority.

Source: SIPPEREC

### Trade-off between high short term costs and potential long term benefits

RATP is an organisation in debt and the priority is to reduce this debt. Investment is prioritised to increase public transport capacity and reliability rather than improve the sector's environmental performance as the public sector transport is already perceived as a much greener alternative to the private car.

### Informational failures, uncertainty and inertia

Business case work to assess the viability of investments usually assumes an increase in energy cost of 2% per annum at present<sup>72</sup>. This is not realistic (the real increase was closer to 7% per annum over the past years) and results in energy efficiency and carbon reduction investment showing artificially low returns on investment.

The verification of CO<sub>2</sub> information can sometimes be difficult, especially when considering the carbon content of goods and materials bought (for example in construction projects). The focus so far has been more on trying to reduce the amount of materials used rather than looking to use low carbon materials (probably at a higher cost).

When considering using third party investment to fund investment in solar energy for example, the current uncertainty in ownership and future operating arrangements means that investors would face higher risks. Investors would generally require the guarantee that the panels they install will remain and that they will keep access to them over long periods of time to ensure financial viability.

### Split responsibilities and incentives

Under past arrangements, the adoption of whole life cost approaches ("gestion coût complet") was sometimes difficult, as different parts of RATP are responsible for investment decisions and maintenance activities. This will probably become even more of an issue once the STIF becomes responsible for investment decisions (separately from the operators) and operators remain responsible for maintenance activities and costs as teams in charge of infrastructure decisions will not have any incentives to invest to reduce operational costs (including energy use) or maintenance costs as these will be absorbed by a different set of accounts or a different organisation.

The changes towards a competitive regime mean that investments with longer pay-back periods are not being progressed at present as RATP could have to hand over to another operator within the pay-back period (bus stations by 2024 and train depots by 2039). Compensation regimes will need to be developed and put in place if longer-term investment is expected from operators in the future.

<sup>72</sup> Based on French transport appraisal guidance: Transports : choix des investissements et coût des nuisances, Commissariat General du Plan, 2001



## Policy and regulatory framework and inertia

Legal obligations and cost savings are currently seen as the main incentives for energy and carbon reduction initiatives. There is currently no binding obligation on RATP to reduce emissions so it is not a high priority objective.

The introduction of third party investment to fund investment in solar energy has been considered but one of the barriers to implementation was identified as the reluctance of RATP teams to allow third parties to access RATP sites and RATP teams wanting to keep all building maintenance in house. Current regulations and incentives for the production of solar energy are also seen as very complicated.

## Balancing public transport emission reduction with wider transport sector objectives

There is a view that large scale investment in public transport infrastructure will deliver reductions in CO<sub>2</sub> through mode shift and that the public transport sector is already green. This results in a lack of interest for smaller scale investment within the public transport sector to improve the sector's performance. In France, this is compounded by the fact that the electricity produced is already low carbon (nuclear and hydro) which means that efforts to reduce energy use do not result in very high reductions in CO<sub>2</sub>.

New vehicles (for example RER ligne A) are bought for their ability to increase capacity (double deck vehicles in this case). This generally results in lower energy use per passenger km but not always in lower energy use overall for RATP as the vehicles are often heavier and more powerful (potentially requiring network upgrades) and this is not fully offset by more energy efficient engines. This results in path dependency issues in the long term due to the long life of rolling stock.

## Market approach versus planning approach

RATP does not procure green energy as it is felt that the French Government and the national energy regulating body are best placed to make choices to support the production of low carbon and renewable electricity and that if RATP were to request more renewable electricity, this would result in someone else having to buy high carbon intensity energy.

In line with this view (and with French Government guidelines and regulations<sup>73</sup>), emissions associated with electricity use are reported using the national average carbon intensity for electricity production rather than the supplier's data on carbon intensity of the electricity they provide to RATP (there are also issues with delays in obtaining this information from suppliers).

## 4.2. Proposed recommendations

Recommendations for T2K partners are described in detail in Chapter 9. Based on RATP's challenges and discussions with RATP staff, recommendations of particular relevance to RATP include:

- improvement to appraisal and business case processes and guidance to better take account of volatility of energy prices, cost of carbon and whole life cost of investment decisions;
- investigating potential alternative financing options including free/low interest loans, state guarantees, revolving funds (including within the organisation), access to patient capital, with specific interest in EU funding sources;
- using ESCO (Energy Services Company) and EPC (Energy Performance Contracting) models; and
- including GHG performance as a criteria in procurement process and contracts with supply chain, potentially supported by lobbying for the development of legal standards in energy efficiency/carbon content of products/services.

<sup>73</sup> French reporting guidelines and regulations are currently being harmonised on this issue. It is likely that the requirement will be for reporting organisations to use the national average carbon intensity although it might be possible for organisations to opt out if they want to use information from their suppliers.





## 5. RET, Rotterdam

### 5.1. Existing context

#### 5.1.1. Governance

Rotterdam City Region (Stadsregio Rotterdam - SRR) is the regional public body for the urban area of Rotterdam and surrounding cities. It is a partnership between the local authorities in the Rotterdam City Region, with elected members from the local authorities on SRR's board.

SRR is currently in charge of transport policy for the area. This is likely to be transferred to a new organisation from 2013. Plans are to establish a new Public Transport Authority as a partnership between local authorities in both Rotterdam City Region and The Hague area.

RET, a public company owned by the City of Rotterdam (previously owned by SRR), currently operates SRR's public transport services through seven year concession agreements with SRR. RET has approximately 3,000 employees and an annual income of € 425 million. Net profit in 2008 was € 10 million.

Public transport funding is allocated to the provinces and SRR from national government and allocated to RET through the concession agreement between RET and SRR with annual budget reviews for approx. 10% of the budget. Large investments in infrastructure are supported by the national government.

#### 5.1.2. Public transport services

RET delivers public transport services in the Rotterdam City Region, running five metro lines, nine tram lines, 42 bus routes and one fast ferry.

RET currently is the City Region's internal operator, delivering services for all four modes through concession agreements on each mode (over a seven year period). Services are used by approximately 600,000 passengers per day. RET decides on general services specifications (timetables, frequency, services) in collaboration with the City Region. The decision to cut services would however be referred to the City Region.

In the surrounding cities two other bus companies deliver services through two concessions awarded by SRR (third party operators):

- Connexion (private operator owned by TransDev) on the island of Voorne Putten; and
- Qbuzz (private operator partly owned by NS) for rural services.

Until recently, RET was the only operator in the City Region (apart from Connexion and Qbuzz). A change of national policy is however introducing competition for the delivery of public transport services, with RET becoming a third party operator. Bus services are entering the competitive market from 2012 and the tendering process for this concession was on-going during the study. RET was awarded the contract to provide bus services in the former RET and Qbuzz area until 2019. The tram and metro operations, which account for 80% of services, will be subject to competition from 2017.

#### Ownership

Two special purpose companies have been set up by the City of Rotterdam, one for the ownership of metro and tram vehicles and one for the ownership of the infrastructure (track and stations). RET owns the buses. RET is contracted to maintain the infrastructure and vehicles through the concession agreements (maintenance work is largely sub-contracted by RET).

RET has recently moved to a new head office which is leased. This results in RET having less influence on energy efficiency and carbon emissions for this building. Other RET locations are owned by RET which gives the organisation more influence on energy efficiency and carbon emissions for these buildings.

### 5.1.3. Energy sources and use

RET spends approx. €10 million on electricity, €7.8million on fuel (buses and fleets) and €2.1 million on gas and district heating per annum.

The table below summarises volumes of energy used by RET in 2010. Electricity use includes traction, stations, office buildings and depots.

**Table 15. RET energy consumption, 2010**

Energy source	Electricity	District heating (offices)	Natural gas (depots heating)	Gasoline (company fleet)	Diesel (buses and ferry)
Volume used	125 million kWh	1.8 million kWh	1.9 million kWh	0.24 million litres	5.6 million litres

#### Electricity

RET has been procuring 100% green electricity since 2008. From 2012, 100% green electricity will be provided by Greenchoice (from renewable sources only, mainly using hydro power from Norway).

All buildings are currently metered to allow for electricity consumption monitoring.

#### Fuel

Buses are generally diesel (Euro V and EEV) although the fleet includes a couple of hybrid buses and electric buses (with range extenders). Petrol and gasoil are purchased through a standard procurement process.

#### Energy costs forecasting

When RET makes investment decisions, the aim is to account for the total cost of ownership. This means that energy costs and the possibility that they will increase are considered, trying to take into account a realistic price increase scenario.

Carbon emissions are not currently taken into account when making an investment decision at the moment.

### 5.1.4. Targets and policies

National greenhouse gases targets for the Netherlands are based on EU level agreements and targets. The national government and Dutch local authorities have agreed the following targets:

- 20% reduction in greenhouse gases by 2020 (on 1990 levels);
- 14% of electricity to come from renewable sources by 2020; and
- reduction in energy use of 2% per annum.

The national strategy to meet the carbon emission reduction target includes the use of gas power plants and carbon capture and storage (seen as important in the Netherlands and especially for Rotterdam to capture emissions from refineries).

The Rotterdam City Region (SRR) has adopted a target of 40% reduction in greenhouse gases emissions by 2025 (on 1990 levels). The City Region also aims to increase the use of public transport by 60% and the use of bikes by 30%.

The City of Rotterdam Climate Initiative has set a target for the City of 50% reduction in CO<sub>2</sub> emissions by 2025 (on 1990 levels). Rotterdam has adopted this higher reduction target when compared to national objectives due to its role as a major emitter in the Netherlands due to port activities (including major refineries and power plants). All sectors, including transport, are expected to achieve a 50% reduction in emissions. This is challenging for the transport sector as transport emissions are currently still increasing.

Clean transport is at the heart of RET's strategy with the aim of meeting corporate social responsibility (CSR) objectives, making the public transport experience "fun" and improving the comfort and well being of passengers.

RET has adopted the following carbon and energy related targets (subject to the results of the current tendering process for the bus concession):

- 50% reduction in CO<sub>2</sub> emissions by 2025 (on 1990 levels), in line with the City of Rotterdam Climate Initiative; and
- 100% public transport passenger kilometres electric by 2025 (from 80% currently) through the electrification of the bus fleet (approx. 200 buses required).

RET has conducted pilots using hybrid buses since 2010 and the company will also start using electric company vehicles at the beginning of 2012. Other energy efficiency and carbon reduction measures already implemented include:

- regenerative braking;
- track side energy storage system for trams (2010) and metro (2012);
- lights switched off at metro stations during the night (since 2011);
- electric bus on Wilhelminapier;
- 100% Euro V compliant buses;
- use of additives in bus fuel; and
- eco-driving for rail and bus.

### 5.1.5. Future steps

#### Building efficiency

Pilot projects to reduce energy use in buildings have already been undertaken, including heating, lighting and escalator stop-start systems.

The new Beverwaard tram depot was designed as a sustainability demonstrator as part of the EU Tramstore 21 project<sup>74</sup>. The new build project was also subject to City of Rotterdam planning requirements with regard to building energy efficiency (a coefficient system is implemented at the national level and local authorities are not allowed to require a higher performance in their area although they can encourage it). The Beverwaard depot includes:

- heat pumps in the basement of the building, using the ground's natural heat to heat the building;
- low-energy lighting;
- ergonomically designed equipment for maintenance teams
- park & ride roof; and
- rainwater management - storage, use and treatment.

Additional investment costs to improve the depot's environmental performance were approx. 10% of the overall cost. 50% of this additional cost was funded through EU Interreg (Tramstore 21 project). All other costs were met by RET and the City of Rotterdam (the old depot was sold).

#### Metro and tram networks

As a test, RET is installing reversible sub-stations on the Metro network as part of T2K (WP2) to reuse the energy generated through regenerative braking on the network. This was already in place for the tram network before T2K. Track side storage capacity is being tested on the tram network.

#### Procurement

RET already uses a whole life cycle cost approach when procuring new buses. EEV vehicles were procured recently when the Euro standard in place was Euro V (procuring higher standards than required). Various technologies have been trialled to reduce bus emissions including biodiesel, fuel additives, natural gas and hydrogen. Two electric buses with range extenders and two hybrid buses are currently being trialled.

RET is also investigating the possibility of using the CO<sub>2</sub> Performance Ladder<sup>®</sup>, a procurement tool owned by the Independent Foundation for Climate Friendly Procurement and Business (Stichting Klimaatvriendelijk Aanbesteden en Ondernemen, SKAO) which encourages companies to be aware of their CO<sub>2</sub> emissions and those of their suppliers.

#### New strategic plan

In the context of T2K, RET is developing a new strategic plan on sustainability. The plan will include tools to inform staff and customers on carbon emissions (footprint calculator and information/behaviour change campaign).

<sup>74</sup> [www.tramstore21.eu](http://www.tramstore21.eu)

### CO<sub>2</sub> Performance Ladder®

The Independent Foundation for Climate Friendly Procurement and Business (SKAO) owns the CO<sub>2</sub> Performance Ladder®, a tool originally developed by ProRail, the operator of the Dutch railway infrastructure. The Ladder allows companies procuring services to take account of the CO<sub>2</sub> performance of potential suppliers by rewarding effort: *“A higher score on the ladder means a concrete advantage in the tendering process, in the form of a nominal discount on the tender price.”*

The Ladder includes five levels of CO<sub>2</sub> awareness certificates with higher levels resulting in higher competitive advantages (it is up to the commissioning party to decide the applicable nominal discount for each level). This goes from:

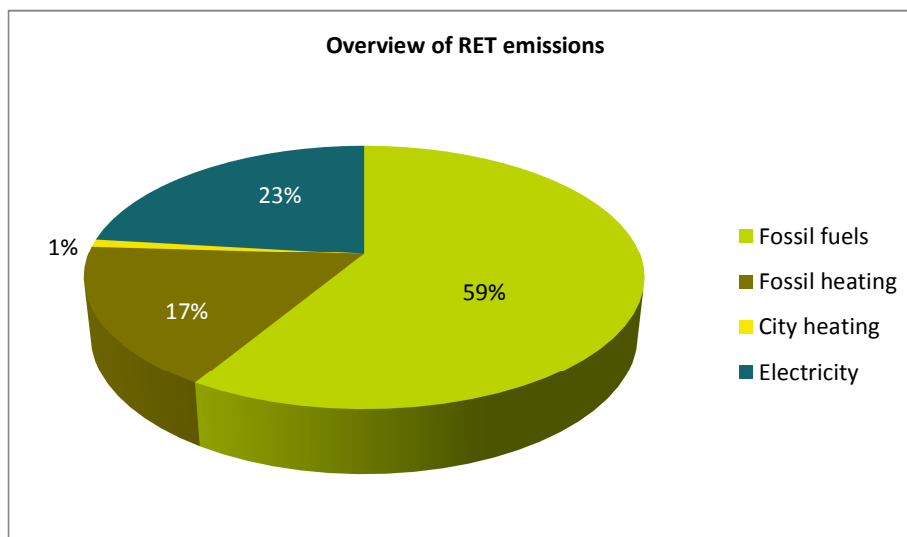
- Level 1, where *“the company has identified its energy flows in qualitative terms and has a list of potential options for saving energy and using renewable energy. Internally, the company communicates its policy in relation to energy-saving and renewable energy on an ad hoc basis and is aware of sector and chain-based CO<sub>2</sub> reduction initiatives”*, to
- Level 5 where *“the company has a CO<sub>2</sub> emissions inventory of its most important suppliers. The company can demonstrate that the objectives for levels 3 and 4 have been attained. The company is publicly committed to a government or NGO CO<sub>2</sub> reduction programme, and is able to demonstrate that it is making a relevant contribution to an innovative CO<sub>2</sub> reduction project.”*

The set of requirements to be met are contained in a general certification scheme and related audit checklists submitted to ladder-certifying organisations which assess the level of performance attained.

Source: SKAO ([www.skao.nl/index.php?ID=45](http://www.skao.nl/index.php?ID=45))

### RET Carbon Footprint

RET has developed a carbon footprinting tool to measure its emissions. Total emissions for 2010 were approx. 23kTCO<sub>2</sub>e and the split between sources is summarised below. Fuel use includes buses, the Fast Ferry and company fleet. Fossil heating shows the use of natural gas at depots and district heating is used for offices. RET procures 100% green electricity and emissions from electricity use are calculated on the basis of the energy mix provided by the energy provider.



Source: RET

### 5.1.6. Challenges

The challenges listed below were identified through discussions with RET and its partners.

#### Carbon price externality

There are no tax rebates for green energy in Holland which results in green energy being slightly more expensive than traditional tariffs. This was however not an issue for RET. RET has procured 100% green electricity since 2008. This is seen as a part of the organisation's environmental commitments and marketing strategy.

There is no feed in tariff for renewable energy producers selling to the grid in Holland (although a feed in premium is in place<sup>75</sup>) and returns on investment in renewable energy production are seen as low and uncertain. Wind turbines were considered for the new Beverwaard tram depot but there was not enough return on investment and safety concerns were raised leading to the idea being abandoned.

Biofuels are currently taxed at the same level as traditional fuels with only a small tax rebate for E85<sup>76</sup>.

There are tax incentives for energy efficiency investments in place in the Netherlands but RET doesn't benefit from this because the company is public owned.

Carbon emissions do not really figure in the government's guidelines on scheme appraisal (guidelines are not mandatory).

#### Policy and regulatory framework and inertia

RET's procurement process does not include a sustainability score at present but this could be developed in the future (compliance with EU directive and implementation of the SKAO CO<sub>2</sub> Performance Ladder<sup>®</sup>).

Suppliers highlighted the need for information requirements to be streamlined across organisations' procurement processes. At present, some organisations already require information with regard to sustainability and CO<sub>2</sub> but requirements vary from one organisation to the next. This results in an additional burden for suppliers as they need to prepare information and data to meet individual organisations' requirements.

High energy consumption is usually not seen as a sufficient reason to change equipment at present. Energy consumption is only one of the considerations when equipment gets to its end of life and needs to be replaced. Equipment is also usually replaced for a whole site when coming to end of life rather than on an installation by installation basis even if it is recognised that the existing installation is not energy efficient.

#### Split responsibilities and incentives

Split benefits are an issue when considering energy efficiency investment as the investor is often separate from the organisation saving on energy bills. For example, for RET, the City Region decides on infrastructure investment and this can result in higher energy use in the long term.

Long term design-build-operate-maintain contracts were discussed during workshops as a potential solution to this issue. Integrated contracts of this type usually mean that the same entity makes decisions on investment, specifies new equipment/infrastructure and maintains it and the long term nature of these contracts can reward long term investment in energy efficiency. Split responsibilities issues can also be addressed by fostering better joint working and budgeting between the various organisations involved in the delivery of public transport infrastructure and services.

#### Informational failures & uncertainty

Uncertainty about the life time of buildings is an issue when considering energy efficiency investment. RET does not always know if a building will continue to be used as is for a long period of time or if funding will become available to refurbish the building or even build a new one. This means that investment in energy efficiency in existing buildings is sometimes difficult to justify.

<sup>75</sup> Providing a secure additional return for producers, while exposing them to the electricity price risk. Source: Financing Renewable Energy in the European Energy Market, Ecofys, 2011

<sup>76</sup> Tax reductions were identified as an important factor in the success of biofuel take-up in various EU countries in European biofuel policies in retrospect, E. van Thuijl & E.P. Deurwaarder, 2006



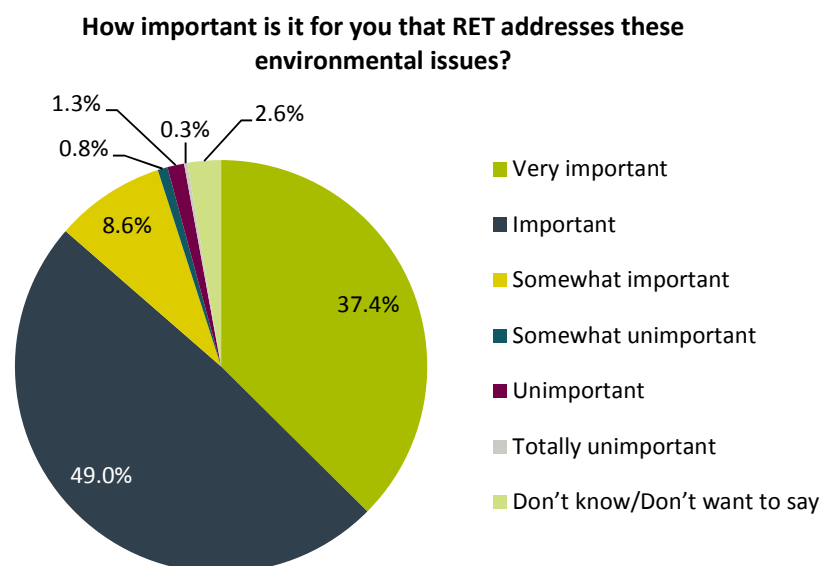
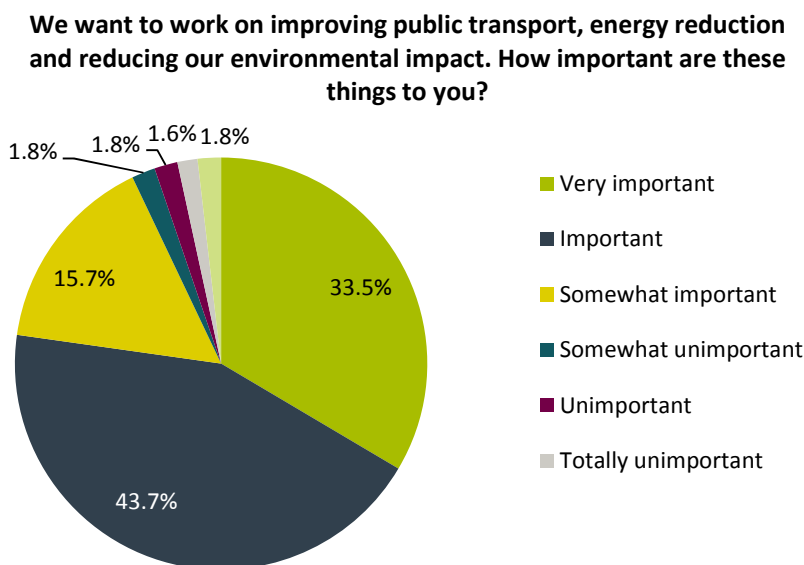
## Balancing public transport emission reduction with wider transport sector objectives

The City Region and the City of Rotterdam are prioritising investment in public transport to reduce the use of the private car and this might result in additional emissions for the public transport sector. RET users are usually supportive of RET's efforts to reduce its energy use (as shown below).

CO<sub>2</sub> emissions and energy efficiency are currently very small issues when considering the important changes taking place in the area with the introduction of competition for the public transport sector.

### RET customers' perspective

In October 2011, RET conducted a customer survey which included questions about the importance of sustainability and environmental issues. Results summarised below show that RET customers are very aware of environmental issues and interested in RET improving its environmental performance.



Respondents were also asked if sustainability is a reason for them choosing to use public transport. 13.6% of respondents said that sustainability was the most important reason for them choosing to use public transport and just under 70% of respondents said that sustainability was one of the reasons for their choice, although not the most important.

Source: RET

## 5.2. Proposed recommendations

Recommendations for T2K partners are described in detail in Chapter 9. Based on RET's challenges and discussions with RET staff, recommendations of particular relevance to RET include:

- Lobbying for stronger requirements on emission reporting, company reporting and information provided to public transport users (with a well defined scope), supported by joint budget and accounting for energy use and carbon emissions (which will improve visibility of impacts and savings within the organisation);
- Capacity building and tools (for example, rules of thumb for carbon and whole life cost assessment) for T2K partners on energy efficiency and carbon reduction;
- Raising awareness of the need for public transport to remain a low carbon option and of the potential for financial savings through energy efficiency investment;
- Using ESCO (Energy Services Company) and EPC (Energy Performance Contracting) models; and
- Including GHG performance as a criteria in procurement process and contracts with supply chain, potentially supported by lobbying for the development of legal standards in energy efficiency/carbon content of products/services



## 6. STIB, Brussels

### 6.1. Existing context

#### 6.1.1. Governance

The Brussels Capital Region (and its Regional Minister for Transport) is responsible for the overall transport policy for the Region, with Bruxelles-Mobilité the executive arm in charge of facilitating the implementation of the strategy.

STIB is the internal operator for the Brussels Region. There is no plan to open the market of public transport in Brussels at present. STIB is a public sector body owned by Brussels Capital Region.

In practice, Brussels Capital Region and STIB work together to develop the public transport and infrastructure investment strategy. STIB also acts as advisor to the Region. STIB is contracted by the Region to provide public transport services through a five year management contract (current contract 2007 – 2011) supported by a business plan (current plan 2008 – 2012). Discussions are currently on-going for the development of the next management contract.

Public transport funding sources include:

- regional public sector funding set in the management contract, as well as additional special funding, for example to support preferential fares for senior citizens (concessionary fares);
- ticket sales revenues;
- regional funding for large infrastructure investment; and
- federal/regional funding to finance infrastructure projects to enhance the international role of the capital (e.g. metro and stations infrastructure).

#### 6.1.2. Public transport services

STIB is the only operator (internal) contracted by the Brussels Capital Region. There are two other regional operators in Belgium: De Lijn for the Flanders Region and SRWT for the Wallonia Region (also linked to their respective organising authorities by five year management contracts). Some of their services also run to and from the Brussels Capital Region. The national rail operator SNCB also operates train services to, from and within the Brussels Capital Region.

##### Services

STIB operates four metro lines, 18 tram lines and 50 bus routes, for 311.6 million passengers in 2010.

STIB runs the metro, tram and bus services as per the management contract with the Region. STIB's Transport Offer Unit within the Commercial Directorate decides on services specifications (timetables, frequency, running speeds). Decisions to cut services or significantly alter them would however be referred to the Region.

##### Ownership

Depots are owned by STIB (with the exception of the Delta site). Metro stations and infrastructure are owned by the Region and bus stops are often owned by local authorities, although a re-appropriation process is underway to transfer the ownership of the stops to STIB.

STIB owns the vehicles (metro, tram and buses). Vehicle specifications are proposed by STIB and have to be approved by the Region. STIB owns the electric network for the metro, tram and infrastructure.

##### Maintenance

The infrastructure owners (region or local authorities) are in charge of new investments (for example, new escalators or lighting installations) but are not generally in charge of maintenance which is usually STIB's responsibility. Some maintenance tasks are sub-contracted by STIB.

This means that if there is no regional budget to replace infrastructure and equipment (for example escalators at stations), STIB has to continue with the maintenance of old stock (often at additional costs).

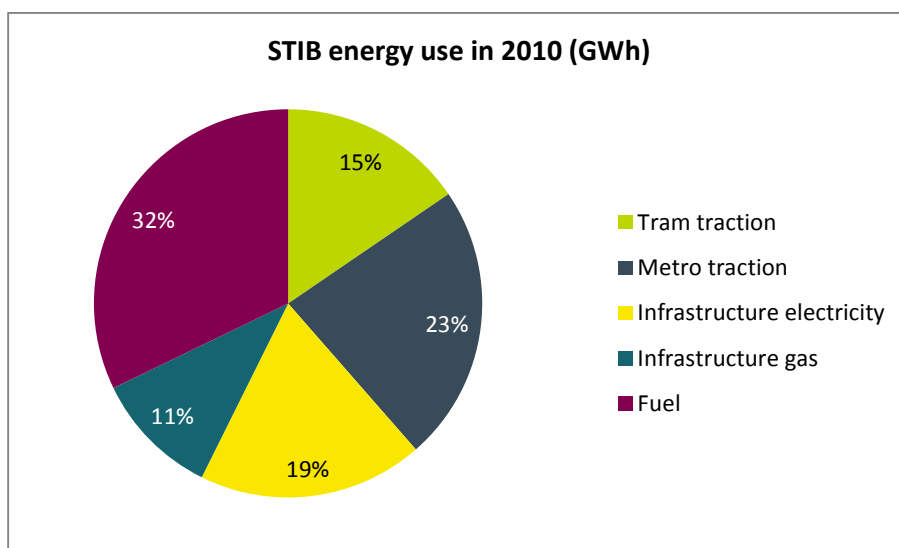
This also means that the Region will usually specify new material and equipment. This is generally of good quality but the impacts on maintenance requirements and energy consumption (for which STIB is responsible) are not always considered.

STIB has established a partnership with vehicle manufacturer Bombardier to set up an excellence centre for tram vehicle maintenance. Bombardier contracts with other operators in Europe to provide maintenance support for their vehicles (tram parts). Bombardier provides spare parts and STIB provides staff time. This centre of excellence provides an additional source of revenue for STIB.

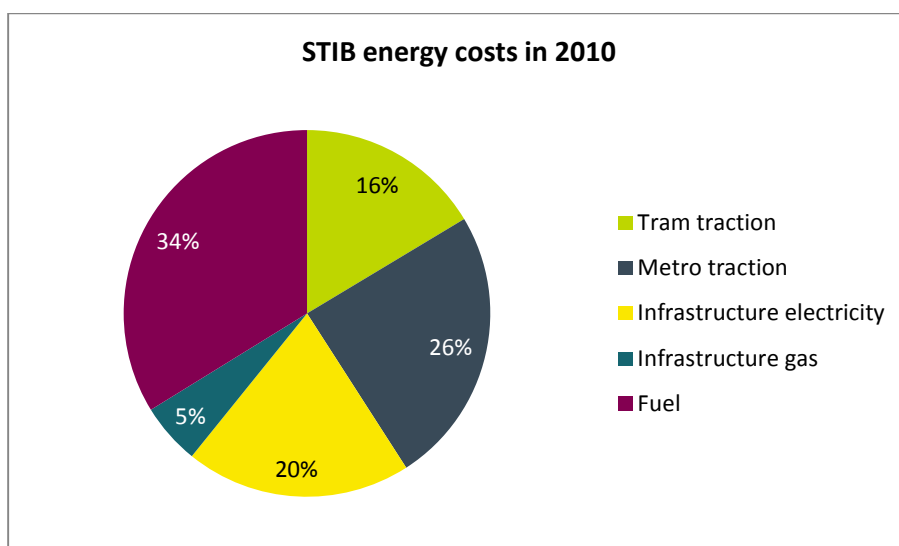
### 6.1.3. Energy sources and use

STIB spends approx. €20 million per annum on electricity and €13 million per annum on fuel (including support fleet). Figures 4 and 5 show the repartition of energy use and costs between the different services and infrastructure for 2010.

**Figure 4. STIB energy use in 2010 (GWh)**



**Figure 5. STIB energy costs in 2010**



STIB's energy use has increased by 12% between 2007 and 2010. This is linked to a 19.9% increase in passenger kilometres offered, with energy efficiency initiatives offsetting part of the increased demand.

The cost of energy has however increased strongly over the 2007-2010 period, with STIB costs showing an increase of:

- 30% in electricity costs;
- 12% in fuel costs; and
- 21% in gas costs<sup>77</sup>.

This has resulted in an increased interest in energy efficiency for the organisation.

## Electricity

Electricity is provided through two different EU compliant procurement processes for three year periods:

- one contract for high voltage (approx. €20 million per annum); and
- one contract for low voltage (approx. €88,000 per annum).

At present, high and low voltage electricity is provided by Electrabel, gas by Lampiris and diesel oil by Van Raak & Becquevoort.

High voltage electricity is 30% green electricity and low voltage electricity for bus stop lighting is 100% green (renewable sources – green energy benefits from lower tax rates for the low voltage supply). STIB is currently negotiating with electricity providers for the next contract period and this might result in a higher proportion of green electricity being procured in the future.

### The cost of procuring green electricity

The existing high voltage electricity contract (2010-2012) includes the following prices:

- traditional mix (9.6% green energy): €70.40/MWh
- 20% green energy: €70.50/MWh
- 30% green energy: €70.78/MWh

Procuring 30% green energy from its high voltage supplier results in STIB paying an extra €90,000 per annum (an increase of 0.5% on its electricity bill for high voltage when compared to procuring the traditional mix).

*Source: STIB*

STIB does not require 100% green energy for high voltage at present as this would not be possible to provide from production based in Belgium and would therefore rely on suppliers buying green energy from elsewhere (certificates). For example, Electrabel provides 20% green energy from energy production in Belgium at present but would buy certificates on the market if higher renewable ratios were required. This has led STIB to question whether they should purchase green energy certificates on the market directly (rather than through an electricity supplier by requiring a higher proportion of green energy) or whether direct investment in renewable energy production would produce better CO<sub>2</sub> reductions and financial returns.

For high voltage, energy prices are usually indexed on a chosen indicator (based on energy market prices). Providers can however propose a different set up, for example by offering a fixed price contract.

### Exploring contractual models to reduce electricity costs

STIB is currently developing a potential option to reduce energy costs for high voltage by offering to provide suppliers with precise consumption estimates (3% error margin) six months in advance of use. This should enable providers to purchase electricity in advance, at times when market prices are lower, and offer electricity at a lower cost to STIB. STIB would then carry the risk of overconsumption (with this electricity likely to be charged at a much higher rate). Discussions are on-going with potential electricity providers to see if this could be included in the next procurement process.

*Source: STIB*

<sup>77</sup> Source: Perspectives Energie, STIB Cellule Environnement, March 2011 (in French)



## Fuel

STIB spends approx. €13 million per annum on diesel (including support fleet). The contract for the provision of diesel is renegotiated regularly. STIB does not benefit from any fuel tax exemption.

Biodiesel is mixed in diesel procured in line with Belgian government initiatives (EU regulation). Biodiesel is however exempt from tax and this could benefit STIB if more biodiesel was added to the fuel mix (subject to the ability to procure sustainable biodiesel and cost).

## Forecasting energy costs

When investment decisions are assessed, an increase of 5% per year in the cost of electricity is considered.

### Fuel procurement – SWAP contract

STIB uses a hedging contract with a private firm to protect itself against fuel price fluctuations. For example, between 2007 and 2010, STIB used a “SWAP contract” with a fixed price per litre of fuel and a fixed quantity (covering approx. 80% of actual fuel consumption).

The contract worked as follows:

- STIB bought its fuel at market price
- Every month, the private firm calculated the fuel's average daily cost for the month and compared this to the price set in the contract
- The difference (positive or negative) is paid by the private firm to STIB or by STIB to the private partner

An assessment undertaken in 2009 shows that €0.9 million were saved by STIB between 2007 and 2009 through this contract.

*Source: Etats financiers et de gestion, Rapport d'analyse combustibles, STIB, Dec 2009*

## 6.1.4. Targets and policies

National greenhouse gas reduction targets have been adopted by the Belgian government to meet its Kyoto commitments and to implement the EU agreement. Main greenhouse gas reduction targets of relevance to STIB include:

- European target of 20% reduction in greenhouse gas emissions by 2020 (on 1990 levels);
- Proposed national target of 30% reduction in greenhouse gas emissions by 2025 (on 1990 levels); and
- EU Covenant of Mayors (signed by the Brussels Region), with a target of 20% reduction in CO<sub>2</sub> emission by 2020 (on 2005 levels).

These targets are not binding and STIB is not subject to any energy efficiency or climate change targets. STIB is interested in carbon emission reductions as part of its CSR policy however and to contribute to emission reductions for the Brussels Capital Region. STIB can also benefit from financial savings from reduced energy use.

The current management contract (2007-2011) between STIB and the Region contains the following requirements related to energy and emissions:

- By 2011, STIB had to obtain the eco-label delivered by Brussels Environment for all its sites.
- With regard to the bus fleet, actions included
  - equip entire regular bus fleet with particle filters by 2010;
  - new buses must meet the latest Euro standard;
  - promote, at equal cost, the use of biodiesel in its traditional buses;
  - replace 70 buses with natural gas run buses (with funding from the Region to cover the additional cost);
  - participate to the regional bio methane project if and when the project is approved;
  - train its bus drivers to eco-drive practices;
- STIB had to define a “clean vehicle” strategy by 2009 covering the period 2010-2020; and
- STIB had to put in place a “company travel plan” through which it would aim to reduce the proportion of staff commuting by car by 20% over the period 2005-2011.

Not all of these commitments were delivered in practice as priorities were reviewed over the contract period. Achievements include:

- all sites (apart from one) have been awarded the eco-label. The financial incentive offered by the Region has worked well in this respect;
- the majority of buses have been fitted with particulate filters;
- bus and metro drivers have been trained in eco-driving practices;
- the regional bio-methane project (gas and electricity production from waste) is not operational yet (on-going procurement process to deliver the facility) but STIB is involved in discussions on the possibility of using some of the fuel produced for buses;
- the clean vehicle strategy has been developed but has not yet been approved by the Region. This will form part of the discussions for the next management contract between STIB and the Region.

#### **Financial incentive for "Eco-dynamic Enterprise" quality-label**

Since 2002, STIB has been involved in the "Eco-dynamic Enterprise" quality-label initiative. The label is managed by Bruxelles Environnement. It is a voluntary certification scheme with three performance levels (stars). Once awarded the label is valid for three years. The label requires organisations to respect all applicable environmental regulations, to assess their impact in eight areas: energy, water, waste, ground pollution, air noise, green spaces and mobility and to act to reduce these impacts.

The current management contract between Brussels Capital Region and STIB included a financial reward of €250,000 per site (or group of sites) and per annum for the achievement of the label (with continual improvement conditions attached).

Although STIB teams are generally interested in environmental performance, the financial incentive was key to the success of this initiative as all wanted to help secure additional budget for STIB. At present, the financial incentives secured are not ring-fenced but allocating the additional funding obtained to additional environmental improvements would probably result in even greater motivation.

*Source: STIB*

New diesel buses have been bought (meeting Euro V and EEV standards) rather than natural gas buses due to the high cost of changing the supporting infrastructure. STIB has undertaken a study to assess the suitability of alternative fuels for buses (electric, natural gas, hybrid, etc). The view was that the electric bus market is not mature enough at present.

Trials undertaken with hybrid buses (regenerative braking and on board energy storage) showed life cycle costs were approx. 20% higher than with traditional diesel buses and concerns were raised with regard to the environmental impacts of battery recycling. Trolley buses have also been considered.

### **6.1.5. Future steps**

#### **Existing initiatives**

STIB has recently completed its carbon footprint study from which it should be able to identify carbon emission reduction targets and policies in a structured way (part of T2K Work Package 3). Further work was also commissioned to investigate STIB's wider carbon footprint (indirect and embedded emissions).

27 quick win measures have been proposed and implemented in the context of the T2K project. Results are being monitored and some initiatives could potentially be extended to other parts of the organisation. This includes:

- partial lighting of metro stations during closing hours;
- innovative driving quality indicator for buses;
- improved efficiency of high voltage electrical sub-stations;
- monitoring of vehicle tyre pressure; and
- energy challenges at various sites.

Three areas were also selected for major investment over the last years:

- cogeneration at Delta site;
- eco renovation of De Brouckere station; and
- recovery of breaking energy on network.

As a result of these measures, the fuel consumption of vehicles (by km) was reduced between 2007 and 2010. A second phase of eco-driving training for bus drivers is planned with on board monitoring installed in 30 buses to maintain performance over time. Eco-driving training is also planned for tram drivers. The adaptation of metro speeds (Ecodrive metro) has reduced total metro traction energy by 15%.

#### **Air, Climate and Energy Bill proposing to phase out electric buses in Brussels**

A new Bill currently in front of the Brussels Parliament (Code Bruxellois Air Climat Energie - COBRACE) proposes to phase out the use of diesel buses by STIB by excluding diesel buses from future vehicle purchases from 2015. Existing diesel buses would remain but this decision would lead to them being progressively replaced by new buses powered through alternative sources.

*Source: STIB and lacapitale.be*

The energy consumption of the infrastructure (per m<sup>2</sup>) has also been reduced over the same period. Energy challenges in tram depots have been very successful with the sites reducing energy consumption by 20%.

Some regulations on new buildings' energy efficiency are already enforced through planning law. For the Brussels Region, there is a legally binding target for all new buildings to be passive by 2015 (less than 45 kWh/m<sup>2</sup>). There is also an aspiration for all new buildings to be carbon neutral by 2020 (not legally binding at present). These targets are however relatively new and existing buildings are probably lagging behind.

Other potential measures under consideration include:

- further recovery of braking energy;
- further modification of maximum speeds;
- reduction of engine idling at bus stops and depots;
- further improvements in lighting efficiency; and
- reduction of tram and metro HVAC (heating, ventilation and air conditioning) requirements.

#### **Energy use monitoring and emission monitoring**

High voltage substations are already equipped with tele-metering systems (and metered consumption is compared to invoices). For each substation, this analysis produces values for the energy consumed by building in the area, and for the traction energy of trams and metros separately.

Energy consumption analysis is done manually for buildings at present and bus fuel consumption is monitored through the refuelling process. More precise fuel consumption monitoring techniques (including real-time vehicle metering) are currently tested.

#### **STIB wider footprinting work**

To better understand its share of emissions and where it can have an influence on emissions attributed to others under conventional footprinting techniques, STIB is currently examining its wider carbon footprint. A wide ranging scope was defined for the work including:

- STIB buildings (direct, indirect emissions and embedded carbon) for offices, depots, staff amenities and green spaces
- Emissions from materials and equipments procured (embedded)
- Emissions from waste
- Staff commuting
- Public transport operations
- Embedded emissions in public transport network (STIB network and other networks used by STIB services)
- Public transport users' emissions including first and last kilometre (considering emissions from travel from the user's origin to STIB's services and from STIB's services to their final destination)
- Emissions from wider activities in which STIB is involved including STIB marketing and promotional campaigns, commercial activities, investments, staff pension scheme and partnerships (for example Cambio car club/sharing)

*Source: STIB*

## Renewable energy production

STIB is installing a cogeneration plant at the Delta site which will produce electricity combined with heat (CHP).

Solar panels have been installed in some metro stations to produce electricity to illuminate artworks. Artworks are the responsibility of the Region but STIB would have paid additional energy costs for the lights so the installation of solar panels prevented this. A study for the implementation of large solar systems using STIB infrastructure is currently under way.

Two studies considering wind turbines concluded that such investments would not be profitable given the low and changing winds in the Brussels Region.

### Energy performance contracting in Belgium - FEDESCO

FEDESCO is a publicly funded ESCO set up by the Belgian federal government in 2005, with a capital of €6.5 million. FEDESCO only works with public sector organisations in Belgium, offering audits, feasibility studies, procurement support, project management and installation of solar PV on public buildings in Belgium. STIB has already worked with FEDESCO to undertake some audits and feasibility studies for their sites.

Source: FEDESCO

## Procurement

Compulsory regional government guidelines have been issued for public sector procurement (goods and services including vehicles and energy) to assess the supplier's environmental and sustainability performance<sup>78</sup> and ensure that this performance influences the procurement decision (part of the marks). This should make a difference with regard to electricity procurement for STIB as providers might be able to propose a higher proportion of green energy (at a slightly higher price) and remain competitive.

STIB's corporate procurement guidelines include sustainability criteria in the awarding process and require the concept of "total cost of ownership" to be used to assess offers, considering purchase, running, maintenance and end of life costs.

### STIB sustainability criteria for procurement

STIB's corporate procurement guidelines ensure that sustainable development is taken into account through the procurement process through three main stages:

- At the pre-selection stage, qualitative sustainability criteria are strongly recommended by STIB's procurement guidelines for contracts over €135,000. In practice, this means requesting information on suppliers' environmental and sustainability policies (for example ISO 14000, EMAS or SA8000);
- At the awarding stage, qualitative sustainability criteria are compulsory for contracts over €135,000;
- In addition, the guidelines include sustainability marks to account for between 5 and 20% of the overall mark supporting the decision to award the contract. This is recommended for contracts over €22,000 and required for contracts over €135,000 (on the condition that this does not preclude competition between suppliers).

Source: "Processus Challenge des Achats et Politique Corporate des Achats à la STIB", April 2011

<sup>78</sup> 5<sup>th</sup> February 2009 circular  
([www.ejustice.just.fgov.be/cgi/article.pl?language=fr&caller=summary&pub\\_date=2009-03-23&numac=2009031134](http://www.ejustice.just.fgov.be/cgi/article.pl?language=fr&caller=summary&pub_date=2009-03-23&numac=2009031134) in French)

## 6.1.6. Challenges

### Split responsibilities and incentives

The Region is responsible for infrastructure investment and STIB is responsible for the maintenance of the infrastructure. This makes the adoption of whole life cost (“gestion coût complet”) approaches more difficult.

The division between ownership and responsibility for investment in the one hand and maintenance responsibilities in the other hand means that the Region will usually specify new material and equipment, sometimes without consideration for the impact on maintenance requirements and energy consumption.

#### Incentivising energy efficiency within the organisation

When analysing the results from their Quick Win projects, STIB identified a strong potential for improved energy efficiency at depots (for example, a three year old depot achieved a 20% reduction in energy use through quick win improvements including lighting and heating efficiency).

STIB staff expressed the view that this potential would be achieved quicker and in a more efficient manner if energy efficiency initiatives could create a “win-win” situation for all involved. Depot based teams should see a financial benefit to the depot or their team in reducing their energy use rather than their efforts being “lost” within the overall STIB energy use and costs.

*Source: STIB*

### Access to capital and credit market failure

STIB's budget is part of the consolidated regional budget and, due to budgetary constraints, the Brussels Region is no longer able to undertake further investments resulting in increased debt<sup>79</sup>. STIB is therefore not able to borrow to invest which constrains investment in energy consumption reduction.

Due to the financial consolidation between STIB and the Region, STIB's investment appear in the Region's budget in the year they are undertaken (without the possibility to write them off over several years as is possible within STIB's accounts) which means that it is difficult for the cash strapped Region to accept additional investments even when they will result in financial savings in the longer term.

### Trade-off between high short term costs and potential long term benefits

The overall energy spend (about €30 million per annum) is not a very big part of STIB's €600 million annual budget but energy efficiency is still seen as important. Investments are however only funded if they result in energy cost savings (not really interest in reduction in emissions without financial benefits). A short to medium term return on investment is important to justify the initial spend.

### Carbon price externality

There are currently no financial incentives or penalties for STIB (and the Region) to reduce emissions. The Brussels Region is on track to meet its Kyoto commitments and this means that there is little appetite for further initiatives.

Discussions on the new management contract between STIB and the Region have so far not considered imposing binding targets linked to incentives and disincentives to reduce energy consumption or greenhouse gas emissions.

It is difficult for STIB to promote emission reductions which are not linked to a cost reduction. There is no legal framework and no incentives for emission reduction which could support the reduction process at present. There is a need to analyse the possibilities of opening investments to third party investors to achieve carbon reduction.

### Policy and regulatory framework and inertia

STIB considered making use of the Joint Implementation mechanism to support investment in energy efficiency and carbon emission reduction but the regional government in charge of JI implementation has not implemented this in the Brussels region.

<sup>79</sup> The outlook on the Region's debt and ability to meet its commitments was changed from “stable” to “negative” in June 2010, the Region is therefore bound to undertake important efforts to contain expenditure

### Informational failures & uncertainty

There is no regulation on carbon reporting for companies in Belgium so no incentive to establish carbon footprints and monitor emissions.

The current scheme appraisal mechanism does not consider carbon emissions although this might change through future EU guidelines and regulations<sup>80</sup>.

## 6.2. Proposed recommendations

Recommendations for T2K partners are described in detail in Chapter 9. Based on STIB's challenges and discussions with STIB staff, recommendations of particular relevance to STIB include:

- lobbying for stronger requirements on emission reporting, company reporting and information provided to public transport users (with a well defined scope), supported by joint budget and accounting for energy use and carbon emissions (which will improve visibility of impacts and savings within the organisation);
- improvement to appraisal and business case processes and guidance to better take account of volatility of energy prices, cost of carbon and whole life cost of investment decisions;
- raising awareness of the need for public transport to remain a low carbon option and of the potential for financial savings through energy efficiency investment;
- investigating funding options including free/low interest loans, state guarantees, revolving funds (including within the organisation), access to patient capital, focusing on EU funding sources especially;
- using ESCO (Energy Services Company) and EPC (Energy Performance Contracting) models; and
- development of "green tickets" products and use of offsets.

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<sup>80</sup> The method of selecting projects eligible for EU funding will have to evolve towards one which puts greater emphasis on European added value and on the contribution to the effectiveness of the overall EU transport system, but also on the compatibility with other EU policy goals, such as reducing greenhouse gas emissions and loss of biodiversity. Source: Commission Staff Working Document Accompanying the White Paper - Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, March 2011





## 7. TfGM, Manchester

### 7.1. Existing context

#### 7.1.1. Governance

The Greater Manchester local authorities work in partnership through a Combined Authority: a strategic sub-regional authority with functions relating to economic development and regeneration, regional planning, transport, skills and training, and air quality. The Combined Authority has set up a Transport for Greater Manchester Committee (elected members), responsible for delivering transport across the Manchester City Region.

Transport for Greater Manchester (TfGM) is the delivery arm of the Transport for Greater Manchester Committee, employing the officers responsible for implementing the policies and decisions of the Committee.

Within the T2K project, this means that TfGM is a different type of organisation as it does not operate public transport services and is actually the executive arm of the transport authority (not the operator as moBiel, RATP, RET and STIB are).

TfGM carries out the following responsibilities:

- subsidising (but not operating) bus services which are not provided commercially by bus operators, where there is a community need;
- subsidising concessionary (reduced) fares and free travel facilities on buses in the area;
- ownership of bus stations, shelters and stops in Greater Manchester and provision of passenger information;
- ownership (but not operation) of Metrolink (the area's tram system);
- lobbying rail sector stakeholders and potentially funding improvements to ensure that local rail services meet local travel needs;
- campaigning to promote public transport in Greater Manchester to users, to improve the environment and cut congestion;
- installation, maintenance and management of traffic signals (new responsibility from 2011);
- maintaining highway databases, surveys, modelling, analysis, appraisals and advice (including strategic road safety analysis and recommendations) to the Transport for Greater Manchester Committee, the Combined Authority and local authorities (new responsibility); and
- monitoring of highway route performance, incident response and event management via a traffic control centre (new responsibility).

The transfer of traffic signals from the Greater Manchester local authorities to TfGM will have a significant impact on TfGM's energy consumption and CO<sub>2</sub> emissions (approx. 50% of TfGM's total energy consumption at present). Traffic signal management is sub-contracted to Siemens and the contract includes some environmental clauses including consideration of fuel efficient fleet management. Siemens will also start replacing many signals from 2012, which should result in a 50% reduction in energy use by the end of the replacement programme.

TfGM also prepares the Greater Manchester transport strategy (the Local Transport Plan), for approval by the Combined Authority.

The transport functions of the Combined Authority and TfGM are funded through contributions from the local authorities (levy) and fare revenues. Public transport investment also relies on funding from the UK government and borrowing.

Bus services receive different levels of financial support from different sources depending on their status:

- bus services operated by private bus companies on a commercial basis (open market). Operators can run any commercial service as long as they give advanced notice of the introduction, withdrawal or changes to a service. These services only benefit from subsidies for the provision of preferential fares for the elderly (concessionary fares) and through the Bus Service Operator Grant (BSOG), a mileage base subsidy which offsets most of the cost of fuel duty initially paid by operators, as shown in Table 16; and
- some bus services are subsidised by TfGM. These services are operated by private operators under a concession agreement with TfGM.

TfGM subsidised 1,000 separate bus services in 2010, of which 400 were school services and 600 were ordinary service buses. TfGM also partly funded the free Metro-Shuttle bus services and supported special accessibility services for the area. TfGM subsidised services carry 24.7 million passengers annually, and account for about 20% of service mileage operated<sup>81</sup>.

**Table 16. Bus Service Operators Grant (BSOG) rates in England, March 2011<sup>82</sup>**

Fuel type	Fuel duty (pence per litre)	BSOG rate (pence per litre)
Diesel, Biodiesel, Bioethanol	57.95	43.21
Biofuels used cooking oil	57.95	38.95
Unleaded Petrol	57.95	40.83
Natural gas used as road fuel (inc biogas)	24.70 (pence per kg)	23.60 (pence per kg)
Road fuel gas other than natural gas (e.g. LPG)	31.61 (pence per kg)	23.60 (pence per kg)

### 7.1.2. Public transport services

TfGM does not directly operate public transport services in the Greater Manchester area. The large majority of services are operated by private sector operators (open market).

#### Metrolink (Greater Manchester tram services)

Metrolink is owned by TfGM and operated by a private company: Metrolink RATP Development Limited (MRDL). TfGM owns the tram vehicles and depots and is responsible for future investment and improvements. The tram operator manages and maintains the tracks, vehicles and depots (also using sub-contractors). TfGM decides on vehicle specifications.

The Metrolink timetable is set by TfGM without consideration for energy use and carbon emission impacts at present. Significant changes to services would need to be agreed by the Combined Authority. The contract between TfGM and the tram operator is quite old and does not mention energy efficiency or carbon emissions.

Metrolink drivers have been trained in eco-driving. Regenerative braking is also enabled on the network (with the energy reused on the network). Energy use in buildings is monitored through automated metering and the new depot has a modern energy management system.

For the new tram lines (under construction), the MPact-Thales consortium (MPT) has been appointed to design, construct and maintain the lines for a five year period.

#### Bus services

The majority of bus services are run commercially by private operators who own the vehicles and decide on their specifications as well as on the routes served<sup>83</sup>. Many bus operators have rolled out eco-driving training programmes for their drivers. Fuel costs are generally recognised as an important part of operating costs by bus operating companies and efforts are made to reduce fuel consumption.

The bus depots are generally owned by the private bus operators. TfGM owns the majority of bus stations and bus stops (but the land on which the stops are located is generally owned by the local authorities). Some bus shelters are owned by JCDecaux (advertising).

<sup>81</sup> Source: A guide to buses in Greater Manchester, GMPTE, 2010

<sup>82</sup> Source: UK Department for Transport. The UK government plans to reduce the grant by 20% over the 2012-2015 period.

<sup>83</sup> In England, Wales and Scotland, with the exception of Northern Ireland and London, bus services were de-regulated and privatised in 1986. To begin with, the bus company in Greater Manchester was effectively publicly owned, but it was sold off in 1991/2. Private bus operators First and Stagecoach are the largest bus operators within Greater Manchester, although Arriva and a number of other operators also run services in the area. Competition in the Greater Manchester commercial bus market is limited, and the trend has been for the market to become less competitive in recent years, due to consolidation of operators and their services. Bus services have to be registered with the Traffic Commissioner before they start. Source: A guide to buses in Greater Manchester, GMPTE, 2010

Some bus services which would not be commercially viable but are judged to be important for the community are subsidised by TfGM. For these services, TfGM can specify the type of vehicle to be used by the operator (for example, Euro standard for engines). There are no specifications on the type of fuel used for these services at present.

TfGM owns the yellow school buses and decides on their specifications.

## Interchanges

Public transport interchanges are in shared ownership between TfGM, Metrolink, Network Rail and local authorities. TfGM owns Horwich Parkway which is operated by Northern Rail (private train operator) on behalf of TfGM<sup>84</sup>.

## 7.1.3. Energy sources and use

### Electricity

TfGM spends approx. £2 million per annum on electricity (excl. tram traction and stops). This is purchased through energy brokers. 50% of this is for traffic signals. Another £1 million per annum is spent on tram traction (paid for by the operator but procured by TfGM). This will increase in the coming years as the network expands.

TfGM would always look at purchasing green electricity first, including for tram traction, unless the additional cost was prohibitive. This is seen as important for the organisation's image, enabling TfGM to promote its tram services as sustainable transport services. TfGM has adopted a policy to this effect.

For Metrolink traction energy, the choice of green energy results in an additional cost for TfGM. Green electricity is generally more expensive but this is usually offset by its exemption from the Climate Change Levy (CCL), a UK tax on energy use. Electricity bought for tram traction is however already exempt from the CCL by law<sup>85</sup> so buying green energy is more expensive. The decision to pay a premium for tram green energy was not a difficult one to make however as it fitted with TfGM's policy.

TfGM procures the electricity for the Metrolink network (traction and depot energy), with TfGM taking the tariff risk and the operator taking the usage risk. This set up gives TfGM some influence on the choice of energy provider for the tram as TfGM takes part of the financial risk. Invoices go directly to the operator but TfGM has access to the energy metering data as the contract owner.

Electricity used for the tram stops is procured by the tram operator directly at present (arrangements are still to be confirmed for new lines under construction).

Electricity used for bus stops, stations (excluding train stations) and offices is also procured as 100% green energy by TfGM. In this case, TfGM would have to pay the Climate Change Levy so the purchase of green energy which is exempt from the Levy results in a similar end cost to TfGM.

Some bus stops are maintained and managed through a contract with JCDecaux (with some advertising). TfGM has no influence on energy use at these bus stops at present (the contract is old and does not take account of energy use or carbon emissions) but JCDecaux pays for the energy consumption of these stops.

TfGM has recently been given the additional remit of maintaining and managing traffic signals for Greater Manchester. The new contract for electricity provision is being procured by TfGM.

<sup>84</sup> Train services are provided by private operators and run on the national rail network which is owned and managed by Network Rail. The UK Department for Transport decides on rail rolling stock specifications. Rolling Stock Owning Companies (ROSCOs) own the trains and private operators operate the services through concessions (franchise agreements) with the UK government and Network Rail. TfGM has limited influence on the specification of rail services at the moment (although metropolitan areas in England are arguing for more powers to be devolved from central government on this matter). TfGM is however currently developing parking facilities at stations to be used as Park & Ride sites by rail users and has installed a wind turbine at Horwich Parkway through T2K (WP2).

<sup>85</sup> The Climate Change Levy is a tax paid by large electricity users in the UK, green energy is exempt from the Levy so although it is bought at a premium, the end cost is usually about the same for the user. Traction electricity used for train and tram services is however exempt from the Levy so buying green energy for rail services is more expensive

## Fuel and gas

Fuel for the buses is procured by individual private operators through their procurement process. Gas is procured through a standard contract.

## Energy and carbon costs forecasting

Guidance on scheme appraisal in the UK provides forecast electricity costs showing a 10% per annum increase between 2010 and 2020, with this rate lowering to less than a 2% per annum increase between 2020 and 2040<sup>86</sup>.

In the UK, carbon values are being used for broader cost benefit analyses to assess whether, taking into account all relevant costs and benefits (including impacts on climate change), a particular policy or investment may be expected to improve or reduce the overall welfare of society. This is applied to transport investment, including new highway and public transport infrastructure.

The approach to carbon valuation in policy appraisal was changed in 2009. Before 2009, it was based on the Social Cost of Carbon (also called the Shadow Price of Carbon), valuing GHG emissions through an estimate of the lifetime damage costs associated with their emission (drawn from the Stern Review). Since 2009, it is based on estimates of the abatement costs that will need to be incurred to meet the UK's emissions reduction targets (as set in the Climate Change Act 2008). Table 17 summarises carbon prices to be used in scheme appraisal for traded (EU ETS) and non-traded sector emissions and shows the central price to be used as well as alternative low and high costs for sensitivity testing<sup>86</sup>.

**Table 17. Summary of carbon prices and sensitivities for appraisal, £/tCO<sub>2</sub>e in 2011 prices**

Year	Traded			Non-traded		
	Low	Central	High	Low	Central	High
2011	6	13	17	28	56	83
2020	19	29	35	32	64	95
2030	37	74	111	37	74	111
2040	72	143	215	72	143	215
2050	106	212	318	106	212	318
2060	127	282	437	127	282	437
2080	113	324	535	113	324	535
2100	71	284	497	71	284	497

### 7.1.4. Targets and policies

In the UK, the 2008 Climate Change Act introduced a legally binding target of at least an 80% cut in greenhouse gas emissions by 2050 (on 1990 levels), to be achieved through action in the UK and abroad. A carbon budgeting system has also been set up, capping emissions over five-year periods. An independent Committee on Climate Change (CCC) advises the Government on the level of carbon budgets and on where cost effective savings can be made. The Committee submits annual reports to Parliament on the UK's progress towards targets and budgets and the Government must respond to these annual reports<sup>87</sup>.

The Climate Change Act does not include sector specific targets but the CCC does advise the Government on the level of emission reduction to be achieved within each sector (including the transport sector) to meet the overall target. The public transport sector is not generally identified independently although the CCC has highlighted areas where the sector could contribute to emission reduction. For example, in its third progress report, the CCC monitored progress in training bus drivers to drive more efficiently and advised the Government to adopt a mandatory rather than voluntary approach to eco-driving training for bus and HGV drivers<sup>88</sup>.

The Greater Manchester Combined Authority has adopted the Greater Manchester Climate Strategy (2011-2020) which includes a 48% carbon emission reduction target by 2020 (on 1990 levels). This target is not

<sup>86</sup> Source: DECC Inter-departmental Analysts' Group (IAG) Guidance for policy appraisal ([www.decc.gov.uk/en/content/cms/about/ec\\_social\\_res/iag\\_guidance/iag\\_guidance.aspx](http://www.decc.gov.uk/en/content/cms/about/ec_social_res/iag_guidance/iag_guidance.aspx))

<sup>87</sup> Source: [www.decc.gov.uk/en/content/cms/legislation/cc\\_act\\_08/cc\\_act\\_08.aspx](http://www.decc.gov.uk/en/content/cms/legislation/cc_act_08/cc_act_08.aspx)

<sup>88</sup> Source: Meeting Carbon Budgets, 3<sup>rd</sup> Progress Report to Parliament, CCC, June 2011

broken down by sectors at present although the Greater Manchester transport strategy (Local Transport Plan) includes the following objective: *“to ensure that carbon emissions from transport are reduced in line with UK Government targets in order to minimise the impact of climate change”*<sup>89</sup>.

Individual local authorities within Greater Manchester have also adopted climate change strategies and targets. For example, the City of Manchester has developed the “Manchester: A Certain Future” action plan. For the transport sector, this includes actions such as:

- replacing road traffic signalling and street lighting with low energy, long life LEDs;
- undertaking research into low emission and alternative fuels;
- the development of a common city-wide pricing and ticketing system for public transport; and
- greening the bus fleet.

TfGM (and its predecessor GMPTE) also has adopted various climate change and energy related targets in several policy and strategy documents as summarised in Table 18 below.

**Table 18. TfGM climate change and energy targets**

TfGM document	Target
TfGM Climate Change Strategy and Action Plan	Overall target of 13.5% reduction in carbon emissions by 2015
Draft TfGM Carbon Management Plan	Proposed target of 30-35% reduction in Carbon by 2016
TfGM Energy Strategy and Action Plan	Overall target of 2.9% reduction in energy use per year

TfGM is currently working on the development of the organisation’s carbon footprint as part of T2K (WP 3). There has been no work on embodied carbon emissions to date.

Targets and policies on energy consumption and carbon emissions are required as a basis for decision making and for actions to be implemented. They are however not always sufficient for the best energy/carbon solution to be adopted. The general upward trend for energy costs has focused the attention on energy consumption. The Carbon Reduction Commitment, and to a lesser extent the Climate Change Levy, have helped by providing further financial incentives to reduce energy use and carbon emissions.

When applying for planning permission, for example to build new interchanges, TfGM has to meet the relevant local authority’s requirements with regard to renewable energy generation and building efficiency. These vary between the various local authorities in the Greater Manchester area. For example Manchester City Council requires buildings to meet a “very good” BREEAM rating<sup>90</sup> and for at least 20% of the energy consumption of new buildings to be produced through local renewable generation.

<sup>89</sup> Source: Greater Manchester Local Transport Plan 2011/12 – 2015/16

<sup>90</sup> BREEAM is an environmental assessment method (EAM) and rating system for buildings developed by the Building Research Establishment (BRE). It is the equivalent to HQE (“Haute Qualité Environnementale”) in France.



### Climate Change Levy (CCL)

The Climate Change Levy is a tax on the use of energy in industry, commerce and the public sector in the UK. All revenue raised through the levy (rates are shown in the table below) is recycled back to business through a 0.3 percentage point cut in employers' national insurance contributions, introduced at the same time as the levy, and support for energy efficiency and low carbon technologies. The aim of the CCL is to encourage businesses to become more energy efficient and reduce their greenhouse gas emissions.

Electricity generated from renewable sources (such as solar power and wind power – but not large-scale hydro-electric schemes or some energy from waste) is exempt as is electricity used for rail traction.

Taxable commodity	2011/12 rate	2012/13 rate
Electricity (pence per kilowatt hour)	0.485	0.509
Gas supplied in Great Britain (pence per kilowatt hour)	0.169	0.177
Petroleum gas supplied in a liquid state (pence per kilogram)	1.083	1.137
Any other taxable commodity (pence per kilogram)	1.321	1.387

### Carbon Reduction Commitment (CRC) Energy Efficiency Scheme

The CRC Energy Efficiency Scheme was introduced by the UK government in 2008. It is a mandatory scheme aimed at improving energy efficiency and cutting emissions in large public and private sector organisations, together accounting for around 10% of the UK's CO<sub>2</sub> emissions. The scheme includes three main elements:

- an obligation to monitor and report carbon emissions;
- a financial incentive to reduce emissions through the requirement to buy allowances for each tonne of CO<sub>2</sub> emitted. Allowances will go on sale from April 2012 and the current price is set at £12 per tonne of CO<sub>2</sub>; and
- a reputational incentive as an annual performance league table is published showing participants' performance.

Sources: UK Department of Energy and Climate Change, HMRC, Environment Agency

### Supporting the value of carbon – Carbon Price Floor in the UK

Although the EU ETS has achieved some certainty over EU overall emission levels and encouraged investment in energy efficiency and low carbon energy generation, the UK Government believes that the cap levels and associated carbon price are not sufficient to meet the UK emission reduction target for 2050. The view is that the carbon price resulting from the EU ETS is not *"stable, certain or high enough to encourage sufficient investment in low-carbon electricity generation in the UK"*.

In 2011, the UK Government announced the introduction of a Carbon Price Floor (CPF) from April 2013. The CPF is designed to top up the EU ETS carbon price to get it to a target level for the electricity generation sector. This means that industries within the EU ETS will be required to pay a top-up tax if the price of carbon under the EU ETS falls under a certain level, set at around £15.7/tonne CO<sub>2</sub> in 2013, rising to £30/tonne in 2020 and £70/tonne in 2030 (real 2009 price). This will be implemented through a reform of the Climate Change Levy currently based on energy use.

The UK Government sees the introduction of the CFP as a *"necessary first step in delivering a package of reforms for the electricity market to support low-carbon investment"*, as it will reduce uncertainty levels over future profitability and rates of return for investors.

Source: *Planning our electric future: a White Paper for secure, affordable and low-carbon Electricity*, UK Department for Energy and Climate Change, July 2011

## 7.1.5. Future steps

### Energy efficiency and quick wins

Work on energy efficiency and carbon emission reduction started by focusing on understanding TfGM's assets and their energy use. 2011 was the first year with investment in energy efficiency including voltage optimisation on the tram network and the installation of LED lights at stops. TfGM (and its contractor) plans to change traffic signals to LEDs as well, achieving a 30 to 50% reduction in energy use.

There are still a lot of quick win measures which could be implemented, including lighting at bus stations. Some areas require additional research. Additional reductions could also potentially be achieved by working in partnership with private operators.

There is a view that energy costs are not enough of a priority within TfGM at present. Energy budgets tend to appear within different departmental budgets, hiding the overall cost to the organisation. This is however being addressed through the new business management system. As energy costs represent approx. 25% of the TfGM property maintenance budget, this tends to be tracked through metering data although it is sometimes difficult to act on this information.

### Working with bus operators

Seven private bus operators have signed up to a partnership agreement with TfGM. The agreement requires operators to use vehicles meeting at least Euro IV standards.

In the procurement of subsidised bus services, the age of the fleet is a criteria that bidders are judged on (at the pre-qualification stage) although this is only a small part of the overall mark as the priority is generally placed on reliability (although this can also be an incentive for operator to use newer vehicles).

#### Partnership working with bus operators – Options for English transport authorities

**Voluntary Partnerships** – an agreement which is not enforceable by law, but can include joint working to improve infrastructure (for example, stops, shelters and highways) and vehicles (for example, by increasing the percentage of low floor accessible buses or reducing average age). Such agreements are usually set over a given timeframe and with specific outputs on both parties. In Greater Manchester, the “Integrate” programme was an example of a wide-ranging Voluntary Partnership.

**Statutory Quality Partnerships** – these are similar to voluntary partnerships but are enforceable by law. In essence, the partnership embodies an arrangement whereby the transport authority invests in improved facilities along a bus corridor and in return, the operators deliver bus services to a higher standard, with transport authorities able to specify frequencies and maximum fares.

**Quality Contracts** – these are similar to the franchising (concession) process, and give considerable powers to the transport authority. Bus operators would be invited to bid to operate exclusively on a specified network, and once the authority has appointed an operator, it would face no on-road competition and could concentrate on building patronage and improving services. This option would allow Transport for Greater Manchester to fully specify and regulate all aspects of bus networks, including fares, frequencies, routes, timetables and standards. There are no Quality Contracts currently in place in England.

*Source: A guide to buses in Greater Manchester, GMPTE, 2010*

### TfGM procurement

Environmental criteria are used in TfGM procurement process although this does not usually count for a large part of the overall mark. Whole life cost is sometimes used but there is no policy to ensure it is always used.

Various targets are in place with regard to environmental performance across TfGM. For example, TfGM has adopted targets for the environmental performance of new buildings, whereby all new buildings currently have to be rated BREEAM “excellent” and will need to be “very good” in the future. The latest Local Transport Plan for Greater Manchester also includes a minimum standard for civil engineering schemes

(CEEQUAL<sup>91</sup> Excellent). The project appraisal process also considers environmental issues and CO<sub>2</sub> emissions but this is not done in a consistent manner at present.

### 7.1.6. Challenges

#### **Split responsibilities and incentives**

It is important to have the ability to influence energy consumption and carbon emissions from existing contracts, buildings, networks and rolling stock. This is not always easy for TfGM as responsibilities are often split between TfGM, local authorities, bus and tram operators, MPT for the new sections of the tram network and other private sub-contractors involved in the delivery of public transport services in the area.

The UK context means that there is often a lack of continuity in ownership and responsibility (political cycles and relatively short concessions/franchises). This was recently recognised by the UK Government through its review of rail franchising (see case study below).

The large number of bus operators (different sizes and operating models) means that so far, only a voluntary code of conduct has been established although TfGM is considering the implementation of Bus Quality Partnerships and Quality Contracts.

#### **Trade-off between high short term costs and potential long term benefits**

Up-front investment costs are identified as the main barrier to further investment in energy efficiency and carbon reduction.

#### **Balancing public transport emission reduction with wider transport sector objectives**

Energy efficiency and CO<sub>2</sub> reduction are not a high priority for the organisation. The main priorities are to attract more users, especially from the private car (leading to overall reductions in emissions for the transport sector in the area), and provide reliable services.

User expectations have increased, for example, with new bus stations, additional services are expected (accessibility, travel information, lights, CCTV, etc) as well as services operating earlier in the morning and later in the evening.

Mandatory targets on energy consumption/emissions for subsidised bus services could result in small bus operators having difficulties bidding to deliver these services due to the large investment required to acquire newer, less polluting vehicles.

#### **Access to capital and credit market failure**

TfGM has been asked to reduce investment spending by 15% in 2010/11 and by another 15% for 2011/12 so it is difficult to justify additional investment in this area.

#### **Technology risk**

There is a view that some energy efficiency and low carbon technologies are still relatively unproven and this is a barrier to investment as there is a higher risk attached. For example, with low carbon buses, there is a risk on the vehicle life cycle (vehicle life length, maintenance cycles) which means that operators and TfGM hesitate to buy the latest technology.

#### **High search and transaction costs**

A significant investment in terms of staff time and knowledge is needed to make the right decisions in terms of energy efficiency and CO<sub>2</sub> reduction (especially if embedded carbon and indirect emissions are to be taken into account).

The initial spend on assessing the feasibility of energy efficiency and CO<sub>2</sub> reduction options and developing a business case for investment can be a barrier. Gaining high level understanding and support for energy consumption/carbon emission reduction work within the organisation (including the Combined Authority) can sometimes be difficult and time consuming. It often seems cheaper to keep doing business as usual.

<sup>91</sup> CEEQUAL is a UK based assessment and award scheme for improving sustainability in civil engineering projects. The scheme is made up of 200 questions relating to environmental and social aspects of a project such as land use, landscape issues, ecology and biodiversity, historic environment, water, energy and carbon, material use, waste management, transport, effects on neighbours and relations with the local community and other stakeholders

## Support for energy efficiency and carbon investment in the UK

**Enhanced capital allowances** - enable a business to claim 100% first-year capital allowances on their spending on qualifying plant and machinery. This means that businesses can write-off the whole of the capital cost of their investment in these technologies against their taxable profits of the period during which they make the investment. This can deliver a helpful cash flow boost and a shortened payback period. There are three schemes for energy-saving plant and machinery, low CO<sub>2</sub> emission cars and natural gas and hydrogen refuelling infrastructure, and water conservation plant and machinery.

**Invest to save support** - Salix Finance Ltd is an independent, not for profit company, funded by the UK Department for Energy and Climate Change (DECC), the Welsh Assembly Government and the Scottish Government. Its purpose is to accelerate investment by public sector bodies in energy efficiency technologies through invest to save schemes. Salix delivers funding through:

- a recycling fund, where a public sector body is given match funding for a number of projects. The client can continue to recycle energy savings returned to the fund into more projects, always maintaining the value of the fund at a constant level. Money is returned to Salix only when no more suitable projects can be found; and
- loans targeted at specific projects, which when completed repay their costs to Salix from the energy savings.

Sources: DECC (<http://etl.decc.gov.uk/>) and Salix ([www.salixfinance.co.uk](http://www.salixfinance.co.uk))

## Policy and regulatory framework and inertia

Changing the culture of operational staff can also be difficult. TfGM's experience shows that focussing on the cost aspect of energy efficiency rather than the environmental aspect works better with operational staff.

## Informational failures & uncertainty

There are difficulties in funding the construction of sustainable new buildings due to the way funding is allocated by central government. New infrastructure funding can be delayed for a very long time with plans not being finalised and when the allocation of funds is decided, the infrastructure often needs to be built quickly to spend the funds allocated within the timeline decided by government which means that there is less time to plan for sustainability improvements.

For example, some interchanges are currently being built as the funding has been allocated from central government. These buildings were however designed several years ago and do not include the latest, most efficient technology. The timescales given by central government for the funds to be spent means that there is no time to revise the designs. The delay also means that energy efficient technology might have become more affordable in the interval but this is not taken into account in the business case. Another example is the Rochdale bus station, where the design work was done two years before the funding was allocated for construction. TfGM are now reconsidering the design to include LED lights.

Building regulations and planning rules can be different depending on the location of the project (different local authorities), adding to the uncertainty of business case work.

Embodied carbon is not currently included in CO<sub>2</sub> assessment for TfGM procurement and there are no plans to do so as this would be very resource intensive. The complexity of impacts sometimes leads to nothing being done however. For example, when considering the replacement of lamps before their end of life, there are questions on the waste impact versus the gain in energy efficiency.

It is also difficult to justify energy efficiency or renewable energy investment in buildings when there is uncertainty about their future. Some buildings are quite old and could be replaced but there is no certainty about funding for their replacement and when this could happen.

There is also some uncertainty in the development of business cases for investment in renewable energy generation. For example, in the UK, the government has recently changed the level of feed in tariffs being paid to solar energy producers. Business cases which had been prepared by TfGM to install solar panels at four interchanges will have to be reviewed and the decision to invest might be reversed.

## Carbon price externality

The UK Department for Transport appraisal process for transport investment does consider carbon emissions but the view is that the cost of carbon is quite low and has little influence on the cost benefit ratio.

### Public transport franchising – UK review of rail franchising

The current UK rail franchising model involves Central Government drawing up a detailed service specification with operators selected on price (subsidy requirements or premium offers) and franchises lasting between seven and ten years. The tightly defined specification limits the scope for bidders to propose their own solutions and there is little incentive for operators to innovate. The short franchise period also means that relatively few operator investments can earn a return.

Short franchises give operators little incentive to reduce costs, or plan for long-term growth. They mean that investing effectively in establishing long term relationships with Network Rail and with employees is more difficult. Frequent competitions also carry substantial costs, both for industry and Central Government. The Government is therefore considering using longer franchises lasting 12 to 15 years (and up to 22.5 years), in the future.

Even with longer franchises there will always be schemes and investments that would be commercially viable if costs could be recouped over a longer time period. This is especially the case in the later years of a franchise contract when new investment opportunities emerge. Operators would need to be able to recoup some of the value from an investment when that franchise comes to an end.

One model for a residual value mechanism could be for Government to agree with the operator an appropriate value for an asset at the end of the franchise term (with provisions to ensure that the asset was maintained appropriately). Any incoming operator would then be required to buy this asset at the agreed value, thus compensating the outgoing operator for the lost investment.

*Sources: Reforming Rail Franchising, DfT, July 2010 and Reforming Rail Franchising: Government response to consultation and policy statement, DfT, January 2011*

## 7.2. Proposed recommendations

Recommendations for T2K partners are described in detail in Chapter 9. Based on TfGM's challenges and discussions with TfGM staff, recommendations of particular relevance to TfGM include:

- lobbying for stricter, consistently enforced land use planning and building regulations requiring improvements in energy efficiency and carbon reduction;
- improvement to appraisal and business case processes and guidance to better take account of volatility of energy prices, cost of carbon and whole life cost of investment decisions;
- capacity building and tools (for example, rules of thumb for carbon and whole life cost assessment) for T2K partners on energy efficiency and carbon reduction;
- investigating funding options including free/low interest loans, state guarantees, revolving funds (including within the organisation), access to patient capital, focusing on EU funding sources;
- using ESCO (Energy Services Company) and EPC (Energy Performance Contracting) models; and
- including GHG performance as a criteria in procurement process and contracts with supply chain, potentially supported by lobbying for the development of legal standards in energy efficiency/carbon content of products/services.



## 8. WP4 drivers and challenges

This chapter summarises the drivers and challenges identified through the analysis stage of the study, through discussions and workshops with the T2K partners and their stakeholders.

### 8.1. WP4 objectives

Work package 4, Optimizing policies and regulations for CO<sub>2</sub> reduction measures, aims to consider the interactions between public transport companies and their stakeholders including local governments, suppliers, maintenance operators, as well as the policy and legal context within which they operate.

The study aimed to deliver five principal outputs summarised in Table 19 below.

**Table 19. WP4 study outputs**

Outputs from WP4 brief	Location of information in this report
A review of how the carbon market operates in the five partner countries	Chapter 2
Analysis of the business models that support CO <sub>2</sub> reductions in the five countries	Chapter 2 and individual partner chapters (3 to 7)
Analysis and recommendations on best practice for incentives and contractual requirements for suppliers to drive CO <sub>2</sub> reduction	Individual partner chapters (3 to 7) for best practice case studies Chapter 9 for recommendations
Analysis and recommendations on how risk is best allocated to support the adoption of innovative equipment and processes	Chapter 9 with recommendations on alternative funding arrangements (including risk allocation)
Recommendations, which are feasible to be implemented in all the partner countries, on how to 'unlock' funding for measures that reduce CO <sub>2</sub>	Chapter 9 with recommendations on alternative funding arrangements

### 8.2. Summary of drivers and challenges

Following the analysis stage and workshops with T2K partners and their stakeholders, the following drivers and challenges were identified (explored in more detail in individual partner chapters above).

#### Summary of drivers

When energy use and CO<sub>2</sub> reduction are considered, a similar set of drivers can be found across all five T2K partners. These include:

- **achieving cost savings** - through reduced energy use or reduced energy costs (and reduced CO<sub>2</sub> emissions where these are taxed);
- **attracting additional public transport users**, especially from the private car – in line with national and regional transport strategies; and
- **demonstrating the organisation's commitment to environmental and climate change targets** - through action on energy efficiency and carbon, also improving the organisation's image and the attractiveness of public transport services.

As shown in the challenges identified below however, energy use and CO<sub>2</sub> reduction are not always considered a priority for investment as attracting additional public transport users and overall cost savings are usually overarching priorities for operators and public transport authorities alike.

#### Summary of challenges

T2K partners are faced with important challenges when considering initiatives to reduce energy use and CO<sub>2</sub> emissions. Although many of these challenges are shared across the five partners, some differences appear between countries and operating models, as summarised in Table 20.



**Table 20. Challenges identified during workshops**

Challenges	moBiel	RATP	RET	STIB	TfGM
<b>Trade-off between high short term costs and potential long term benefits</b> – difficulties in convincing organisations and partners to invest when high levels of capital investment are required up-front offset by long-pay-back periods	✓	✓✓		✓	✓
<b>Access to capital and credit market failure</b> – reducing debt and achieving overall cost savings can be overriding objectives, limiting access to capital for investment. It can also be difficult to secure credit from private sector lenders		✓✓		✓✓	✓✓
<b>Balancing public transport emission reduction with wider transport sector objectives</b> – public transport is seen as a low carbon option and national and regional transport strategies aim to encourage further use of public transport (resulting in lower emissions for the transport sector as a whole) whilst ensuring that transport supports the local economy and remains affordable for everyone	✓	✓	✓✓		✓
<b>Split responsibilities and incentives</b> – ownership, governance and operating models sometimes mean that the financial/reputational benefits arising from an initiative might not accrue to the organisation funding the investment. Investment decisions resulting in higher energy can also be made independently from the organisation paying for energy.		✓✓	✓	✓	✓✓
<b>Informational failures and uncertainty</b> – uncertainty about future energy (and carbon) prices and future transport demand can result in sub-optimal decisions, as can uncertainty on future governance, ownership and operating models. The information required to inform decisions can also be difficult to gather (especially when considering indirect and embedded emissions and wider sustainability impacts)	✓	✓	✓	✓	✓
<b>Carbon price externality</b> – failure of investment decisions to take full account of the cost of CO <sub>2</sub> emissions to society		✓	✓	✓	✓
<b>Policy and regulatory framework</b> – existing policies, regulations, standards and terms of contract between operators and transport authorities can restrict (or fail to encourage) the implementation of energy and carbon reduction initiatives	✓	✓	✓	✓	✓
<b>Technology risk</b> - some technologies are still relatively unproven and the higher risk can be a barrier to investment					✓
<b>High search and transaction costs</b> – identifying the right opportunities and technologies to improve energy efficiency or reduce carbon emissions requires time and knowledge as does convincing the organisation and its partners to invest/implement the initiative					✓
<b>Path dependency (lock-in)</b> – investment in public transport infrastructure and vehicles has long term impacts due the long life of these assets which means that partners could end-up being locked-in high energy use/emission paths	✓	✓			
<b>Inertia and behavioural barriers</b> – individuals and organisations can end up acting habitually or to meet existing norms and standards rather than objectively considering the impacts of their actions on energy use and carbon emissions	✓	✓	✓	✓	✓
<b>Market approach versus planning approach</b> – partners have differing views on the best approach to encouraging CO <sub>2</sub> reduction and the production of renewable energy which results in different decisions being made on initiatives	✓	✓			

“✓✓” denotes a challenge which was identified as particularly strong through discussions with the T2K partners. The absence of a “✓” does not mean that this issue is not relevant to the organisation but rather that this particular issue was not raised in discussions with the organisation and its partners during the workshops.

## 9. WP4 recommendations

This chapter presents the recommendations for work package 4 of the Ticket to Kyoto project. Detailed information on the development of these recommendations is included in Appendix C.

### 9.1. Summary of recommendations

Table 21 below summarises the recommendations and shows T2K partners' assessment of their relevance to each partner.

**Table 21. Summary of WP4 recommendations**

Recommendations	moBiel	RATP	RET	STIB	TfGM
<b>R1 - Company emission reporting and information provided to public transport users</b> Lobbying for stronger requirements on company reporting and information provided to public transport users (with a well defined scope), supported by joint budget and accounting for energy use and carbon emissions	√		√	√	
<b>R2 - Improvement to business case process and guidance</b> Improvement to appraisal and business case processes and guidance to better take account of volatility of energy prices, cost of carbon and whole life cost of decisions	√	√		√	√
<b>R3 - Capacity building and tools</b> Capacity building and tools (for example, rules of thumb for carbon and whole life cost assessment) for T2K partners on energy efficiency and carbon reduction	√		√		√
<b>R4 - Raising awareness of the need for public transport to remain a low carbon option</b> Raising awareness of the need for public transport to remain a low carbon option and of the potential for financial savings through energy efficiency investment	√		√	√	
<b>R5 - Investigating EU funding sources</b> Investigating funding options including free/low interest loans, state guarantees, revolving funds (including within the organisation), etc, focusing on EU funding sources	√	√		√	√
<b>R6 - Using ESCO and EPC models</b> Using ESCO (Energy Services Company) and EPC (Energy Performance Contracting) models		√	√	√	√
<b>R7 – Providing carbon neutral journeys by using the carbon market</b> Investigating “green tickets” products and use of offsets		√		√	
<b>R8 - Including GHG performance in procurement process and contracts</b> Including GHG performance as a criteria in procurement and contracts with supply chain, potentially supported by lobbying for the development of legal standards in energy efficiency/carbon content of products and services		√	√		√
<b>R9 - Joint procurement of low carbon vehicles</b> Exploring the potential to procure low carbon vehicles jointly	√				
<b>R10 – Land use planning and building regulations</b> Lobbying for stricter, consistently enforced land use planning and building regulations requiring improvements in energy efficiency and carbon reduction					√

## 9.2. Company emission reporting and information provided to public transport users (R1)

### What does this recommendation entail?

T2K partners should use their lobbying powers to request stronger requirements for energy use and emission reporting in the public transport sector.

This could be done at two levels, with organisations involved in the delivery of public transport services required to:

- report on the organisation's energy use and emissions regularly; and
- inform users on energy use and emissions resulting from their use of public transport services.

This could be achieved through legal obligations implemented at the regional, national or EU level or through voluntary agreements between organisations within the public transport sector (potentially through UITP<sup>92</sup>).

The requirement to accurately report energy use and emissions would encourage organisations to be more proactive in measuring these impacts which would improve their visibility across the organisation and within the supply chain. This would raise the profile of investments in energy efficiency and carbon emission reduction and show that efforts need to be made for the public transport sector to be able to remain a low carbon option in the long term (when competing with electric cars). It would also support public transport sector partners in setting challenging but realistic targets for performance improvement.

Reporting and information requirements would need to be clearly defined and emissions taken into account would probably only include Scope 1 and Scope 2 emissions, with the possibility for organisations to decide to include some Scope 3 emissions<sup>93</sup>. The information provided to users could be based on an estimate of GHG emissions linked to their journey (using averages and standard data per mode and ticket type, at least at the start, with the objective of developing actual values for each provider/mode to enable users to compare impacts more accurately).

### Which partners prioritised this recommendation?

moBiel, RET and STIB felt that this option would be relevant to them as it would support their efforts to monitor their impact and raise the profile of energy efficiency and carbon emission reduction within their organisation and their local area.

RATP is already under a duty to report at the organisation and user level as described below.

### Evidence of implementation and impacts

See case studies overleaf.

### Who needs to be involved to deliver this recommendation?

This will require T2K partners to lobby national or EU government for changes to existing regulations.

### Deliverability and resources

Belgium, France, Germany, the Netherlands and the UK already have mandatory and voluntary regulations on company reporting<sup>94</sup> and these regulations apply to T2K partners in some cases although most are publicly owned organisations and therefore not required to comply with these regulations. This recommendation is about making sure that existing guidelines are improved where necessary to ensure that reporting duties placed on public transport sector organisations encourage further energy efficiency and carbon reduction investment.

#### Reporting for public transport operators in France

In France, carbon reporting will become compulsory from December 2012 for private sector organisations with more than 500 staff, public sector organisations with more than 250 staff, regional, sub-regional and local authorities with more than 50,000 inhabitants and central government. This information will be publicly available and updated every 3 years. Organisations are required to report on Scope 1 and 2 emissions as a minimum (including non energy GHG such as cooling gases and methane). Organisations will also be required to publish a summary of their action plan to reduce GHG emissions for the 3 year period.

French reporting guidelines require organisations to use national emission factors for electricity use, meaning that organisations can't report reduced emissions if they have chosen a low carbon supplier or have specified a proportion of green electricity. Offsets (carbon credits) are also excluded.

From December 2013, all transport providers (public transport as well as car rental, flights or freight) will also be required to provide information to their customers on the amount of CO<sub>2</sub> emitted for their journey.

Providers will be able to use default values provided by central government until July 2016. From this

### Reporting for private operators in the UK

In the UK, as public transport operators are usually private companies, many of them are already reporting on energy use and carbon emissions to fulfil their legal company reporting duties.

First Group, one of the main operators of bus services in Greater Manchester has developed a regularly updated Climate Change Strategy. The latest strategy published in 2011 includes information on the carbon intensity of journeys made on First buses and trains in the UK as shown in the table below. First Group's figures for bus travel are based on actual fuel consumption and an average journey length based on data from the National Travel Survey.

Mode of transport	CO <sub>2</sub> per passenger km in 2010/11 (grams)
First Group UK bus	81
Average local bus in the UK (DfT figures)	134
First Group UK rail (diesel)	50.8
Average for national rail (DfT figures)	53.4
Average car (DECC figures)	137
Electric car (based on 2008 UK grid mix)	75

Source: First Group Climate Change Strategy 2011

Information on T2K partners' actual emissions (as currently being developed under T2K WP3) will be useful in comparisons with other modes of transport as public transport in dense urban areas is generally more energy efficient than in more rural areas<sup>95</sup> but conversion factors used to report emissions do not take this into account.

Through the work they are undertaking in WP 3, T2K partners will all be able to start reporting on their emissions even if their national law does not currently require them to do so. Through WP3, they are establishing their current carbon footprint and developing user information on the carbon impacts of public transport journeys which will ultimately be available on their websites.

<sup>95</sup> Source: Overview of energy consumption, density and proportion of alternative transport modes in cities worldwide (2001 data), as quoted in The role of public transport to reduce Green House Gas emissions and improve energy efficiency, UITP, March 2006

Staff time has already been invested to develop the information required for WP3 and regular updates will be required to maintain and update this data in the future. To lobby for reporting requirements to be implemented across the public transport sector, staff time will be needed to disseminate WP3 experiences and results within organisations and across the public transport sector and lobby for a change in regulations at national and EU levels.

### **What are the risks?**

The scope of emission reporting duties will need to be well defined to enable organisations to report key impacts without requiring them to report on a wide range of impacts which would become difficult and costly to measure and monitor. Examples of scope definition can be found in the UK and France.

Without being too onerous, conversion factors used in reporting will need to be precise enough to enable a differentiation between operators, with those making an effort to improve their energy efficiency and carbon footprint being rewarded through good publicity when they report overall emissions and give information to users for their journey's impact.

### **What are the next steps?**

T2K partners will need to disseminate their WP3 work to a wider audience and show how the work has enabled them to identify quick wins for energy efficiency and carbon reduction investment by gaining a better understanding of their energy use (and resulting emissions). This early work undertaken under WP3 could also benefit the partners by improving their image and showing their commitment to energy efficiency and carbon reduction objectives.

For the partners' efforts to bring them additional advantages in terms of image, they would need to be able to compare with other operators in the public transport sector and with other modes of transport. This could be done through a sector wide requirement for energy use and emission reporting. T2K partners will then need to lobby at national and EU level for sector wide regulations to create a level playing field across all organisations involved in the sector. This could be done through UITP and other international forums.

### 9.3. Improvement to business case process and guidance (R2)

#### What does this recommendation entail?

This recommendation is about improving the business case (also known as cost benefit analysis or appraisal) processes used by T2K partners when deciding on the viability of an investment. Focusing on energy efficiency and carbon reduction investment, T2K partners identified issues with current practices as they often include unrealistic assumptions on energy costs in the future and in most cases exclude monetary impacts for GHG emissions. Although whole life cost approaches are being developed, it was also noted by T2K partners that these would need to be improved.

The following issues were identified as key points to be addressed:

- assumptions made on future energy (notably fossil fuel) prices and their volatility can have a significant impact on how energy-efficient projects compare with less energy-efficient solutions. Conducting sensitivity analysis of the business case to variations in energy price can allow investors to reach a higher degree of certainty on the benefits of an energy-efficient project;
- taking the cost of carbon emissions into account (giving emissions a monetary value) allows for a more balanced approach to the business case and would favour energy-efficient projects over less energy-efficient solutions; and
- whole life cost of investment decisions rely on an extended appraisal period to achieve a more comprehensive assessment of the costs and benefits, including environmental impacts, of a project. For instance, enhancing the energy efficiency of investment can result in significantly higher upfront costs, which will take longer to be recovered. Similarly, positive environmental impacts can materialise further down the life cycle of a project. Using whole life cost of investments allows a fairer comparison of projects with alternative, less environmentally-friendly and less capital intensive solutions.

#### Which partners prioritised this recommendation?

RATP, STIB and TfGM highlighted this recommendation as addressing an important issue for them.

#### Evidence of implementation and impacts

At the EU level, the Guide to Cost Benefit Analysis of Investment Projects<sup>96</sup> recommends giving a value to the amount of fossil fuels or of other non-renewable energy sources saved and emissions avoided through the project, by using a standard shadow price where possible.

##### Business case guidance in the UK (Cost Benefit Analysis)

The UK Department for Transport (DfT) has published investment appraisal guidance (TAG) for investment in the transport sector. TAG prescribes calculating the difference in GHG emissions with and without the investment. It provides values for carbon tonnes equivalent for the traded and non-traded sectors of the economy up to 2100 (see Section 7.1.3).

The Department of Energy and Climate Change (DECC) has also developed a toolkit for the valuation of energy use and GHG emissions for appraisal and evaluation, comprising guidance handbooks and a Microsoft-Excel based toolkit.

TAG specifies that the full length of the “useful life” of an investment should be taken into account and sets a maximum length of 60 years for the appraisal period.

TAG is regularly used for business case development in the UK and not restricted to large infrastructure projects. For instance DfT’s impact assessment for the Bus Service Operators Grant Regulations in 2011 values GHG emissions according to DECC standard values under a central, low and high emissions scenario over the recommended appraisal period.

Sources: [www.dft.gov.uk/webtag](http://www.dft.gov.uk/webtag) and specifically [www.dft.gov.uk/webtag/documents/expert/pdf/unit3.3.5.pdf](http://www.dft.gov.uk/webtag/documents/expert/pdf/unit3.3.5.pdf), [www.decc.gov.uk/assets/decc/statistics/analysis\\_group/122-valuationenergyuseggemissions.pdf](http://www.decc.gov.uk/assets/decc/statistics/analysis_group/122-valuationenergyuseggemissions.pdf), <http://assets.dft.gov.uk/publications/bus-service-operators-grant/impact-assessment.pdf>

<sup>96</sup> Guide to Cost Benefit Analysis of Investment Projects, European Union Regional Policy, July 2008



### Business case guidance in France and Germany

In France, a 2005 internal guideline paper from the Minister for Transport ("Instruction de Robien") to the Directors of government departments involved in transport projects appraisal sets a revised methodology for the economic valuation of large transport infrastructure projects. The methodology:

- includes recommendations on sensitivity tests, including with regard to energy costs and taxes;
- sets a value for carbon for the period 2000-2010 (100 €/tonne equivalent to € 0.066 per litre of petrol and € 0.073 centimes per litre of diesel) and a formula to roll it forward (value to be increased by 3% per annum after 2010); and
- prescribes a long life cost assumption.

German guidance issued by the Federal Environmental Agency in 2007 sets the mid-value of carbon to be used for transport appraisal at €70 per tonne.

Source: [http://temis.documentation.equipement.gouv.fr/documents/temis/14849/14849\\_2005.pdf](http://temis.documentation.equipement.gouv.fr/documents/temis/14849/14849_2005.pdf) and <http://www.umweltdaten.de/publikationen/fpdf-l/3533.pdf>

### Who needs to be involved to deliver this recommendation?

T2K partners would need to lobby internally where internal processes are already in place and need to be changed to better reflect actual energy prices and carbon costs. T2K partners might also need to lobby regional and national government and EU level institutions to require improved business case guidance applicable to most investments (with proportionate assessments for smaller investments).

The development of such guidance requires expert opinions to set assumptions on energy and carbon costs and whole life cycle parameters. Training would then be required for staff involved in business case development to ensure that new guidance is applied correctly.

### Deliverability and resources

There remain some challenges posed by a comprehensive GHG emissions calculation if non-carbon GHG (greenhouse gases other than CO<sub>2</sub>) and embodied emissions (emissions linked to the construction of vehicles or the production of fuels for example) are to be taken into account. In the UK, TAG does not include them at present.

Future energy prices remain uncertain which limits the scope and the impact of sensitivity testing.

Staff time will be required to lobby for improved guidance. Once the guidance is in place, staff involved in business case development will need to be trained to ensure it is applied within the organisation.

### What are the risks?

The wide range of assumptions to make, especially when modelling for the long term, can be difficult for project managers, procurement bodies and investors and a uniform methodology applied across all type of projects could be costly to apply.

There is the need for a level playing field (at least across the transport sector) which can only be achieved through national or EU level guidelines.

### What are the next steps?

T2K partners could start by reviewing existing guidelines and their approach to energy prices, cost of carbon and whole life cost. It is possible that existing guidelines applied to different types of projects could provide a good basis to improve public transport sector guidelines.

T2K partners will then need to lobby regional, national government and EU level institutions to promote the establishment of standard investment appraisal guidance including whole life cost assessments, as well as adequate monetary values for carbon emissions and assumptions on future energy prices. The efficiency of such lobbying could be enhanced by submitting a review of international best practices and a proposed framework as a baseline for discussions. T2K partners could gather examples of instances where investment decisions were swayed by the exclusion (or inclusion where it has been done) of assumptions on the volatility of energy prices, whole life cost or cost of carbon. T2K partners could also show how this could have led to more energy-efficient choices in previous investment decisions.

## 9.4. Capacity building and tools (R3)

### What does this recommendation entail?

This recommendation aims to address issues identified by T2K partners with regard to staff availability and capacity to further develop, implement and monitor energy efficiency and carbon reduction strategies.

Through T2K WP3 partners will develop energy use and CO<sub>2</sub> emission monitoring methodologies and strategic CO<sub>2</sub> plans for the period to 2020. Staff resources will however still be required to implement these strategic plans, monitor impacts and update the strategies.

Having access to staff with the right skills, available to work on these issues when required and able to keep up to date with methodological and technical changes will therefore remain a key issue for T2K partners. As identified in the challenges (Chapter 8), identifying the right opportunities, technologies, procurement criteria and funding opportunities requires time and knowledge, as does convincing the organisation and its partners to invest in energy efficiency and carbon reduction.

### Which partners prioritised this recommendation?

moBiel, RET and TfGM selected this recommendation as one of their priorities. As discussed with T2K partners, staff availability and capacity issues are often linked to the size of the organisation with smaller organisations finding more difficult to dedicate staff resources exclusively to energy and carbon issues.

### Evidence of implementation and impacts

- **Keeping up to date**

Energy efficiency and carbon reduction are fast moving fields which can be very technical and where experts often disagree on the most promising technologies and the best investments. Some on-line resources allow practitioners to keep up to date with the latest expert opinion and technology development. These include:

- Point Carbon on environmental and energy markets ([www.pointcarbon.com](http://www.pointcarbon.com))
- LinkedIn groups
- Edie.net in the UK and Ireland ([www.edie.net](http://www.edie.net))
- CE Delft ([www.ce.nl](http://www.ce.nl), in Dutch and English)
- clean vehicle platform Agentschap in the Netherlands ([www.agentschapnl.nl](http://www.agentschapnl.nl), in Dutch)
- Knowledge Platform Traffic and Transport in the Netherlands ([www.kpvv.nl](http://www.kpvv.nl))

Participation in professional organisations such as UITP can also enable staff to exchange information on best practice and funding sources with other professionals.

#### Capability development in North-East England

The UK's North East Improvement and Efficiency Partnership has run an integrated series of training courses on sustainable procurement for procurers, other relevant officers (including senior staff) and elected politicians for local authorities across the north-east region.

The core course is the UK's new national 3-day sustainable procurement training module which was trialled in the region and has since been delivered to over a hundred regional staff. In addition linked half-day courses for elected members and a train-the-trainer course have been run, as well as specialised sessions on timber and wood procurement, the use of life-cycle costing and carbon footprinting.

Source: *Buying Green! A handbook on sustainable procurement, European Commission, Sept 2011*

- **Ready made tools**

In some countries, tools have been developed to:

- compare the efficiency of different vehicles and different modes of transport (for example, ecoscore<sup>97</sup> in Belgium or ADEME's guide on car fuel use<sup>98</sup> and mode comparator<sup>99</sup> in France);
- provide conversion factors for organisations reporting their emissions (for example DEFRA/DECC conversion factors in the UK<sup>100</sup> or ADEME's data in France<sup>101</sup>);

<sup>97</sup> [www.ecoscore.be](http://www.ecoscore.be)

<sup>98</sup> <http://www2.ademe.fr/servlet/getDoc?sort=-1&cid=96&m=3&id=52820>

<sup>99</sup> [www.ademe.fr/eco-deplacements/calcullette](http://www.ademe.fr/eco-deplacements/calcullette)

- in the UK, the Carbon Trust developed a suite of tools<sup>102</sup> for organisations including an energy analyser, a carbon footprint calculator, an online training tool as well as tools to estimate returns on investment in wind power and biomass heating;
- TopTen<sup>103</sup> aims to provide information on the most energy efficient products available, also covering products' impact on the environment, health and quality. Products compared in the database currently include building components, office equipment, lamps and cars; and
- Environment Tools<sup>104</sup> aim to list green accounting tools available on the internet and has recorded over 500 tools, listed within various categories including location, methodology, sector, etc. The site is UK focused but includes 24 tools which can be used in Europe.

At the European level, a whole suite of tools is available to assess life cycle costs, including<sup>105</sup>:

- the European Commission's calculator for life cycle costing for vehicle procurement<sup>106</sup>
- the European Commission's common method for life cycle costing in construction<sup>107</sup>
- a tool for assessing both life cycle costs and CO<sub>2</sub> emissions in procurement<sup>108</sup>;
- a life cycle costing tool produced by the Swedish Environmental Management Council<sup>109</sup>;
- a life cycle costing tool developed within the BUY SMART project<sup>110</sup>.

## Who needs to be involved to deliver this recommendation?

T2K partners are the best placed to identify any additional tool they might require to continue to monitor and implement their strategies. EU or national tools might already be available to meet their needs (either as they are or with some additions and modifications). Partners should share information on the tools and information sources they already use.

Training courses are also widely available and new courses are regularly being developed to follow demand. If T2K partner were to identify common training needs, it might be cheaper for them to procure a course for all partners (although language skills and national differences in regulations and requirements might be a barrier).

## Deliverability and resources

This recommendation is about getting more out of the staff resources available. It might be possible for T2K partners to draw on each others' resources and knowledge as they are already doing through other work packages. Although training staff or developing new tools (if needed) require an initial investment, this should result in staff becoming more efficient in their area of expertise.

## What are the risks?

Tools can become very technical and take time and money to develop if they are to be perfectly adapted to each organisation's need. It is important to assess existing resources and see if they can be used to meet partners' need. In some cases, there can also be too many tools to choose from and staff time and expertise is needed to make the right choice.

## What are the next steps?

Following from the T2K WP3 work, partners will need to identify any additional tools and training they might need to continue to monitor and implement their strategies. EU or national tools might already be available to meet their needs (either as they are or with some additions and modifications). It might also be possible for T2K partners to continue to draw on each others' resources and knowledge for example through joint training sessions.

<sup>100</sup> <http://archive.defra.gov.uk/environment/business/reporting/pdf/110819-guidelines-ghg-conversion-factors.xls>

<sup>101</sup> <http://www2.ademe.fr/servlet/KBaseShow?sort=-1&cid=96&m=3&catid=24989>

<sup>102</sup> [www.carbontrust.co.uk/cut-carbon-reduce-costs/products-services/web-tools/Pages/web-tools.aspx](http://www.carbontrust.co.uk/cut-carbon-reduce-costs/products-services/web-tools/Pages/web-tools.aspx)

<sup>103</sup> [www.topten.eu](http://www.topten.eu)

<sup>104</sup> [www.environmenttools.co.uk](http://www.environmenttools.co.uk)

<sup>105</sup> Source: Buying Green! A handbook on sustainable procurement, European Commission, Sep 2011

<sup>106</sup> [www.cleanvehicle.eu](http://www.cleanvehicle.eu)

<sup>107</sup> [http://ec.europa.eu/enterprise/sectors/construction/files/compet/life\\_cycle\\_costing/final\\_report\\_en.pdf](http://ec.europa.eu/enterprise/sectors/construction/files/compet/life_cycle_costing/final_report_en.pdf)

<sup>108</sup> [www.smart-spp.eu](http://www.smart-spp.eu)

<sup>109</sup> [www.msr.se/en/green\\_procurement/LCC](http://www.msr.se/en/green_procurement/LCC)

<sup>110</sup> [www.buy-smart.info](http://www.buy-smart.info)

## 9.5. Raising awareness of the need for public transport to remain a low carbon option (R4)

### What does this recommendation entail?

This recommendation was developed to address T2K partners' concerns that energy efficiency and reduced carbon emissions are not currently identified as important priorities within the wider urban transport policy framework. This is due to public transport being perceived as a generally low carbon option, with mode shift from private cars to public transport mode identified as a priority to reduce transport sector emissions.

This perception needs to be challenged however, due to the following factors:

- policies which aim to increase public transport use often result in additional energy use and related emissions (and costs) for the public transport sector (although this should result in lower energy use and emissions by passenger kilometre and for the transport sector as a whole);
- financially constrained transport authorities and operators will have difficulties funding additional energy costs (and carbon tax costs where this is implemented); and
- energy efficiency is fast improving for new cars and the roll out of electric cars in future years could result in public transport journeys becoming less energy and carbon efficient than private car ones.

This recommendation is about T2K partners and other public transport sector stakeholders raising awareness of these issues with transport authorities and regional and national government and arguing that energy efficiency and carbon reduction in the public transport sector is a sound investment to ensure that:

- public transport services remain able to compete with the private car in terms of environmental benefits; and
- public transport services remain affordable through reduced energy and carbon costs (especially where emissions are taxed) and risks.

This recommendation is supported by other recommendations included in this report such as improved business case processes and guidance and improved company emission reporting and information provided to public transport users.

### Which partners prioritised this recommendation?

moBiel, RET and STIB prioritised this recommendation due to their concerns that energy efficiency and carbon reduction are currently not identified as a strong priority within the public transport sector.

### Evidence of implementation and impacts

Based on WP3 work currently underway, T2K partners will be able to compare carbon performance between their public transport services and private car use in the coming years as the take up of hybrid and plug-in electric vehicles increases. Actual data for the services delivered by the partners (and their stakeholders) will be useful as public transport in dense urban areas is generally more energy efficient than in more rural areas<sup>111</sup> but conversion factors generally used to report emissions do not take this into account.

As an example, Table 22 compares transport modes, based on data for the UK, and shows that emissions from new electric vehicles compare with light rail and tram services in the UK and that emissions from petrol hybrid cars are already lower than those from local bus services. It is important to note however that this is linked to very low average occupancy on UK buses outside London and that the comparison is likely to be more favourable to buses in other countries. The comparison also changes with the carbon intensity of the electricity used to charge electric vehicles which varies between countries as shown in Section 2.2.

T2K partners would also need to raise awareness of the cost of the energy they use at present as well as forecast costs in the future. Although energy costs represent only a small proportion of T2K partners' overall budgets (as shown in Table 2), annual energy costs are significant<sup>112</sup> and likely to increase in the future (see improvement to business case processes and guidance recommendation), against a background of very tight public finances.

<sup>111</sup> Source: Overview of energy consumption, density and proportion of alternative transport modes in cities worldwide (2001 data), as quoted in The role of public transport to reduce Green House Gas emissions and improve energy efficiency, UITP, March 2006

<sup>112</sup> €5.3 million for moBiel in 2011 (elec and fuel), €188 million for RATP in 2010 (elec, fuel and HVAC), €17.7 for RET (elec and fuel), €33 million for STIB (elec and fuel) and £3 million for TfGM (elec only)

**Table 22. Comparison of carbon performance by mode in the UK**

Transport mode/vehicle type	Scope 1 emissions (tank to wheel)	Scope 1 and 3 emissions (well to wheel)
Local bus (excluding in London) <sup>113</sup>	185.9 gCO <sub>2</sub> e/passenger km	221.3 gCO <sub>2</sub> e/passenger km
Light rail and tram <sup>113</sup>	71.5 gCO <sub>2</sub> e/passenger km	80.9 gCO <sub>2</sub> e/passenger km
National rail (electric and diesel) <sup>113</sup>	59.5 gCO <sub>2</sub> e/passenger km	64.6 gCO <sub>2</sub> e/passenger km
Average car (UK fleet mix) <sup>113</sup>	204.6 gCO <sub>2</sub> e/passenger km	241.6 gCO <sub>2</sub> e/passenger km
Average petrol hybrid car <sup>113</sup>	139 gCO <sub>2</sub> e/vehicle km	163.6 gCO <sub>2</sub> e/vehicle km
Renault Fluence EV (current UK grid mix) <sup>114</sup>		72 gCO <sub>2</sub> /vehicle km

It is also likely that national and regional governments implement more energy and carbon related taxes in the future as recommended at EU level in the 2011 Transport White Paper<sup>115</sup>, which notes that the transport sector will need to reduce its dependence on oil and reduce CO<sub>2</sub> emissions through market measures, including the full application of “user pays” and “polluter pays” principles. This is also in line with EU level proposals to implement a carbon tax on fuels through changes to the Energy Taxation Directive (with a minimum tax level across all member states)<sup>116</sup>.

T2K partners should anticipate these cost increases and have the opportunity to at least partially offset them through improved energy efficiency as showed through work undertaken in T2K WP1 and 2. Results from T2K WP1 and 2 should also be disseminated and used to help T2K partners promote further investment in energy efficiency and carbon reduction within their organisations and with their delivery partners.

#### Who needs to be involved to deliver this recommendation?

This recommendation focuses on communications:

- within T2K partner organisation, between teams in charge of strategy, procurement, project implementation, maintenance, etc; and
- between T2K partners and other stakeholders involved in transport in their area, including transport authority, local/regional and national authorities (responsible for funding allocations), private sector operators (where applicable).

#### Deliverability and resources

Staff time to develop a narrative to discuss these issues with transport authority and local/regional authorities (linked to work already being undertaken in T2K WP3 and other recommendations included in this report).

#### What are the risks?

The main risk is that communicating on the need for public transport to reduce energy use and emissions to be able to compete with electric cars in the future could lead to negative media coverage and some decision makers thinking that investment in public transport is not justifiable when considering emission reduction targets. This could be mitigated as public transport services also fulfil other priorities (congestion reduction, accessibility, etc) but would be damaging for the public transport sector’s image.

#### What are the next steps?

T2K partners to develop a clear picture of their energy use and carbon emissions (T2K WP3) and improve on the reporting of their emissions and business case processes (see other recommendations). T2K partners could then engage transport authorities and local/regional authorities into a constructive dialogue around the need for the public transport sector to reduce energy costs and remain competitive (on environmental grounds) in the future.

<sup>113</sup> Source: 2011 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting, AEA

<sup>114</sup> Source: Plugged-in Fleets, A guide to deploying electric vehicles in fleets, Climate Group, February 2012. This is based on average current UK grid mix and does not consider future grid mix (including the impact of additional electricity demand through electric vehicles roll out)

<sup>115</sup> Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, European Commission, March 2011

<sup>116</sup> Source: europa.eu



## 9.6. Investigating EU funding sources (R5)

### What does this recommendation entail?

T2K partners should be able to draw on various funding options available at regional, national and EU levels to invest in energy efficiency and emission reduction. This recommendation focuses on EU level funding sources and support, as national and regional instruments vary between the five countries.

Access to investment capital was identified as one of the main challenges facing T2K partners when considering investing in energy use and carbon reduction. Funding mechanisms identified below should provide additional support although it is also important to recognise that partners will require staff time and budgets to apply for these potential funding sources.

### Which partners prioritised this recommendation?

RATP, STIB and TfGM expressed a specific interest in this recommendation. This is linked to these partners identifying the lack of access to capital as one of their main barriers to energy efficiency and carbon reduction investment.

### Evidence of implementation and impacts

- **Potential EU funding sources**<sup>117</sup>

The planned funding allocations in the 2007-2013 Cohesion Policy programmes for sustainable energy investments amounts to about €9.4 billion, of which approximately €4.8 billion for renewable energy sources and the remaining €4.6 billion for energy efficiency.

The **Joint European Support for Sustainable Investment in City Areas (JESSICA)** enables Member States to invest some of their structural funds in financial engineering instruments (revolving funds) supporting urban development. These financial instruments (so-called Urban Development Funds) invest in public-private partnerships and other projects included in integrated plans for sustainable urban development.

Under the current **EU Research & Development Framework Programme (FP7 2007-2013)**, about €2.3 billion is dedicated to energy related research. Most of this budget is used to support research, technological development and demonstration projects through the annual Calls for Proposals.

The **Intelligent Energy Europe (IEE)** programme focuses on removal of non technological barriers to energy efficiency and renewable energy market uptake. Under the 2007-2013 programming period, €730 million is available. The IEE helps creating favourable market conditions, shaping policy development and implementation, preparing the ground for investments, building capacity and skills, informing stakeholders and fostering commitment. This also includes projects on financing energy efficiency in public buildings.

Under the IEE, the **ELENA Technical Assistance Facility** was launched in 2009, aimed at providing co-financing (of up to 90% of eligible costs) to local and regional authorities for the development and launch of sustainable energy investments. The EU support must lead to investments with leverage of at least 1:20. So far, around €27 million has been assigned to projects which should trigger investments approaching €1.5 billion. About a third of these investments are addressing the buildings sector and energy performance contracting.

Complementing the ELENA Facility, grant support (up to 75% of eligible costs) for project development assistance is also provided through the 'Mobilising Local Energy Investments (MLEI)' Action of the IEE, mostly aimed at small scale sustainable energy investment projects (minimum €6 million).

In July 2011, the European Commission launched the €265 million **European Energy Efficiency Fund (EEEF)**, providing different types of loans, guarantees and/or equity to local, regional and (if justified) national public authorities. EEEF aims to finance energy efficiency (70%), renewable energy (20%) and clean urban transport (10%) projects through innovative instruments, in particular promoting the application of energy performance contracting. A technical assistance grant support (€20 million) is available for project development services (technical, financial) linked to the investments financed by the Fund.

#### European Local ENergy Assistance (ELENA)

ELENA (European Local ENergy Assistance) is a European Facility run by the European Investment Bank aiming to support authorities in accelerating their investment programmes in the fields of energy efficiency and renewable energy sources. It supports local and regional authorities in contributing to the "20-20-20" EU targets. ELENA support covers a share of the cost for technical assistance that is necessary to prepare and implement an investment programme, e.g. additional feasibility and market studies, business plans, energy audits - in short, everything necessary to make sustainable energy projects ready. ELENA does not focus on PPP specifically, but it recognises public-private partnerships (PPP) as a possible procurement method.



### Intelligent Energy Europe

Priorities for the 2012 call for proposals from Intelligent Energy Europe included energy in transport, with an indicative budget of €12.5 million, focusing on:

- energy efficient transport, supporting local authorities in developing Sustainable Urban Mobility Plans covering freight and passenger transport in urban and peri-urban areas, and giving particular emphasis to the reduction of transport energy use; and
- clean and energy efficient vehicles, promoting policies and projects fostering the take up of non-conventionally fuelled vehicles with low GHG emissions in urban areas.

An indicative budget of €27 million is also included for integrated initiatives, including:

- energy efficient Public Spending Initiative, providing support and capacity building to help public procurers at national and local level apply green public procurement criteria for the purchase of energy related products, including vehicles under the Clean Vehicles Directive;
- local energy leadership;
- mobilising local energy investments, including working with EPC and ESCOs; and
- energy efficiency and renewable energy in buildings.

Source: *Intelligent Energy Europe, Call for Proposals 2012*

[http://ec.europa.eu/energy/intelligent/index\\_en.htm](http://ec.europa.eu/energy/intelligent/index_en.htm)

Looking forward, in its proposals for the next Multiannual Financial Framework for 2014-2020, the Commission has proposed to concentrate ERDF funding in this area. 20% of the ERDF (approx. €17 billion) should be spent on energy efficiency and renewable energy in more developed and transition regions. A wider use of financial instruments is proposed as well, which would enable better leverage of private capital and renewed liquidity flows towards investments in renewables and energy efficiency measures.

Under the Horizon 2020 programme €6.5 billion are to be allocated to research and innovation in "Secure, clean and efficient energy" in 2014-2020.

- **Competitions and awards**

Competitions and awards are also organised in this field at European level which can offer a good incentive for project development and investment<sup>118</sup>.

### European Energy Efficiency Fund (EEEF)

EEEF is a public-private partnership open to investments from institutional investors and professional investors. The Fund aims to support energy saving and energy efficiency investments in EU countries including *"clean urban transport to support increased energy efficiency and integration of renewable energy sources, with an emphasis on public transport, electric and hydrogen vehicles and reduced greenhouse gas emissions"*. The overall objectives of the Fund are to:

- *"contribute to the mitigation of climate change",*

### **Who needs to be involved to deliver this recommendation?**

T2K partners, individually or collectively, will need to prepare expressions of interests and bids to obtain funding and assistance through the mechanisms listed here. This can be done using internal resources or drawing on specialist consultancy resources where required.

T2K partners would also need to discuss their ideas and proposals with EU institutions before and during the bidding and delivery process.

### **Deliverability and resources**

T2K partners have obviously succeeded in securing European funding previously, for the T2K project but also for the TramStore and other European projects.

Staff time and financial resources are required to prepare proposals and bids.

### **What are the risks?**

T2K partners could use staff time and financial resources to prepare unsuccessful proposals. Although this financial risk cannot be avoided completely, it is possible to reduce the risk by keeping other funding opportunities in mind when developing the evidence to support a proposal, for example through EPC and ESCOs (see recommendation on using ESCO and EPC models).

### **What are the next steps?**

T2K partners should consider opportunities to secure financial support from EU mechanisms for energy efficiency and carbon reduction investment, notably through Intelligent Energy Europe, the EEEF and the ELENA facility.

This could be done individually (with other potential partners) or collectively, as an action resulting from T2K cooperation. As per recommendations included in this report, one potential area for a proposal could be joint capacity building in energy efficiency and carbon reduction for the public transport sector.

## 9.7. Using ESCO and EPC models (R6)

### What does this recommendation entail?

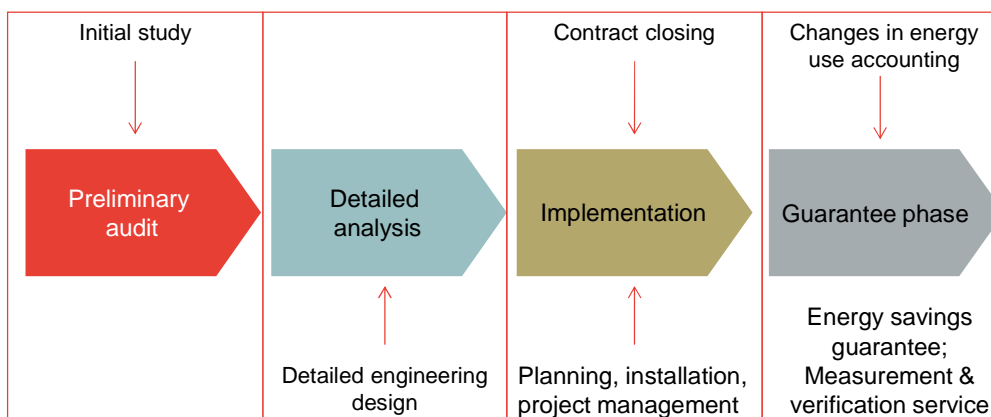
The European Commission Energy Services Directive<sup>119</sup> defines the various models as follows:

- energy service company (ESCO) - a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed performance criteria;
- energy performance contracting (EPC) - a contractual arrangement between the beneficiary and the provider (normally an ESCO) of an energy efficiency improvement measure, where investments in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement; and
- third-party financing (TPF) - a contractual arrangement involving a third party (in addition to the energy supplier and the beneficiary of the energy efficiency improvement measure) that provides the capital for that measure and charges the beneficiary a fee equivalent to a part of the energy savings achieved as a result of the energy efficiency improvement measure. That third party may or may not be an ESCO.

Figure 6 below provides an overview of the process usually followed to set up an EPC/ESCO arrangement. EPC and ESCO models can address barriers to investment in energy and related carbon emission reduction by providing specialist knowledge, finance and risk transfer solutions, installation, operation and maintenance under a long-term contract.

Adopting these models could make sense for T2K partners if the expected reduction in overall costs (reduced energy costs plus repayment under the EPC/ESCO arrangement) more than offsets the transaction costs of negotiating and managing the contractual relationship with the energy service provider. The main advantages for T2K partners are that no financial outlay is required from the public transport organisation and that the third party takes on the majority of investment risks.

**Figure 6. EPC/ESCO process overview**



### Which partners prioritised this recommendation?

RATP, RET, STIB and TfGM identified this recommendation as a priority to address issues related to access to investment capital and the need to mitigate investment risks.

EPC and ESCO models are less of interest for moBiEl due to the organisation's relationship with its energy provider and the fact that this type of approach "Energiespar Contracting" is already well established in Germany<sup>120</sup>.

<sup>119</sup> Energy End-use Efficiency and Energy Services 2006/32/EC (<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:114:0064:0064:en:pdf>)

<sup>120</sup> Source: Le contrat de performance énergétique, La pratique à l'international, Définitions, contrats et modèles, Deloitte, June 2001

## Evidence of implementation and impacts

An example of an ESCO model applied to a public transport organisation is in the United Kingdom<sup>121</sup>. Through the Clinton Climate Initiative, Transport for London (TfL) identified a 25% carbon reduction target. Two key challenges were the mix of buildings owned and used by TfL and the lack of capital funding to support the initial investment. In May 2009, 21 buildings were included in a £4 million ESCO contract. Investments carried out included lighting replacement and controls, upgraded building energy management controls, control of computers during night time and in stand-by, building fabric improvements, combined heat & power (CHP) plant and solar thermal hot water system.

The investment is expected to translate into a reduction of 25% in electricity consumption and 20% in gas use in those buildings, with corresponding energy cost savings estimated around £769,128 per annum and a CO<sub>2</sub> reduction of 3,648 tonnes per annum.

### RE: FIT – Working with ESCOs in London

RE: FIT is a ready-to-use, cost neutral procurement initiative that allows the public sector to retrofit existing buildings with energy conservation measures (supported by ELENA funding). Several leading agencies including Transport for London have taken part in the first phase.

The RE: FIT framework streamlines the procurement process for energy services by providing pre-negotiated framework contracts through which a group of prequalified ESCOs can undertake the design and implementation of energy conservation measures. RE: FIT allows the public sector to implement the retrofitting in typically 3 to 6 months (instead of up to 18 months through OJEU).

The reduction in energy bills is achieved by appointing an ESCO to implement energy efficiency measures in the buildings. The ESCO guarantees a set level of energy savings (risks transferred to the ESCO), offering financial savings over a set period. The Framework Agreement is available for 3 years commencing in January 2010 (with an option to extend to a fourth) and the resulting call offs from the framework can be for up to 10 years duration.

Source: *Manage Energy RE: FIT case study* ([www.managenergy.net/lib/documents/215/original\\_re-fit\\_original.pdf](http://www.managenergy.net/lib/documents/215/original_re-fit_original.pdf))

### Integrated Energy Management Services in public buildings in Italy

In order to combine cost savings and incentives for innovation in public procurement, Consip, the Italian central purchasing body, launched a framework contract on Integrated Energy Management Services (heating services including improvement of energy efficiency, consumption reduction and CO<sub>2</sub> emissions avoidance).

Pre-procurement market consultation was carried out using online questionnaires addressed to businesses and the main trade associations in Italy and the tendering process was an open procedure with 12 lots awarded to five different suppliers.

Through contracts under the framework, suppliers are required to ensure a minimum level of reduction for primary energy consumption of the whole building/ heating plant system. The suppliers are also required to provide evidence of the results obtained.

The framework was assessed to have achieved a 27% cost reduction for public administrations over approximately 5,000 buildings. Contracts executed under the framework had an estimated total value of € 800 million. It was assessed that if all Italian public authorities were to use this framework, the cumulative effect would be around € 100 million of savings per annum.

The contracts included a performance clause requiring a minimum amount of energy saved (375 TOE). Actual energy saved under the framework (6,000 TOE) was higher than the minimum required, resulting in the avoidance of 4,800 tonnes of CO<sub>2</sub> emissions.

Source: [http://ec.europa.eu/environment/gpp/pdf/news\\_alert/Issue11\\_Case\\_Study27\\_Consip\\_Energy.pdf](http://ec.europa.eu/environment/gpp/pdf/news_alert/Issue11_Case_Study27_Consip_Energy.pdf)

<sup>121</sup> Source: <http://www.eu-esc.org/index.php?id=14>

### Who needs to be involved to deliver this recommendation?

ESCO and EPC approaches are at an early stage of development in T2K partners' countries (apart from Germany). This means that it should be possible for T2K partners to develop these approaches but that additional help might be required from support agencies (for example FEDESCO in Belgium) as well as EU level support such as ELENA and EEEF (see recommendation on investigating EU funding sources above).

### Deliverability and resources

The deliverability of an EPC or ESCO model depends on overcoming several barriers including:

- lack of awareness and information, including costs, benefits, and risks – this could potentially be overcome by energy efficiency awareness campaigns, dissemination of case studies, procurement guidelines, product catalogues/specifications, demonstrations projects;
- lack of technical capacity for audits, project design, procurement, implementation and supervision of EPC projects as well as lack of trust in energy efficiency potential - public agencies which provide technical support for energy efficiency projects should be able to help and there are training programmes available for facility and energy managers to develop the right skills for T2K partners to support and manage an ESCO/EPC contract;
- restrictive procurement, contracting, and financing rules – although this is being addressed at EU level to enable the development of EPC and ESCO approaches in Europe; and
- small size and/or high transaction costs of energy efficiency projects – bulk procurement for EPC/ESCO approaches is possible as shown in case studies above and would result in larger projects and relatively lower transaction costs.

Another key issue for T2K partners is resistance to this type of arrangement within their organisations. ESCO and EPC approaches are a type of outsourcing contract and this might not be well received within the organisation. Energy services companies investing in this type of contracts will generally require access to installations and premises to carry out maintenance work themselves as this will impact on the performance of their initial investment and their financial reward. This can also be an issue for organisations which usually carry out the majority of maintenance work in house.

Resources required to set up and deliver EPC/ESCO approaches include: staff time and human resources to acquire skills to procure and negotiate with energy services companies as well as manage and monitor the contract.

#### Joint energy performance contracting in Styria, Austria

In 2001, a group of local authorities in Styria, Austria, identified a total of 21 buildings with the potential for energy consumption reduction, to be the subject of a joint energy performance contract.

The buildings were split into two pools for the tender. The energy savings contracted from the selected service provider range from 15-44% with a contract period of 12 years.

Carrying out the activity jointly addressed the problem that EPC for smaller buildings with low energy costs is less attractive for energy service companies and involves high effort by the community itself.

*Source: Buying Green! A handbook on sustainable procurement, European Commission, September 2011*

### What are the risks?

Key risks identified for this approach include:

- loss of control on equipment and plant as the energy services company invests, install and maintains new equipment to reduce energy use, potentially resulting in public transport services reliability risks if new equipment is not adequately selected for the needs of a public transport network;
- resistance from within the organisation due to the refusal to outsource this type of work and share maintenance duties and access to sites with external contractors;
- possible lack of in-house expertise to procure energy services under this type of contract and manage the relationship over the long term contract; and

- possible lack of expertise and experience in the public transport sector from energy services companies as they have generally focused on buildings so far.

### **What are the next steps?**

A logical next step to further develop this option is to examine the extent to which an EPC/ESCO approach would be applicable to T2K partners: which parts of their operations and energy use could be subject to an EPC/ESCO approach? This could potentially be done through an open dialogue or market testing exercise with energy services companies, national energy efficiency organisations and EU level experts (through ELENA and EEEF for example).

If the option is viable, the next stage would be to develop a procurement approach (possibly jointly between T2K partners or with other public transport operators and organisations).



## 9.8. Providing carbon neutral journeys by using carbon markets (R7)

### What does this recommendation entail?

Where GHG emissions cannot be avoided or reduced, T2K partners could consider purchasing carbon credits (CERs, ERUs and VERs) to offset (compensate) these emissions (see Section 0). The credits correspond to emission reductions achieved elsewhere. The use of offsets is based on market principles, with organisations making decisions on whether to reduce emissions internally or through the purchase of carbon credits based on the most cost effective solution. This mechanism could potentially be used by T2K partners to:

- become carbon neutral organisations by offsetting their remaining GHG emissions (after they have made efforts to reduce emissions internally);
- offset emissions from their electricity consumption, instead of partners procuring green electricity (see Section 2.4); or
- offer carbon neutral journeys or green tickets to their customers which could be sold at a premium and include offsetting credits corresponding to average emissions resulting from the use of the ticket.

When considering the potential for T2K partners to make use of carbon markets, another option to consider is the possibility for T2K partners to lobby to see market approaches develop further which would enable partners to generate additional revenues from their investment in energy efficiency and carbon reduction. This could include:

- domestic offsets covering the transport sector (and the public transport sector) in Europe, as per Article 24a of the EU ETS Directive (see Section 0); or
- the development of a market for energy efficiency credits as is currently in place in France (see case study in Section 2.3.2).

### Which partners prioritised this recommendation?

RATP and STIB expressed an interest in investigating the use of carbon markets and offsets further although partners recognised that this option would require further work if it is to be taken forward, including consultation within the organisations and with stakeholders as well as market research.

### Evidence of implementation and impacts

Offsets are especially of interest for business users and freights as organisations can then claim reduced emissions from business travel and deliveries (subject to guidelines on emission reporting). Individual users could however also be interested, especially for those who are aiming to adopt a low carbon lifestyle. Offsets might also become more widely used if the transport sector was to join the EU ETS or be subject to more stringent carbon reduction targets.

#### Carbon free business travel with Deutsche Bahn

Since 2009, Deutsche Bahn (Germany's national rail operator) offers carbon free business travel through its bahn.corporate Environment Plus programme. In 2010, the programme was used by various organisations including Germany's Federal Government and its Departments and the State of Rhineland-Palatinate. An equivalent Eco-Plus programme is also available to freight customers.

The Deutsche Bahn Group uses an internal compensation mechanism by feeding electricity generated from renewable sources on the network (through DB Energie, Deutsche Bahn's energy supply company) for the amount needed for the carbon free business trip. Carbon free business travel costs an additional €1 for a return Munich to Mannheim trip.

Deutsche Bahn use 10 % of the profits from the Environment Plus and Eco Plus offerings to support the construction of new plants for generating renewable energy. In 2010, an agreement was concluded with Enertrag AG to support the construction of a hybrid power plant in Prenzlau (Germany).

Source: *Deutsche Bahn 2011 Interim Group Management Report and website*  
([www.dbecoprogram.com/index.php?lang=en](http://www.dbecoprogram.com/index.php?lang=en))

#### Eurostar's carbon neutral offer – an offset programme under review

Eurostar's policy with regard to carbon emissions include:

- efforts to reduce energy use and emissions, with a target to reduce CO2 emissions per passenger journey by 35% by 2012 (on 2007 levels); and
- remaining emissions are offset by purchasing carbon credits.

### Using offsets – public sector examples

In the UK, the Government is committed to offsetting all emissions arising from official and Ministerial air travel through the Government's Carbon Offsetting Facility (GCOF). The GCOF was developed with air travel offsetting as a main objective but is also available to other government departments and public sector bodies as a supplier framework agreement, with ten suppliers included in the framework. The latest e-auction took place in November 2011, when over 32,000 credits (CERs) were bought by UK Government Departments and public sector bodies at a price of £7.03 per CER.

*Source: UK Department for Energy and Climate Change (DECC)*

### Using offsets – engaging with stakeholders

Swiss Post offers a "pro clima" carbon-neutral mailing option which enables postal customers to offset transport emissions for their letters and parcels by paying a small surcharge. Swiss Post then invests these contributions in selected climate protection projects. In January 2012, customers were invited to choose a project for the funds collected in 2011 to be invested. A wind project in Turkey was selected following an internet vote.

*Source: Swiss Post website*

### Who needs to be involved to deliver this recommendation?

T2K partners can decide to purchase carbon credits to offset their remaining emissions (following internal emission reduction). They would probably need to procure the services of an offsetting company to procure the credits and should use independent verification to ensure that their actions in this area are transparent.

As noted in Section 0, carbon credits purchased as offsets are not always accepted as direct reductions in emissions for company reporting purposes. For example, in the UK carbon credits can be shown as "purchased offsets" in the organisation's report but do not result in reduced CRC payments. A similar regime is in place in France<sup>122</sup>.

<sup>122</sup> Sources: Méthode pour la réalisation des bilans d'émissions de gaz à effet de serre conformément à l'article 75 de la loi n°2010-788 du 12 juillet 2010 portant engagement national pour l'environnement (ENE), Ministère de l'Écologie, du Développement Durable, des Transports et du Logement, September 2011 and UK Environment Agency (CRC) and DEFRA Guidance on how to measure and report your greenhouse gas emissions, 2009

## Deliverability and resources

Staff time will be required to procure a suitable partner to provide high quality credits. The purchase of a suitable amount of credits is linked to the organisation's emission monitoring and reporting work (see recommendation on company emission reporting and information provided to public transport users above).

## What are the risks?

Carbon credits purchased as offsets are not always accepted as direct reductions in emissions for company reporting purposes. This leads to questions on the validity of this investment.

The use of public funds to purchase carbon credits can be seen as unsuitable by some stakeholders. The projects supported by the purchased credits can be seen as too remote and their additionality can be questioned (even for certified credits). For example, a recent report for the European Commission<sup>123</sup> identified significant issues with the current CDM mechanism. Table 23 below presents the pros and cons of the main types of offset projects<sup>124</sup>. These questions mean that a strong focus on offsets could potentially bring reputational risks. The complexity of the market also means that it is sometimes difficult to explain the offsetting approach to customers and stakeholders as experienced by Eurostar.

**Table 23. Pros and cons of main offset projects**

Type of offset project	Pros	Cons
Renewable energy	Easier to prove additionality; technology transfer benefits (to developing country); long-term benefits	Complex projects; delivery of credits could be affected by delays in making project operational, difficulties in establishing baseline, or changing baseline conditions
Energy efficiency	Technology transfer benefits (to developing country); long-term benefits	Complex projects; delivery of credits could, for example, be affected by difficulty in establishing baselines or concerns over additionality
Fuel switching	Simple projects, proven technologies	Concerns over additionality
Gas recovery or destruction		
Carbon capture and storage	Technology transfer benefits (to developing country); long-term benefits	Methodological accounting issues yet to be resolved, concerns over long-term environmental impact; early stage technology
Biological sinks — Land Use, Land Use Change and Forestry (LULUCF)	Additional socio-economic and environmental benefits; reverses contribution of approximately 20% of anthropogenic greenhouse gas emissions caused by land use change and forestry; viable way for least developed countries to participate in climate change mitigation and bring sustainable development benefits to those countries	Permanence issues (not able to guarantee CO <sub>2</sub> capture over time); accounting and methodological issues; negative secondary effects (leakages for example through displacement of agricultural practices to other areas); seen by some as distraction from real problem (world's fossil fuel-based energy systems); credits granted on predicted CO <sub>2</sub> absorption level rather than actual absorption levels
Credits from portfolio	Cheaper credits; minimises risk of underperforming (non-delivery, impermanency)	Credit cannot be associated to individual project; credit credibility could be affected by any individual project in portfolio (higher probability of reputational risks); non-customisable

<sup>123</sup> Study on the Integrity of the Clean Development Mechanism (CDM), Final report, AEA for the European Commission, December 2011

<sup>124</sup> Source: The Carbon Trust three stage approach to developing a robust offsetting strategy, Carbon Trust, 2006

Type of offset project	Pros	Cons
Credits from individual projects	Credits can be associated with a particular project (can provide positive PR and improved CSR position); customisable	Expect higher credit prices; higher exposure to underperformance and credibility risks

## What are the next steps?

T2K partners will finalise their carbon footprinting work through WP3 ensuring that their emissions are assessed and reported. The partners will then develop action plans to reduce their emissions through internal actions (T2K WP3). T2K partners could then decide to combine direct and indirect emission reductions with offsetting for their remaining emissions.

If the decision to use offsets is taken, T2K partners could procure carbon credits either individually or collectively. This would require partners to appoint suitable credit providers and verification companies (recommended).

If T2K partners decide to develop carbon neutral products such as “green” or “zero carbon” tickets as currently offered by Deutsche Bahn, they might want to undertake stakeholder consultation and market research to develop a suitable product for their customers.

T2K partners could also lobby their regional or national government and EU level institutions for the creation of further market based incentives for energy efficiency and carbon reduction such as the creation of a domestic offset scheme for Europe (see Section 0) or energy efficiency tradable certificates as currently in place in France (see page 25).

### BSI PAS 2060 – Specification for the demonstration of carbon neutrality

The British Standards Institution (BSI) has developed a standard for entities seeking to demonstrate carbon neutrality for their activities or products. The recommended process includes the following steps:

- define the product or service which will be offered as carbon neutral;
- use a recognised methodology to quantify its carbon footprint;
- develop a carbon footprint reduction action plan and commit to carbon neutrality;
- take action to reduce the footprint and monitor the effectiveness of those actions;
- re-assess the product or service’s remaining carbon footprint;
- introduce offsets for the remaining carbon footprint; and
- declare the achievement of carbon neutrality.

*Source: BSI PAS 2060 Specification for the demonstration of carbon neutrality*

## 9.9. Including GHG performance in procurement process and contracts (R8)

### What does this recommendation entail?

This recommendation investigates the potential for T2K partners to select suppliers and products on the basis of their energy use and carbon performance or at least to give performance in these areas a stronger influence on purchasing decisions. This builds on the Clean Vehicles Directive<sup>125</sup> which requires that energy and environmental impacts linked to the operation of the vehicles over their lifetime are taken into account in purchasing decisions. It also takes account of EU and national level sustainable procurement guidelines such as the Buying Green Handbook<sup>126</sup>.

This could be supported by T2K partners lobbying national and EU level governments for stricter standards on energy efficiency and carbon content for traded goods and services.

Further implementation of energy use and carbon performance criteria within procurement would support T2K partners in their effort to reduce Scope 3 GHG emissions (from their supply chain). It would also further support the development of low carbon products and services and reduce the financial risks for organisations developing new low carbon offers.

### Which partners prioritised this recommendation?

RATP, RET and TIGM prioritised this recommendation. moBiel prioritised the related recommendation on joint procurement of low carbon rolling stock (see recommendation R9). STIB expressed some interest in best practice case study but identified sustainable procurement as an area where significant progress had already been made within the organisation through the implementation of regional government guidelines for public sector procurement and the development of sustainability criteria within STIB's procurement guidelines<sup>127</sup> (see Chapter 6).

### Evidence of implementation and impacts

The Buying Green Handbook notes that *“three million tonnes of CO<sub>2</sub> would be saved in the Netherlands alone if all Dutch public authorities applied the national Sustainable Public Procurement criteria, which include green criteria. Public sector energy consumption would be reduced by 10%.”*<sup>128</sup>

Whole life cost analysis was undertaken for the purchase of green buses in various EU countries<sup>129</sup>. This analysis takes account of initial investment costs, motor vehicle tax, fuel costs, maintenance and insurance costs and end of life disposal, and shows the following results:

- whole life costs for bio-ethanol buses in Sweden were 3.1% higher than for traditional vehicles;
- whole life costs for CNG buses in Germany were 4% lower than for traditional vehicles; and
- whole life costs for EEV buses with SCR technology in Spain and the Czech Republic were 0.2% higher than for traditional vehicles in Spain and 0.4% higher in the Czech Republic.

#### Encouraging the adoption of Green Public Procurement – “bonus – penalty” system in France

In France, a publicly funded, budget neutral financial “bonus-penalty” system was introduced in 2010 to reward the best performing Ministries and penalise the poorer performing ones with regard to the implementation of Green Public Procurement in Government. This is based on eight indicators covering the following areas: the delivery of an implementation plan, a social assessment, energy audits, a tool to calculate fluid (water and energy) flows, share of vehicles emitting less than 130g CO<sub>2</sub>/km, paper, copy machines and printers, energy use in buildings.

*Source: Assessment and Comparison of National Green and Sustainable Public Procurement Criteria and Underlying Schemes, Final Report to the European Commission, AEA, November 2010*

<sup>125</sup> Directive for the Promotion of Clean and Energy Efficient Road Transport Vehicles (2009/33/EC)

<sup>126</sup> Buying Green! A handbook on sustainable procurement, European Commission, September 2011

<sup>127</sup> Processus Challengé des Achats et Politique Corporate des Achats à la STIB, STIB, April 2011

<sup>128</sup> De impact van het programma duurzaam inkopen anno 2011, Dutch Ministry of Infrastructure and Environment, 2011, as quoted in Buying Green! A handbook on sustainable procurement, European Commission, September 2011

<sup>129</sup> Costs and Benefits of Green Public Procurement in Europe, Part 1: Comparison of the Life Cycle Costs of Green and Non Green Products, Final Report, Öko-Institut e.V, July 2007



### Who needs to be involved to deliver this recommendation?

T2K partners procurement teams to develop specifications and criteria, alongside project and programme managers. Suppliers should also be involved in the development of suitable criteria and data requirements to ensure that this does not add significant costs to their products and services.

### Deliverability and resources

STIB has already implemented sustainability criteria within its procurement guidelines and most T2K partners have already implemented or are implementing the Clean Vehicles Directive.

Staff time will be required, including legal staff time to ensure that new criteria are compliant with public procurement principles. European and national guidelines are available to support procurement teams when developing criteria and requirements. The European Commission has established a Helpdesk to disseminate information about Green Public Procurement (GPP) and to provide answers to stakeholders' enquiries<sup>130</sup>.

### What are the risks?

If sustainability and GHG criteria require significant additional work and investment from suppliers, this is likely to result in additional costs (at least initial investment costs).

Low carbon products and services might be more costly to procure initially, although for long lived assets such as rolling stock, whole life costs should be reduced. The Procura Manual however notes that *"in many cases the greener alternative is available at the same purchase price as standard products, or at a marginally higher price. Energy efficient IT products for example are generally no more expensive to buy than the less efficient alternatives, even ignoring the reduced costs during use."*<sup>131</sup>

New criteria and data requirements for procurement will need to comply with public procurement principles.

### What are the next steps?

T2K partners can work with their legal and procurement teams to further roll out the use of GHG criteria.

The partners could also consider setting up strategic partnerships with low carbon vehicle manufacturers or other providers (for example for track side and station equipment), sharing some of the up-front cost of low energy use/carbon products development but gaining the ability to specify performance levels to be reached.

#### Sustainable bus shelters in Barcelona

Barcelona purchased 500 new bus shelters and adapted 1,200 old existing bus shelters following the incorporation of environmental and social criteria in the city's public procurement process. For the procurement of the bus shelters, the selection process used a quality management system with a scoring matrix. The total amount of the selection criteria was 120 points of which a total of 15 points were allocated for the use of recycled and recyclable materials, non polluting manufacturing processes and maintenance products.

*Source: Costs and Benefits of Green Public Procurement in Europe, Case Study Sustainable Procurement of Bus Shelters in Barcelona, Spain, June 2007*

<sup>130</sup> See <http://ec.europa.eu/environment/gpp/helpdesk.htm>

<sup>131</sup> The Procura<sup>+</sup> Manual A Guide to Cost-Effective Sustainable Public Procurement, 2<sup>nd</sup> Edition, Procura and ICLEI, 2007 (see [www.procuraplus.org](http://www.procuraplus.org))



### Procura Manual – examples of procurement criteria

For direct bus purchases, specifications could include:

- vehicle engines must be certified as meeting the EEV standard for emissions;
- all vehicles are to be fitted with driving style meters to monitor fuel usage; and
- vehicle noise emissions must not be higher than XX dB.

For tendered public services, specifications could include:

- all buses used in carrying out the service must have engines meeting EURO XX standards; and
- all buses used in carrying out the services must be fitted with driving style meters to monitor fuel usage.

Example award criteria: “the contract will be awarded to the tender applicant with the highest score of points allocated according to the following scheme: Engine EURO standard 10 points, other criteria 90 points (out of 100)”.

Examples of contract provisions:

- “the number of kilometres driven by EEV buses must be reported annually. This number must increase by 10% per annum”.
- “all bus drivers involved in carrying out the service must be trained on environmentally conscious driving on a regular basis to increase fuel efficiency”.

An alternative approach is also proposed: for tendered services, maximum values for emissions for the fleet as a whole could also be set, getting progressively stricter through the contract period. This allows flexibility for the operator to decide how best to meet this limit.

Source: *The Procura<sup>+</sup> Manual A Guide to Cost-Effective Sustainable Public Procurement*, 2<sup>nd</sup> Edition, Procura and ICLEI, 2007 (see [www.procuraplus.org](http://www.procuraplus.org))

### Procura Manual – procuring green electricity

When procuring green electricity, the Procura Manual recommends considering:

- giving preference to non-hydro renewable energy sources, given the local environmental concerns relating to hydro schemes and the quantity of existing large hydro plants (as buying electricity from these plants would not result in additional renewable generation); and
- additionality, requiring that a proportion of the energy procured comes from new plants to further encourage the development of additional renewable energy capacity.

Example specifications:

- “at least 50% of the supplied electricity must come from renewable energy sources. Guarantees of Origin must be provided by a credible independent third party that certifies the origin of the electricity and that it has not already been sold elsewhere. Such Guarantees of Origin should be issued by competent bodies designated by the Member States”.
- “30% of the electricity from renewable sources must be from “new” renewable plants. Plants will be so-defined if they came into operation less than seven years before the publication of the tender. Alternatively, this condition is met if the tenderer commits to bringing into operation a new renewable energy plant within two years from the start of the contract period, leading to an overall capacity of 30% of the supplied electricity”.

Example award criteria:

- 10 points out of 100 awarded for electricity from renewable sources offered above the minimum requirement;
- 5 points out of 100 awarded for electricity generated by “new” renewable plant above the minimum requirement;
- 5 points out of 100 awarded for the proportion of the Renewable energy supply coming from non-hydro sources; and
- other criteria – 80 points.

Source: *The Procura<sup>+</sup> Manual A Guide to Cost-Effective Sustainable Public Procurement*, 2<sup>nd</sup> Edition, Procura and ICLEI, 2007 (see [www.procuraplus.org](http://www.procuraplus.org))

## 9.10. Joint procurement of low carbon vehicles (R9)

### What does this recommendation entail?

By implementing this recommendation, T2K partners would aim to develop joint procurement strategies and programmes for the purchase of low carbon rolling stock (buses, trams and metro). This could be done by the five T2K partners in the context of the T2K project or partners could join existing or new joint procurement initiatives (some of which are identified below).

Joint procurement of low carbon rolling stock should:

- support the development of a critical mass of public transport authorities and operators willing to invest in low carbon rolling stock (supporting investment in this emerging market);
- help with capacity and knowledge issues, especially for smaller organisations, by pooling knowledge and expertise across organisations; and
- deliver cost savings through economies of scale (where similar rolling stock can be used in different locations).

### Which partners prioritised this recommendation?

moBiel selected the joint procurement of low carbon vehicles as an option of relevance for the organisation. Although other T2K partners did not select this option as a key priority for their organisation, they still expressed some interest in joint procurement where feasible, if it results in financial benefits.

### Evidence of implementation and impacts

The PROCURA manual<sup>131</sup> notes that “*joint procurement can be suited to bus purchases – as a high technology sector with single standardised units of a generally high value*”.

The European project COMPRO<sup>132</sup> focused on the common procurement of clean public transport vehicles (compressed natural gas and hybrid). Four partners (Nantes, France; Bremen, Germany; Emilia Romagna Region, Italy and Goteborg, Sweden) worked together to consider:

- the demand side (convergence on standards and specification);
- the legal perspective (contractual issues); and
- the supply side (manufacturers’ views on joint procurement).

Headline conclusions from the project included<sup>133</sup>:

- it is easier to agree common specifications for an off-the-shelf technology than for newer emerging technologies, it is also easier for operators in the same country and with similar governance and funding arrangements to agree on similar specifications;
- transnational joint procurement is possible but can sometimes be difficult and more costly, especially as it is not an established practice for this sector; and
- European local and regional authorities or other public bodies can access the ELENA funds (see EU funding recommendation) to cover the technical assistance costs for the preparation of the joint tendering procedures and contractual arrangements for jointly purchasing high energy efficiency buses.

#### Financial benefits of joint low carbon vehicle procurement

The cities of Brest and Dijon in France used joint procurement to purchase tram vehicles. Savings for both cities were assessed to be in the order of 24% compared to individual procurement processes. This allowed the City of Brest to acquire six additional trams.

In Italy, Emilia Romagna and Veneto jointly procured 56 rail vehicles at a cost of €335 million. The joint procurement process was assessed to have secured a substantial reduction in price.

*Source: Common procurement of clean vehicles, Final recommendations of the European project COMPRO, December 2009*

<sup>132</sup> See [www.compro-eu.org](http://www.compro-eu.org), funded through Intelligent Energy Europe

<sup>133</sup> Common procurement of clean vehicles, Final recommendations of the European project COMPRO, December 2009

## Who needs to be involved to deliver this recommendation?

T2K partners and other European transport operators and authorities, possibly through existing projects and programmes. Some EU funding support might be required to support part of the investment as this would reduce technology risks for the purchasing operators/authorities (see below).

## Deliverability and resources

Experience from the COMPRO project identified the importance of a common language to agree specifications and procurement frameworks. It also highlighted the need for staff time to discuss and agree specifications, iron out any legal issues and identify opportunities for financial support through national or EU mechanisms.

Smaller transport operators/authorities are probably the most likely to benefit from a joint procurement exercise as they will be able to draw on a large operator/authority's staff resources and expertise. Potential cost savings might be the main driver for larger operators/authorities.

Two main models are identified<sup>134</sup>:

- full joint procurement, where a lead authority is designated to coordinate the action and partners share the tasks according to their experience, resources and knowledge; and
- piggy backing procurement, where an authority publishes a tender including a statement that other named public authorities may also wish to make use of the resulting contract.

### Green Bus Fund – supporting the switch to low carbon buses

The Green Bus Fund is a fund set up by the UK Government to support bus operators and local authorities in England to buy new low carbon buses. Its main purpose is to support and hasten the introduction of low carbon buses across England.

For the purpose of the fund, a low carbon bus is defined as a bus that is capable of achieving at least a 30% reduction in greenhouse gas emissions compared to a similar size standard diesel Euro III bus. Low carbon buses also need to meet Euro V or better emissions standards.

The fund has been allocated in three rounds:

- £30 million in 2009 to be used between 2009 and 2011;
- a second round was run in 2010, with a budget of £15 million; and
- a third round for 2011/12 is currently running with a budget of £20 million.

The first two rounds helped deliver some 540 new low carbon emission buses in England. TfGM have received £5.23 million to purchase 63 low carbon buses in the first two funding rounds, with private operators in the TfGM area receiving over £6 million in total to support the purchase of almost 70 low carbon buses.

Sources: DfT Green Bus Fund and TfGM

## What are the risks?

When considering the joint procurement exercise itself, experience from the COMPRO project highlighted potential risks with regard to language barriers and contractual/legal issues. Partners identified the risk for cost savings through economies of scale to be offset by additional procurement process costs and the need to compromise on rolling stock specifications for an agreement to be reached across partners.

Low carbon rolling stock uses relatively new technology and there are associated risks with purchasing new technology, namely:

- the risk to be locked in a technology which becomes rapidly obsolete with rising maintenance and operational costs;
- technology failure and increased maintenance (or replacement) costs; and
- good results identified in one location might not be easy to replicate as the technology has not been tested in all circumstances (and technology promoters might have chosen locations with the highest likelihood of success for their first trials).

<sup>134</sup> Source: LEAP toolkit (see [www.leap-gpp-toolkit.org](http://www.leap-gpp-toolkit.org))

EU and national government financial support can help with the adoption of new low carbon technologies by operators and transport authorities by, at least partially, mitigating these risks<sup>135</sup>.

### What are the next steps?

T2K partners could discuss future rolling stock procurement programmes and identify potential opportunities for joint procurement (also with other potential partners in their own country or within Europe). Interested partners could also investigate potential national and EU financial support (see EU funding recommendation).

T2K partners could lobby for stricter standards on energy efficiency and carbon content for products and services they procure at national and European level.

#### Joint procurement initiatives in other sectors

In 2003, the community of Assen received the Dutch Sustainable Procurement Prize for its leading role in the **joint procurement of green electricity** by eleven municipalities and the province of Drenthe. Agreements were defined in a framework agreement with the energy supplier, complete with annual energy conservation targets and ambitions for various renewable energy projects. Through the framework, all municipalities in the province and the province itself purchased 100% green electricity, representing 45 million kWh per year. By purchasing jointly, the authorities saved €300,000 per year in energy costs and reduced administrative costs by reducing the number of invoices processed.

Local authorities in Sweden have also teamed up to jointly procure **biodiesel** for municipal fleets.

Source: LEAP toolkit (see [www.leap-gpp-toolkit.org](http://www.leap-gpp-toolkit.org))

<sup>135</sup> As identified in The great transformation: decarbonising Europe's energy and transport systems, Georg Zachmann, Michael Holtermann, Jörg Radeke, Mimi Tam, Mark Huberty, Dmytro Naumenko And Anta Ndoye Faye, Bruegel Blueprint Series, 2012

## 9.11. Land use planning and building regulations (R10)

### What does this recommendation entail?

T2K partners would lobby EU, national and regional government for:

- land use planning rules which result in increased use of public transport and low carbon modes of transport rather than in developments reliant on the private car;
- building regulations requiring high energy efficiency performance for new and refurbished buildings and production of renewable energy; and
- consistent enforcement of these rules and regulations resulting in reduced energy use and carbon emissions.

These rules and standards would apply to areas across all sectors and not be limited to T2K partners' activities but they would support T2K partners' objectives to invest in energy efficiency, carbon emission reduction and renewable energy production by introducing additional incentives.

### Which partners prioritised this recommendation?

TfGM prioritised this recommendation due to concerns expressed with regard to existing land use planning and building regulations which can be different, or applied differently, between the 10 Greater Manchester local authorities. TfGM notes that this situation adds to the uncertainty of business case work and can result in different investment priorities across the area.

### Evidence of implementation and impacts

- **Land use planning**

Although it is generally recognised that land use planning and the resulting location of developments (housing, employment sites, leisure, shopping, etc) have an impact on transport demand and mode choice, research shows<sup>136</sup> that it is difficult to develop land use planning policies which result in lower transport impacts due to the complexity of systems involved.

Research undertaken in the UK<sup>137</sup> points to *"the slow pace of new development (new housing adds about 1% per year to the existing stock) and the faster pace of 'churn' of choices (on average about 10% of houses change hands during any one year, plus the effects of immigration and emigration)"*. This suggests that *"in the short run changes in patterns of travel within the existing physical pattern of land-uses can be of the order of ten times greater than changes due to new development"*.

This suggests that although T2K partners should support local, regional and national authorities in the development and implementation of more sustainable planning policies, this is likely to have only a limited impact on energy use and carbon emissions. T2K partners could however support planning authorities choose sustainable locations for new developments by helping with the appraisal of future travel demand, mode choice and energy and carbon impacts.

#### Identifying optimal locations for minimal CO<sub>2</sub> emissions in the Oulu region, Finland

In 2008, with 13 significant retail proposals in the Oulu region, this project assessed CO<sub>2</sub> emissions associated with the proposals to identify the best location for these planned units.

Origin-destination (OD) analysis showed that locating large retail units close to a city centre would be an optimal solution to reduce CO<sub>2</sub> emissions from traffic. This information was then used by city planners when deciding on planning permissions.

Source: ELTIS case studies ([http://www.eltis.org/index.php?id=13&lang1=en&study\\_id=3172](http://www.eltis.org/index.php?id=13&lang1=en&study_id=3172))

<sup>136</sup> For example, see PROPOLIS project results as quoted in Sustainable Urban Transport Plans (SUTP) and urban environment: Policies, effects, and simulations, Review of European references regarding noise, air quality and CO<sub>2</sub> emissions, Final Report, Rupprecht Consult, 2005 (<http://ec.europa.eu/environment/urban/pdf/sutp.pdf>)

<sup>137</sup> As quoted in Land Use Aspects of Transport's Contribution to Climate Change, Committee on Climate Change Expert Workshop, 2009

- **Building regulations and energy efficiency targets**

Building regulations on energy performance have recently been strengthened at the European level. Requirements now coming into force include<sup>138</sup>:

- minimum energy performance requirements (set by EU Member States) will be applied for all new build and major renovation projects (more than 25% of the building's surface or more than 25% of the building's value) from 2013;
- from 2019, all new buildings occupied or owned by public authorities must be "nearly zero energy buildings" (meeting "very high energy performance" standards); and
- from 2021, all new buildings, including existing buildings undergoing major renovation, will have to meet "very high energy performance" standards.

The current definition of "nearly zero energy" buildings and "very high energy performance" is however left vague in the Directive, allowing Member States to determine their own standards, resulting in wide variations on energy performance requirements<sup>139</sup>.

A new set of measures was also proposed by the European Commission in 2011 to ensure that the EU is on track to meet its energy efficiency target (20% reduction in energy use by 2020). The proposed new Directive would include<sup>140</sup>:

- a legal obligation to establish energy saving schemes in all Member States, with energy providers obliged to save 1,5 % of their energy sales, by volume every year, through the implementation of energy efficiency measures at customers' premises<sup>141</sup>;
- public sector to lead by example, with a legal obligation to purchase energy efficient buildings, products and services and having to carry out renovation works covering at least 3% of their total floor area every year;
- provisions to strengthen the energy services markets, with an increased participation of energy service companies (ESCOs) and the ability for Member States to use their allocations under the European Regional Development Fund (ERDF) to finance the renovation of public buildings; as well as
- better information for consumers (access to data on real-time and historical energy consumption, individual metering, billing based on actual consumption).

Following the implementation of this new Directive, the Commission would propose binding national targets if by 2014, it became clear that the EU was still unlikely to achieve the 20% target.

#### **On-site renewable energy generation in the UK**

In the UK, national planning guidance allows local planning authorities to require a percentage of the energy to be used in new developments to come from on-site renewable energy. Such policies should:

- ensure that the requirement to generate on-site renewable energy is only applied to developments where the installation of renewable energy generation equipment is viable given the type of development proposed, its location, and design; and
- not be framed in such a way as to place an undue burden on developers, for example, by specifying that all energy to be used in a development should come from on-site renewable generation.

In 2003, the London Borough of Merton was the first local authority to adopt an area wide prescriptive planning policy requiring new developments to generate at least 10% of their energy needs through on-site renewable energy. Around half of the UK's local authorities implemented the "Merton Rule". It is however applied to a different degree with some authorities requiring 20% or more.

Sources: *Planning Policy Statement 22: Renewable Energy*, office of the Deputy Prime Minister, 2004, London Borough of Merton website and [www.themertonrule.org](http://www.themertonrule.org)

<sup>138</sup> Directive 2010/31/EU on the energy performance of buildings (recast)

<sup>139</sup> Source: RICS

([www.rics.org/site/scripts/documents\\_info.aspx?categoryID=543&documentID=798&pageNumber=4](http://www.rics.org/site/scripts/documents_info.aspx?categoryID=543&documentID=798&pageNumber=4))

<sup>140</sup> Source:

<http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/11/440&format=HTML&aged=0&language=en&guiLanguage=en>

<sup>141</sup> Similar schemes are already in place in Denmark, France, Italy, the UK, and the region of Flanders



### Who needs to be involved to deliver this recommendation?

T2K partners would need to lobby their local, regional or national authorities as well as EU level institutions for more stringent and strictly enforced rules.

### Deliverability and resources

Staff time would be required for lobbying activities, including collating information on issues related to the current system. Staff time and modelling capability would be required if T2K partners are to support planning authorities in appraising the impact of their planning decisions on transport demand and resulting emissions.

### What are the risks?

More stringent rules and regulations and stricter enforcement could result in higher costs (at least initial investment costs) for T2K partners when they are planning to build a new building or facility or refurbish existing amenities.

Stricter land use planning rules could result in development proposals being abandoned, delayed or a new location being chosen by developers.

### What are the next steps?

T2K partners to develop further information and case studies showing the need for improved and better enforced regulations (potentially through work from T2K WP1 and 2) and disseminate their findings to the relevant authorities.

T2K partners can also support planning authorities by providing data and analysis to show the impact of planning decisions on transport demand, mode choice, energy use and carbon emissions.

T2K partners should also follow progress in this area through the implementation of new EU level regulation at the national and regional level in their respective areas. They could for example aim to influence the definition of “nearly zero energy buildings” chosen by their national government.

## 9.12. Taking the recommendations forward

Recommendations from WP4 (summarised in Table 24) should be incorporated into T2K partners' Action Plan to be developed as part of WP3.

Many actions require T2K partners to lobby other organisations within the public transport sector or wider governmental institutions. This could potentially be done in conjunction with existing transport sector organisations such as the International Association for Public Transport (UITP) or the Association for European Transport (AET).

**Table 24. Recommendations – quick wins and long term actions**

Recommendations	Quick wins and urgent attention required	Longer term actions
R1 - Company emission reporting & information provided to public transport users	T2K partners are already developing this information through WP3 and will be able to disseminate results quickly	T2K partners will need to lobby for reporting and user information requirements to become the norm within the public transport sector
R2 - Improvement to business case process and guidance	T2K partners can change internal processes quickly and at low cost	T2K partners will need to lobby for EU/national or regional guidance to be changed, for example by developing case studies
R3 - Capacity building and tools	T2K partners can already share knowledge and tools T2K partners could develop a capacity building project (potentially using EU funding)	
R4 - Raising awareness of the need for public transport to remain a low carbon option	T2K partners will soon be able to use information gathered through WP3 to raise awareness of the issue internally and with partners and stakeholders	Partners will need to keep monitoring their performance against other modes of transport to inform funding prioritisation
R5 - Investigating EU funding sources	T2K partners should consider the use of other EU funding sources such as Intelligent Energy Europe, ELENA and EEEF	
R6 - Using ESCO and EPC models	T2K partners should organise initial discussions with potential partners to test their interest in the public transport sector and assess feasibility Partners should also submit proposals for EU support (ELENA and EEEF)	If the EPC/ESCO approach is viable for the partners, they could then consider developing a joint procurement approach
R7 - Providing carbon neutral journeys by using carbon markets	T2K partners need to define their position on the use of offset with regard to their organisation's objectives If they decide to use offsets, they will need to appoint a suitable credit provider	T2K partners could lobby for other market mechanisms encouraging energy efficiency and low carbon investment such as domestic offsets or the use of energy efficiency certificates
R8 - Including GHG performance in procurement process and contracts	T2K partners can already organise internal procurement strategy reviews and training on green procurement T2K partners can also explore the possibility of strategic partnerships with suppliers to develop low energy/carbon equipment	T2K partners could lobby for stricter standards on energy efficiency and carbon emissions for goods and services they procure
R9 - Joint procurement of low carbon vehicles	T2K partners can discuss the potential for joint procurement exercises and potentially gain financial support to develop them through EU mechanisms	
R10 - Land use planning and building regulations	T2K partners need to prepare for the implementation of stricter EU targets in the coming years	T2K partners could lobby at the national/regional level to ensure that these EU level targets are implemented, for example by developing case studies



# Appendices



# Appendix A. Contributors

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## Appendix B. Overview of electricity markets in T2K partner countries

T2K partners generally procure their electricity through traditional procurement methods, appointing an energy provider to provide energy for a set period or several providers onto a panel (for a longer period) with mini-competitions run every year. TfGM uses the services of an energy trader to procure its electricity and moBiel buys electricity from its mother company Stadtwerke Bielefeld. T2K partners have limited influence on the structures and markets described below.

### B.1. In Belgium

Elia is Belgium's transmission system operator and is responsible for the transmission of electricity over the high-voltage grid from generators to the distribution system operators and large industrial consumers. Elia's network is a key link between France, the largest electricity exporter and the North European electricity markets, as well as Belgium's generators and consumers.

The responsibility for energy matters is shared between the federal government and the Regions. The federal government is responsible for tariff policy for both transmission and distribution system operators. Regions are responsible for distribution and local transmission of electricity via networks with a nominal voltage of 70 kV or less. They are also responsible for renewable energy (except for offshore wind farms) and the rational use of energy. The Belgian electricity market is regulated at the federal level by the CREG (Commission de Régulation de l'Électricité et du Gaz).

Network access in Belgium is partly regulated and partly negotiated. The majority of the eligible clients have a right of access on payment of the published transmission tariffs. However, in a limited number of cases (i.e. transits, large volume transmissions), access may be on payment of a negotiated tariff.

The market has been fully liberalised in 2007, so that all companies and residential users connected to the federal transmission grid are free to choose their supplier. Any party in Belgium wishing to sell power to end-users must hold a supply licence. Four different supply licences are available in Belgium since there are four different authorities governing relationships between supplier and consumer.

Belpex is the Belgian Power Exchange for anonymous, cleared trading in day-ahead electricity, providing the market with a transparent reference price. On Belpex, power purchase/sale transactions are concluded directly between the market participants. In order to deliver the energy, market participants need to either qualify with Elia as "access responsible parties" (ARP), or designate an ARP that accepts the participant within its ARP perimeter. An ARP can be a generator, a large customer or a trader. An ARP is contractually obliged vis-à-vis Elia to ensure that all the transactions in its perimeter are in balance. Elia continuously monitors the electricity flows on its network to ensure the balance between off-take and injection of electrical energy.

In 2010, the Belgian electricity market coupling, which already involved France and the Netherlands, was extended to cover the Central West Europe region (CWE), which means that the Belgian daily market is now coupled, on the basis of implicit auctions, with France, Germany, Luxembourg and the Netherlands. Market coupling enables the day-ahead markets of these five countries to be operated in synergy. Via Interim Tight Volume Coupling (ITVC), also launched in 2010, the CWE region is also coupled with the Scandinavian market.

### B.2. In France

The French system is highly interconnected with its neighbouring systems, exchanging power with every country with which it has a border. The Réseau de Transport d'Électricité (RTE) is responsible for the continuity and quality of transmission services and for providing equal access for all users to the power transmission network. Whenever an unbalance in the supply and demand of electricity appears, RTE can activate its primary and secondary reserves, to which all energy suppliers in France participate, or purchase a demand adjustment from a demand-side operator. The Commission de Régulation de l'Énergie (CRE), an independent administrative authority, regulates the energy sector in France. It was created in 2000, when the energy markets were opened to competition.

The French power market is based on the concept of Balance Responsible Entities (BR) which are responsible for engaging in commercial transactions, whilst minimising their exposure to the costs of settling imbalances between their supplies and deliveries. Each BR entity submits a declaration to RTE, detailing the injection and off-take of power that make up its balance perimeter. They undertake to compensate RTE financially for any negative imbalance (injection minus extraction). RTE compensates the BR financially for any positive imbalance. Even though the market organisation in France allows large customers to choose their supplier of electricity, EDF has maintained a dominant market share of energy sales to eligible customers.

Powernext, launched in 2001, is the French power exchange and offers spot and future trading. The auctioning of standard hourly contracts for physical delivery of electricity to business customers takes place on Powernext, under the responsibility of RTE and guaranteed by Clearent (a subsidiary of the Euronext stock exchange).

### B.3. In Germany

There are four transmission system operators (TSO – “Übertragungsnetzbetreiber”) in Germany: TransnetBW GmbH, TenneT TSO GmbH, Amprion GmbH and 50Hertz Transmission GmbH. Each of them is responsible for one control area in Germany.

The task of regulating Germany’s electricity and gas markets has primarily been assigned to the Federal Network Agency (Bundesnetzagentur). For utilities with less than 100,000 customers in only one federal state, the competent authorities are the state regulatory offices. The EnWG (Energiewirtschaftsgesetz) is the legal framework that governs grid operation and codifies the negotiated access to the grid.

The market model is bilateral (net pool) with the European Energy Exchange (EEX) in Leipzig covering the spot market, the futures market and the clearing of OTC dealings. The Balancing Groups (BG – “Bilanzkreis”) concept represents a central element in the German electricity market model. In general, all physical system users must be assigned to at least one BG, which combines a number of generators and consumers within the same control area. Each BG seeks to continuously balance its supply and production through the use of its own generation and by purchasing power from other areas. The BG manager is responsible for all operational issues within the BG, including the balancing of its group and the (financial) settlement of any imbalance with the TSO. Trading occurs exclusively between different BGs, and only the net exchanges are nominated to the TSOs. Each BG is limited to one specific control area.

German electricity is traded on EEX, one of the most important power exchange platforms in terms of volumes. EEX operates a spot and a derivatives market for electricity and also trades in EU emission allowances under the EU Emissions Trading Scheme. EEX is based in Leipzig and offers the most common power products, namely spot (day ahead and intraday) and derivatives with up to six year maturities (Phelix Futures).

The EEX is a regulated market subject to the German Exchange Act and it is supervised by three different institutions: the Exchange Council, the Ministry of Economic Affairs of the Free State of Saxony and the German Financial Supervisory Authority. The exchange’s prices are the benchmark for the whole market including OTC, wholesale and retail business. There are 220 participants on the EEX exchange, ranging from top investment banks to small, regional producers from all over Europe.

Although not formally included in the Trilateral Market Coupling Initiative launched by APX, Powernext and Belpex, EEX has exhibited a strong degree of price correlation with APX, Powernext and Belpex over the last few years.

### B.4. In the Netherlands

TenneT B.V., the Dutch independent TSO owned by the state, handles the operation of the electricity grid. Apart from tasks related to providing high voltage transmission service, the allocation of interconnection capacities, programme responsibility and securing blackstart capability, TenneT is also responsible for safeguarding the energy balance in the Dutch system and has overall responsibility for the safe and reliable transmission of electricity in the Netherlands.

The energy sector is regulated by DTe, a part of the Dutch Competition Authority (NMa). DTe guarantees transparent grid access conditions and transmission pricing. It regulates the electricity network and ensures free and non-discriminatory access to the grid. DTe also determines the rate structure in consultation with TenneT and grid users.

In the Netherlands, since 2004, customers are able to choose what company they buy their electricity or gas from, but not what company transports the energy to their houses. Therefore, the Netherlands Competition Authority (NMa), of which DTe is an arm, regulates the network operators to make sure that customers still pay a reasonable price, and that transport is well organized. In addition, it regulates the suppliers to promote a competitive environment.

Suppliers and consumers may trade electricity through bilateral contracts or through the Amsterdam Power Exchange (APX). On the balancing market, the parties bid to give TenneT the right to adjust their imbalance, using a single-price auction format.

APX is a provider of power and gas exchanges for the wholesale market, providing markets for short term (spot) trading only in the Netherlands, the United Kingdom and Belgium. The APX uses a single price two-sided auction format on which one can trade today, in hourly contracts, for delivery of electricity tomorrow. Although it is a voluntary market, regulations force electricity imported using capacity bought in TenneT's day-ahead interconnector auctions to be traded through the APX.

Electricity is traded on several wholesale markets. In addition to the informal, bilateral market for non-standardized contracts, there are several markets for standardized products.

In cooperation with the European Commission, APX launched a Trilateral Market Coupling initiative in 2004 to bring the French, Belgian and Dutch power exchanges closer together. Coupling power exchanges implies managing their respective supply and purchase curves jointly, by matching the highest purchase bids and lowest sale bids, regardless of where they have been made (e.g. matching a purchase bid in Belgium with a sales bid in France), but taking into account the available interconnection capacities on the borders. In other words, the counterparty of a transaction on a power exchange may originate from a foreign exchange without the participants being bound to explicitly acquire the corresponding transmission capacity.

## B.5. In the UK

National Grid Electricity Transmission plc (NGET) is the system operator for the electricity transmission system in Great Britain, with responsibility for making sure that electricity supply and demand stay in balance and the system remains within safe technical and operating limits. National Grid is also responsible for network planning and development. Transmission is a price regulated activity with three separate price controls – one for England, one for Wales and one for Scotland– and there is a separate TSO price control regulating the costs of transmission operation which is recovered from all system users.

The electricity and gas markets in the UK are regulated by Ofgem, the Office of the Gas and Electricity Markets. Ofgem promotes competition in these markets and regulates the monopoly companies which run the gas and electricity networks.

The UK electricity market is fully open and supply competition is well established with seven major national suppliers (all of which have significant generation activities) and a number of smaller specialised suppliers (concentrating on specific market segments or geographical areas).

The market organisation in Great Britain is a bilateral market where individual suppliers and generators are responsible for balancing through entering into contracts (either through bilateral OTC deals or on an organised exchange called UKPX).

In real time, the TSO is responsible for balancing the system by buying and selling energy and securing ancillary services. A special “balancing mechanism” is available to the TSO to do this but it is also free to purchase energy or option contracts outside these arrangements if it wishes.

The costs of operating the system (the costs of the TSO sales and purchases etc.) are recovered from all system users in a charge (Balancing Services Use of System or BSUoS) which is determined for each half hour trading period and levied on a per kWh basis. The aggregate cash flow from imbalance penalties (which can be either positive or negative) is paid to or recovered from all system users (again on a per kWh basis in each period).

The BritNed cable between the Netherlands and the UK will soon enable market coupling from the Netherlands to all directions: north (via NorNed), east and south (via the CWE MC replacing the TLC) and west (via BritNed). It will also link the two electricity markets operated by APX-ENDEX in the Netherlands and the United Kingdom.

# Appendix C. Long list of options development and initial assessment

## C.1. Challenges and options

Table 25 maps a long list of initial options onto to the challenges identified through the analysis stage and discussions with T2K partners and their stakeholders.

Options were identified by the project team following the first round of workshops. At this stage, all options generated were included to ensure that no potential options were dismissed from the process and that the optioneering was wide ranging and imaginative. The options have varying degrees of effectiveness and will also have a range of inherent deliverability risks associated with their implementation.

## C.2. Initial assessment of potential options

### Assessment criteria

The initial long list of options was submitted to an initial assessment, summarised in Table 26, using the following criteria:

- **Feasibility challenges** – how practical is the suggested option? How difficult/easy is it to deliver? Is it a natural extension to what is already happening? Does it fit with the organisation's wider objectives? What capacity is needed to deliver it? Would many stakeholders need to be involved? Are there business interests vested in the status quo remaining? (graded low, medium or high level of challenge)
- **Affordability challenges** – is the proposed solution affordable, irrespective of the level of estimated revenue? Costs taken into account here are costs to T2K partners and the public purse, but not the wider costs to users and society (graded low, medium or high level of challenge)
- **Acceptability challenges** – is the option likely to be publicly / politically acceptable? (graded low, medium or high level of challenge)

The potential role T2K partners could play in implementing the proposed options was also identified, including a potential lobbying role (lobby) and direct delivery by T2K partners and their staff (deliver). Some options include both roles as T2K partners would need to lobby for general rules/regulations to be changed but could start delivering before general changes are implemented.

### Option selection and consolidation

This initial assessment was discussed in the second round of workshops and led to the selection of the final recommendations presented in Chapter 9.

Some recommendations consolidate several initial options:

- Options 2, 3 and 14 are consolidated under "Lobbying for stronger requirements on emission reporting, company reporting and information provided to public transport users (with a well defined scope), supported by joint budget and accounting for energy use and carbon emissions (which will improve visibility of impacts and savings within the organisation)"  
Consolidates options;
- Options 6, 7, 8 and 9 are consolidated under "Improvement to appraisal and business case processes and guidance to better take account of volatility of energy prices, cost of carbon and whole life cost of investment decisions";
- Options 15 and 16 are consolidated under "Capacity building and tools (for example, rules of thumb for carbon and whole life cost assessment) for T2K partners on energy efficiency and carbon reduction";
- Options 18 and 19 are consolidated under "Raising awareness of the need for public transport to remain a low carbon option and of the potential for financial savings through energy efficiency investment"; and
- Options 23 and 25 are consolidated under "Development of "green tickets" products and use of offsets".

Some options were identified as of interest for some partners but were not developed as fully fledged recommendations:

- Option 5 - Clarify impact of energy procurement decision on actual energy mix (market mechanism through EU ETS and Kyoto mechanisms), Chapter 2 contains relevant information on the purchase of green electricity and carbon markets;
- Option 13 - Increased returns on production of renewable energy (feed in tariffs and premium), Chapter 2 includes some information on incentive mechanisms in the five partner countries;
- Option 22 - T2K partners making use of carbon trading mechanisms to generate revenue, Chapter 2 contains information on this option and its viability; and
- Option 26 - Long term concession/franchise agreements, TfGM's Chapter (7) contains information on the UK's franchising experience.

The following options were not selected for further development:

- Option 3a - Development of joint energy/carbon action plans to share targets and credit for achievements;
- Option 4 - Increased cost of energy and increase cost of CO<sub>2</sub> emissions (internalisation) through taxation/quota/market mechanisms;
- Option 10 - Demonstrate proposed initiative supports "economy", "equity" and "air quality" objectives;
- Option 11 - Tax allowances and rebates for energy efficiency/low carbon investment;
- Option 12 - Accounting processes to support low carbon/energy efficiency investment; and
- Option 17 - Further R&D and diffusion support for new technology.

**Table 25. Challenges and potential options**

Challenges	Potential options to address identified challenges
Trade-off between high short term costs and potential long term benefits	<p><b>To reduce initial costs:</b></p> <ul style="list-style-type: none"> <li>further R&amp;D and diffusion support for new technology (State/EU) <i>Examples: German National Platform for Electro Mobility, UK Low Carbon Vehicle Partnership and Technology Strategy Board</i></li> <li>joint procurement of low emission vehicles (T2K partners, transport authorities, states) <i>As noted in EU Transport White Paper</i></li> <li>interest free/low interest loans (state/EU/private sector), invest to save loan schemes (state/EU/private sector ) <i>Examples: Salix finance in the UK</i></li> <li>use of risk sharing facilities for R&amp;D activities, for example EU RSSF<sup>142</sup> <i>As noted in EU 2050 Roadmap</i></li> <li>grants, financial support, revolving funds and blending mechanisms (transport authority, state/EU) <i>Examples: Green bus fund in the UK, As noted in EU 2050 Roadmap</i></li> <li>ESCO (Energy Service Company) approach, where private sector company funds up-front investment and is repaid through energy savings</li> <li>tax allowances and rebates for energy efficiency/low carbon investment (state) <i>Examples: UK Enhanced Capital Allowance scheme (tax deduction) – only applicable if organisation pays tax</i></li> <li>possible changes to accountancy rules for a preferential treatment of energy efficiency/carbon investment (e.g. write-off period)</li> </ul> <p><b>To shorten pay-back period:</b></p> <ul style="list-style-type: none"> <li>increased cost of energy and CO<sub>2</sub> emissions (internalisation) through taxation/quota/market mechanisms (state/EU)</li> <li>increased returns on production of renewable energy (feed in tariffs and premium)</li> <li>actual increases and volatility of energy prices taken into account in business case work (state/EU guidelines, T2K partner procedures)</li> <li>cost of CO<sub>2</sub> taken into account in business case work (state/EU guidelines, T2K partner procedures)</li> </ul> <p><b>To better be able to take account of long term benefits:</b></p> <ul style="list-style-type: none"> <li>access to patient (5 to 10 year term) capital (state/EU/private sector)</li> <li>long term concession/franchise agreements (transport authority),</li> <li>invest to save loan schemes (state/EU/private sector – such as Salix finance in the UK)</li> <li>ESCO (Energy Service Company) approach, where private sector company funds up-front investment and is repaid through energy savings</li> </ul>

<sup>142</sup> The European Commission and the European Investment Bank (EIB) have joined forces in the Risk Sharing Finance Facility (RSFF). RSFF is built on the principle of credit risk sharing between the European Community and the EIB and extends therefore the ability of the Bank to provide loans or guarantees for investment with a higher risk and reward profile. The RSFF has a EUR 2bn capital cushion, EUR 1bn from the EIB and the same amount from the Commission's 7th Research Framework Programme (2007-2013), enabling the Bank to lend more than EUR 10bn for this kind of investment. Source: [www.eib.org/products/loans/special/rsff/index.htm](http://www.eib.org/products/loans/special/rsff/index.htm)



# TICKET TO KYOTO

Contextual drivers for CO2 reductions in public transport



Challenges	Potential options to address identified challenges
Access to capital and credit market failure	<p><b>Access to capital:</b></p> <ul style="list-style-type: none"> <li>grants &amp; financial support revolving funds and blending mechanisms (transport authority, state/EU) <i>Examples: Green bus fund in the UK, As noted in EU 2050 Roadmap</i></li> <li>invest to save loan schemes (state/EU/private sector) <i>Examples: Salix finance in the UK</i></li> <li>ESCO (Energy Service Company) approach, where private sector company funds up-front investment and is repaid through energy savings</li> <li>access to patient (5 to 10 year term) capital (state/EU/private sector)</li> <li>provision of state/public sector guarantee to secure private sector loans for T2K partners</li> </ul> <p><b>Generating revenue:</b></p> <ul style="list-style-type: none"> <li>T2K partners making use of carbon trading mechanisms</li> </ul>
Balancing public transport emission reduction with wider transport sector objectives	<ul style="list-style-type: none"> <li>raising awareness of the need for public transport to remain a low carbon option (T2K partners, transport authority)</li> <li>demonstrate initiative supports “economy”, “equity” and “air quality” objectives: business case for initiative to include assessment of contribution to wider objectives and take these objectives into account (T2K partners, transport authority)</li> <li>show how energy efficiency initiatives can deliver more public transport services at lower cost per pax/km (T2K partners, transport authority)</li> </ul>
Split responsibilities and incentives	<p><b>Better implementation of “polluter pays” principle:</b></p> <ul style="list-style-type: none"> <li>joint budget/accounting for energy/carbon costs to provide better overview of costs (T2K partner)</li> <li>joint energy/carbon action plans (e.g. transport authority, operators, contractors) to share targets and credits for achievements</li> </ul> <p><b>Better implementation of whole life cycle approach:</b></p> <ul style="list-style-type: none"> <li>capacity building (T2K partner)</li> <li>provision of easy to use tools and guidance (T2K partner, transport authority, state/EU, private sector)</li> </ul>
Informational failures and uncertainty	<p><b>Addressing uncertainty in energy/carbon prices:</b></p> <ul style="list-style-type: none"> <li>improved awareness of results from sensitivity testing (T2K partner, transport authority)</li> </ul> <p><b>Addressing uncertainty in governance, ownership, operating models:</b></p> <ul style="list-style-type: none"> <li>long term concession/franchise agreements (transport authority, state)</li> </ul> <p><b>Information needed for business case/investment decisions:</b></p> <ul style="list-style-type: none"> <li>capacity building (T2K partner)</li> <li>provision of easy to use tools and guidance (T2K partner, transport authority, UITP, state/EU, private sector)</li> </ul>

# TICKET TO KYOTO

Contextual drivers for CO<sub>2</sub> reductions in public transport



Challenges	Potential options to address identified challenges
Carbon price externality	<ul style="list-style-type: none"> <li>CO<sub>2</sub> emissions (internalisation) through taxation/quota/market mechanisms (state/EU) <i>As noted in EU Transport White Paper</i></li> <li>cost of CO<sub>2</sub> taken into account in business case work (state/EU guidelines, T2K partner procedures)</li> <li>review cost of CO<sub>2</sub> to ensure significant in appraisal process (state/EU guidelines, T2K partner procedures)</li> <li>provision of information on CO<sub>2</sub> emissions to users <i>Example: French carbon reporting regulations ("obligation d'affichage"), objective to develop common EU standards for carbon footprinting in EU Transport White Paper</i></li> <li>inclusion of CO<sub>2</sub> costs in public transport fares (maybe through offer of a green ticket at premium price, similar to offsetting mechanism used by airlines)</li> </ul>
Policy and regulatory framework	<ul style="list-style-type: none"> <li>review contracts/policies to ensure CO<sub>2</sub>/energy use reduction is part of the objectives/incentivised (transport authority, T2K partner procurement process) <i>Examples: STIB eco-label scheme with financial incentive from Brussels Region, BSOG incentivising low carbon buses in the UK, STIB procurement guidelines including environmental and sustainability performance in the mark, Netherlands Low Emission Zones agreement with cities</i></li> <li>land use planning and building regulations requiring improvements in energy efficiency and carbon reduction (local authority, state, EU) <i>Examples: Manchester City Council, Brussels Region</i></li> </ul>
Technology risk	<ul style="list-style-type: none"> <li>further R&amp;D and diffusion support for new technology and development of standards for interoperability (State/EU)</li> <li>partnership agreement with suppliers/manufacturers to retain support following purchase (T2K partner and suppliers)</li> <li>joint procurement of low emission vehicles (T2K partners, transport authorities, states) <i>As noted in EU Transport White Paper</i></li> <li>interest free/low interest loans (state/EU/private sector)</li> <li>invest to save loan schemes (state/EU/private sector) <i>Examples: Salix finance in the UK</i></li> <li>use of risk sharing facilities <i>As noted in EU 2050 Roadmap</i></li> <li>grants, financial support, revolving funds and blending mechanisms (transport authority, state/EU) <i>Examples: Green bus fund in the UK, As noted in EU 2050 Roadmap</i></li> <li>tax allowances and rebates for energy efficiency/low carbon investment (state) <i>Examples: UK Capital Allowance scheme (tax deduction)</i></li> <li>possible changes to accountancy rules for a preferential treatment of energy efficiency/carbon investment (e.g. write-off period)</li> </ul>
High search and transaction costs	<ul style="list-style-type: none"> <li>capacity building (T2K partner)</li> <li>provision of easy to use tools and guidance (T2K partner, transport authority, UITP, state/EU, private sector)</li> </ul>
Path dependency (lock-in)	<p><b>Ensure long term energy use and carbon impacts are taken into account in appraisal/business case:</b></p> <ul style="list-style-type: none"> <li>cost of CO<sub>2</sub> taken into account in business case work (state/EU guidelines, T2K partner procedures)</li> <li>review cost of CO<sub>2</sub> to ensure significant in appraisal process (state/EU guidelines, T2K partner procedures)</li> </ul> <p><b>Adoption of whole life cycle approach for business case/appraisal</b></p>

# TICKET TO KYOTO

Contextual drivers for CO<sub>2</sub> reductions in public transport



Challenges	Potential options to address identified challenges
Inertia and behavioural barriers	<ul style="list-style-type: none"> <li>• capacity building (T2K partner)</li> <li>• provision of easy to use tools and guidance (T2K partner, transport authority, UITP, state/EU, private sector)</li> <li>• review contracts/policies to ensure CO<sub>2</sub>/energy use reduction is part of the objectives/incentivised (transport authority, T2K partner procurement process) <i>Examples: STIB eco-label scheme with financial incentive from Brussels Region</i></li> <li>• duty to report emissions for operators and to provide information on CO<sub>2</sub> emissions to users <i>Example: French carbon reporting regulations ("obligation d'affichage")</i></li> </ul>
Market approach versus planning approach	<ul style="list-style-type: none"> <li>• clarify impact of energy procurement decision on actual energy mix (market mechanism through EU ETS and Kyoto mechanisms)</li> </ul>

**Table 26. Initial assessment of options**

Options	Feasibility Challenges	Affordability Challenges	Acceptability Challenges	T2K partners' role	Notes
<b>Legal / Policy framework</b>					
<b>Option 1</b> Land use planning and building regulations requiring improvements in energy efficiency and carbon reduction	L	L	L	Lobby	Main influence on new facilities and major refurbishments requiring planning consent
<b>Option 2</b> Duty to provide information on CO <sub>2</sub> emissions to users	L	L	L	Lobby for duty	Reinforce importance of emission reduction for corporate image (stronger business case)
<b>Option 3</b> Duty to report emissions for T2K partners and operators (company reporting)	L	L	L	Lobby for duty	Helps raise awareness of emissions internally and strengthens business case
<b>Option 3a</b> Development of joint energy/carbon action plans to share targets and credit for achievements	M	L	L	Deliver	Already partially in place, more relevant in UK where public transport delivery involves more separate stakeholders
<b>Option 4</b> Increased cost of energy and increase cost of CO <sub>2</sub> emissions (internalisation) through taxation/quota/market mechanisms	L	M	M	Lobby	Not enough political support to drive through this change within current economic climate although can raise revenue
<b>Option 5</b> Clarify impact of energy procurement decision on actual energy mix (market mechanism through EU ETS and Kyoto mechanisms)	L	L	L	Lobby	Internal capacity building to support procurement decisions but also linked to national energy strategy
<b>Planning – improving the business case</b>					
<b>Option 6</b> Assumptions on increases and volatility of energy prices taken into account in business case work based on observed and realistic trends	L	L	M	Lobby/deliver	Better reflecting impact of potential commodity volatility would have a profound impact on business case results
<b>Option 7</b> Improved awareness of results from sensitivity testing	L	L	L	Deliver	Internal capacity building potentially showing investment in energy/carbon reduction as a way to reduce financial risk
<b>Option 8</b> Cost of CO <sub>2</sub> taken into account in business case work (higher cost)	L	L	M	Lobby/deliver	Could significantly improve business case for energy efficiency/low carbon investment
<b>Option 9</b> Adoption of whole life cycle approach for business case/appraisal	M	L	L	Lobby/deliver	Will ensure more comprehensive assessment of costs and give more weight to operational energy/carbon costs

Options	Feasibility Challenges	Affordability Challenges	Acceptability Challenges	T2K partners' role	Notes
<b>Option 10</b> Demonstrate proposed initiative supports "economy", "equity" and "air quality" objectives	L	L	L	Deliver	Helps strengthen business case and improve deliverability
<b>Option 11</b> Tax allowances and rebates for energy efficiency/low carbon investment	L	M	M	Lobby	Potentially difficult within current economic climate
<b>Option 12</b> Accounting processes to support low carbon/energy efficiency investment	M	L	M	Lobby	
<b>Option 13</b> Increased returns on production of renewable energy (feed in tariffs and premium)	L	M	M	Lobby	Potentially difficult within current economic climate
<b>Option 14</b> Joint budget/accounting for energy/carbon costs (increased visibility of energy/carbon costs)	L	L	L	Deliver	Changes to internal processes to help strengthen business case for investment
<b>Planning – capacity building</b>					
<b>Option 15</b> Further capacity building for T2K partners on energy efficiency and carbon reduction	L	L	L	Deliver	Potential outcome from T2K project
<b>Option 16</b> Provision of easy to use tools and guidance to support energy efficiency/low carbon investment	L	L	L	Lobby/deliver	Potential outcome from T2K project
<b>Option 17</b> Further R&D and diffusion support for new technology	L	L	L	Lobby	Established mechanism. But potentially difficult within current economic climate
<b>Planning – raising awareness</b>					
<b>Option 18</b> Raising awareness of the need for public transport to remain a low carbon option	L	L	L	Deliver	Commonly accepted concept, but magnitude of ambition is variable
<b>Option 19</b> Show how energy efficiency initiatives can deliver more public transport services at lower cost per pax/km	L	L	L	Deliver	Helps strengthen business case and reduce improve deliverability
<b>Finance and funding</b>					
<b>Option 20</b> Interest free/low interest loans, state guaranteed loans, grants, financial support, revolving funds and blending mechanisms, access to patient (5 to 10 year term) capital, use of risk sharing facilities	M	M	M	Lobby/deliver	Can be difficult within current economic climate, some mechanisms available but require capacity within organisation to access them

Options	Feasibility Challenges	Affordability Challenges	Acceptability Challenges	T2K partners' role	Notes
<b>Option 21</b> Use of ESCO (Energy Service Company) approach and energy performance contracting	L	M	L	Deliver	Provide access to capital for investment but require capacity within organisation to access
<b>Option 22</b> T2K partners making use of carbon trading mechanisms to generate revenue	L	M	M	Deliver	Potential to raise additional funding but requires capacity within organisation to access
<b>Option 23</b> Inclusion of CO <sub>2</sub> costs in public transport fares (voluntary scheme where users can buy a "green" ticket)	L	L	M	Deliver	Success is dependent on value placed on environment by users and willingness to pay
<b>Procurement</b>					
<b>Option 24</b> Review contracts/policies to ensure CO <sub>2</sub> /energy use reduction is part of the objectives/incentivised	L	L	L	Deliver	May only have a marginal impact, unless incorporated early and with significant weight in procurement process
<b>Option 25</b> T2K partners buy carbon credits to offset carbon impacts of operations	L	L	M	Deliver	Has the potential to allow operations to be carbon neutral. Carbon benefits will not be immediately conspicuous for politicians and users.
<b>Option 26</b> Long term concession/franchise agreements	L	L	M	Lobby/ deliver	Can result in improved business case for investment and reduction in split incentives and responsibilities but may reduce influence of public sector on franchise operations
<b>Option 27</b> Joint procurement of low emission vehicles	M	L	L	Deliver	Could result in lower cost/risk and better access to capital/carbon credits but attempts to do this before have not on the whole succeeded





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