The Regional Transport Role of Tramways, Light Rail for Liveable Cities & Regions

2009

Light Rail (UK) Ltd
www.lightrailuk.com

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The Regional Transport Strategy role of Tramways & Light Rail

Who are Light Rail (UK) Ltd?

Recent Activities

Tourist Tramways – Rhyl & Liverpool

Public Enquiries – Manchester Metrolink, Merseytram

All Parliamentary Light Rail Group - Westminster, Edinburgh & Cardiff

Air Quality Reports – Runcorn Bridge

Traffic Studies – Wirral, Rhyl, Glasgow, Warrington, Halton, Toronto

Political Lobbying

Public Presentations – Local Transport Plan 1 & 2

A quote from the people who rebuilt their Cities

"Life today is inconceivable without motorised transport." However if transport is allowed to develop totally free, it will end up seriously endangering our society as traffic congestion and pollution are now showing.

So maintaining healthy living conditions must become our top priority.

When transport related interests clash or impose restraint on each other, the greater political good must be served by allocating priority to the appropriate interest".

Reinhard Klimmit, Federal Minister of Transport,

West Germany, 1960

1. Contents

2. Aims, Objectives and Desired Outcomes

☐ Aims

The aim of this document is to contribute to establishing liveable cities. It will also put forward, where appropriate, the proposition that Light Rail and/or Tramways are not just for the large metropolitan cities. This document will go further in arguing why smaller cities and towns cannot really afford not to introduce and develop their own tram systems from a liveable, sustainable, environmentally friendly, health benefit position. It will also consider, from a community perspective, why communities should invest in a fixed rail street running public transport system.

This document also recognizes that promoting a wall-to-wall tramline wish list at the expense of other modes of transport – buses, in particular – is disingenuous. It does aim to seek a way in which all modes, including the biggest threat to our safety and quality of life that is the private car, can actually contribute to the establishment of livable cities. Each mode has it's part to play. However it is important that some of the mistakes of the past are not repeated, especially where separate modes of public transport operated in isolated competition with each other rather than being integrated to form the 'joined up' transport experience that can be found on the Continent. It is to be assumed that many smart or soft options will have been explored and implemented where suitable.

The term 'Tram or Tramway' is used here to help us think "smallish" yet "viable" and not cause any confusion with the predominantly interurban or suburban 'corridor based' light rail systems that have opened in the United Kingdom in recent years.

Light rail and tramways constitute an important element in the range of public transport systems. Recently, these systems have been developed and reintroduced on a significant scale around the world. These can be seen not only in the traditional tramway cities and town where trams had been retained, (sometimes in the face of fierce and unfair competition from other mode) but in many places that long ago gave up their traditional tramways. This was a decision they came to regret. Hence Light Rail is making a comeback. The quality of life where this has happened is enhanced beyond that originally envisaged by the town fathers who can be seen now to have been statesmen of vision and forward thinking!

It can be argued that a tramway improves, regenerates and continues to contribute to a higher quality of life for residents, employers, employees, business users, tourists and the varied visitors to our towns and cities.

There will be a variety of reasons why a tramway would be suitable for a city or town.

The Regional Transport Strategy role of Tramways & Light Rail

Electricity was the conqueror of time and distance at the turn of the 20th Century. This rapidly led to fast growth of urban areas. It is interesting to note with twenty twenty hindsight that most of our successful towns and cities expanded and grew wealthy with electrically powered transport. Later, with increased wealth came motorised traffic and the fixed rail system in the street was seen short-sightedly to be an obstruction for that self-important individual and powerful lobbyist, the motorist.

There was a Board of Trade statement in the 'thirties recommending that this form of transport should be removed from our streets and that the more flexible bus or electric trolley bus be substituted. It could then be argued that the seeds of major urban road congestion were sown then.

☐ Objectives

Safety and Security	To improve safety and personal security on the transport system
Modal Shift	To increase the proportion of trips undertaken by walking, and cycling as well as by public transport
Excellent Transport System	To enhance the attractiveness, reliability and integration of the transport network
Effectiveness and Efficiency	To ensure the provision of effective and efficient transport infrastructure and services to improve connectivity for people and freight
Access for All	To promote and facilitate access that recognises the transport requirements of all
Environment and Health	To improve health and protect the environment by minimising emissions and consumption of resources and energy by the transport system
Economy, Transport and Land- use Planning	To support land-use planning strategies, regeneration and development by integrating transport provision

Desired Outcomes

The desired outcomes of this paper are to: -

A. Develop the economy, through improving connectivity for business and freight, enhancing transport effectiveness and efficiency, providing access to employment, education, shopping and leisure, and by improving transport integration;

B. Promote social inclusion and equality, by providing a transport system that is safe, accessible, and affordable to all sections of the community; and

C. Improve health and protect the environment, by minimising emissions and consumption of resources and energy, by promoting active travel, quality public transport and modal shift

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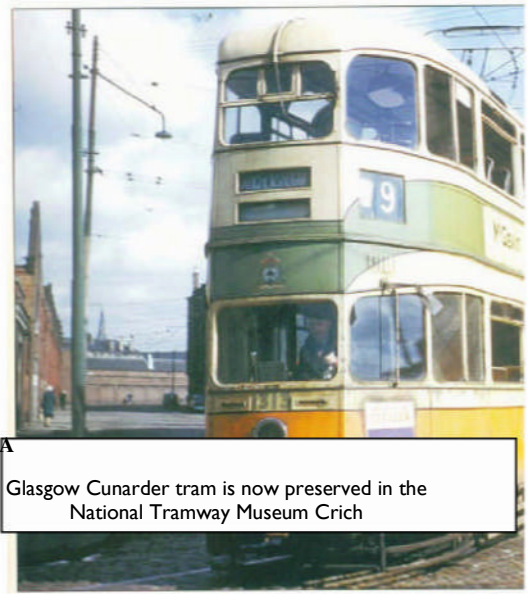
4. Past Generation



A Glasgow Cunarder tram is now preserved in the National Tramway Museum Crich

:PhotoCourtesySTTS

In the UK, the tram and the evolutionary development of the Light Rail Vehicle (LRV) was consigned to the scrap heap and folk memory, one of history's forgotten orphans! This has not been the case elsewhere. Europe is a prime example where this mode of transport has continued to develop in its many guises!

Trams or LRVs have the ability to move up to 250/300 people in one vehicle, in a fast, clean and comfortable conditions, from where they are to where they want to be.

This is reflected in the ability to move between 2,000 and 18,000 people per hour along clearly defined traffic corridors.

The permanent presence of tracks in the ground are a longterm political statement of intent, a reassurance to the

traveller's comfort and security.

A "Glasgow" Liveried vehicle on test Feb 2009?

The Regional Transport Strategy role of Tramways & Light Rail

5. Movement and Roads:

What is a town or city now and in the future?

The town, city or district is the centre for many activities, trade, commerce, retail, banking, insurance, business operations, arts, leisure, government, tourism and many others. It is where people foregather to work, shop and enrich their lives.

The interests and development of a town, city or neighbourhood lies in its vibrancy, attractiveness and, most of all, its movement. Transport & movement are its lifeblood, but movement requires arteries in the form of roads and streets. The human analogy still applies for, if these become clogged, life ebbs. Too much traffic causes a commercial and social thrombosis, which if it persists, drives industry, commerce, and people away elsewhere, often to the periphery of the city.

We are well on the way as road traffic is expected to increase by 40% between 1990 and 2025.

Future of Transport White Paper,2004

6. Decay

Once decay and decline a set in, reversing the process is slow and very expensive.

All the low cost transport options, cheap alternative systems that have been experimented with have, sadly, not worked as originally hoped for on the same scale as the tram and light rail vehicle.

7. Local Liveability

Liveability is about having a good quality of life in our locality from safe, clean, streets, to high quality public facilities. Easy movement is fundamental to our basic freedom and democracy and transport has a key role to play.

The UK Government is consulting separately on measures to tackle the increasing problems of congestion and polluting vehicles.

Traffic is dangerous and intimidating. Air pollution and noise remain key concerns, particularly in urban areas.

Cleaner technologies will not combat congestion alone, but they do contribute to reductions in noise and improvements in the quality of life in general and health in particular.

8. Air Quality

A cleaner Sheffield: Photo PaulJackson LRTA Sheffield

Though now better than for many years in some areas and set to continue to improve, air quality or pollution is still a serious problem in most traffic–clogged urban areas where there are significant health impacts.

The steeply rising number of additional vehicles coming onto our roads annually will tend to exacerbate the situation.

Gains from "green fuels" and efficient engines will be far outstripped by traffic growth. *Climate Change Programme 2006, Defra, 2006*

Trams emit no pollutants from the vehicle at the point of use, although there may be emissions at power stations depending on the form of generation. Chimney Exhaust scrubbers are relatively easy to install at the power station.

Marseilles 2008

Lack of pollution at point of use is valuable in urban areas and traffic corridors where there are high concentrations of some pollutants and reducing traffic emissions is a goal of the local authorities.

9. Congestion

Trams are a very positive way to reduce congestion, the source of much noise, dirt, vibration and other pollutants Congestion is the scourge of modern urban and suburban life. By encouraging a high modal change unmatched by any other transport mode (32 %+), journeys by the commuter motorists and the ad hoc trip can be reduced. By carefully planning a tram route to pass major schools & universities "school run" type congestion can also be reduced. This will develop the next generation of users of quality public transport unlike at present where "end-of-life" buses are used. This creates an unpleasant experience to which many of our children are subjected and traffic noise remains a problem. Almost silent running in the urban area where slow speed is the norm, the tram reduces the barrage of noise experienced in most town centres.

When Manchester's Metrolink was first introduced with street running through the city centre, a minor initial negative comment was that the trams were too quiet!
The decibel readings were well below the comparable traffic roar in the Piccadilly gardens interchange area.

1 0. Sustainable & Renewable Local Power Generation

Electricity can be generated from renewable, sustainable sources such as Hydropower, Wind Power and photovoltaics. Remote wind power generate 50% of the power requirements for Calgary's LRT.

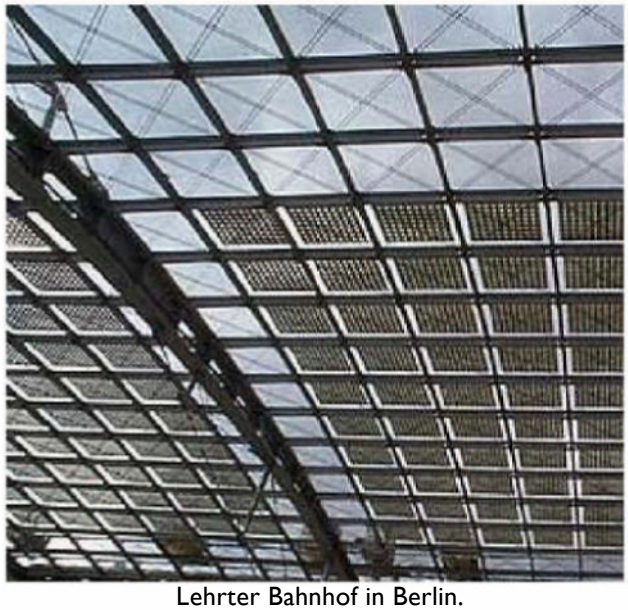
Solar Panels when used in Local Power Generation schemes lend themselves to tramway traction.

This method generates up to 60% of Karlsruhe's Tramway needs. High capacity storage batteries and national grid provide the balance of power needed.

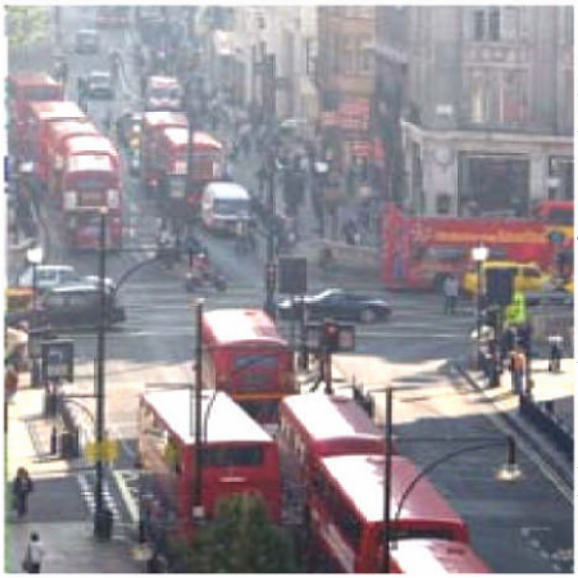
These solar panels are relatively simple to retrofit on the roof municipal buildings. The voltaic panels generate around 800v DC electricity making it simple technology to feed this current into the tramway overhead at 750 volts.

The available acreages for conversion to solar voltaic panel's power generation are tremendous from urban roof space, motorway sound proofing fences, bill boards etc., which are ideal for this type of power generation are open ended.

This will significantly reduce the need for major power stations to be built in the urban area. Significant funding is available through grants from EEC sources.



Lehrter Bahnhof in Berlin.
Its roof incorporates a photovoltaic generator.



A badly polluted Oxford Street London 2005

"Many low-carbon technologies are currently more expensive than fossil fuel alternatives but experience show that the cost of technologies fall with scale and experience" *Stern Review*

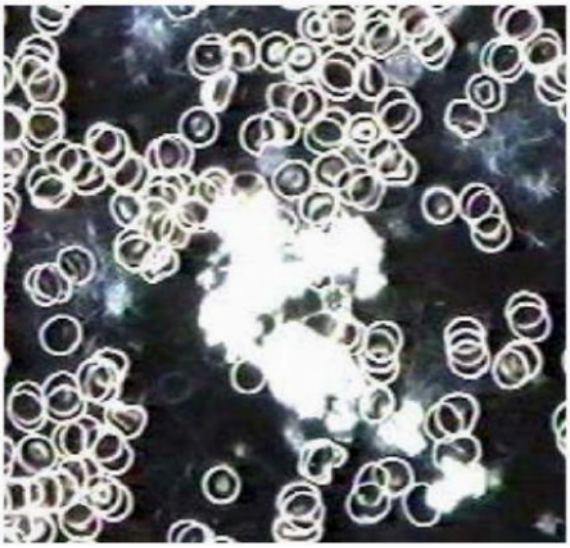
The advocated use of diesel and petrol powered vehicles as stated by the UK Dept of Transport Department Consultation Guide issued Dec 2006 excludes the fast and easy use of local power generation schemes advocated by the Department of Environment, Food and Rural Affairs and the Department of Energy.

An excerpt from the DfT guidance for Light Rail 2006

Para 1 .4.2 "The Government recognises that light rail can deliver quicker, more reliable journeys, and can be effective in attracting people out of cars. The Government will support light rail schemes where they are the best solutions for the local circumstances. This will usually be in corridors with high traffic and passenger flows. However, bus options are likely to offer the most cost-effective solutions in other corridors"

1 1. Health Impact of Airborne Pollutants

Evidence has now emerged which confirms that the long-term effects of particle air pollution areconsiderably more significant in damaging Public Health than heart disease.



http://www.cancersalves.com/images/darkfield images/congestion

The Committee on the Medical Effects of Air Pollutants Report published May 2001, considers that the total effect of long-term exposure on life expectancy for the whole population is about 10 times greater than that estimated for the short-term effects of Air Pollution. The Committee emphasised that although long-term health effects were larger than the short-term effects, there were more uncertainties in these calculations.

More people die from respiratory disease in the UK than from coronary heart disease or cancer. In fact the UK has one of the highest death rates from respiratory disease in Europe. Death rates are nearly twice the EU average and well above the European average.

"A significant number of deaths can now without doubt be attributed to transport; mainly tail-pipe emissions, road, brake & tyre wear related air born pollutants." *British Thoracic Society Report 2001*

The relative burden of respiratory illness & death in the UK is increasing as the burden of heart disease decreases. Respiratory diseases are now killing one in four.

The health impacts of pollutants are not just only restricted to individuals afflicted by respiratory disease but contribute to a whole range of other illnesses such as heart problems, liver disorder etc.

The benefits of the tram in this arena alone, to the wider community and the nation are tremendous and should be included by Government when calculating the Cost Benefit Ratio (CBR). Currently they are excluded as is clearly demonstrated in the latest Light Rail Guidance Dec 2006 from DfT.

A year-on-year reduction of demands on the National Health Service, by reducing the major respiratory demands on beds will reduce in simple terms the cost to the community. A case could be argued for allocating funds from NHS budgets towards tram schemes. This pump priming would free up NHS resources at a local and national level over the cumulative generational lifecycle of the tramway for the overall benefit of the community.

12. Health Consequences of Pollution and Congestion

The health evidence now available when the present Air Quality Strategy Objective for particles was set focused primarily on acute health effects. Medical evidence is now emerging which suggests that the long-term effects of particle air pollution (PM 2.5 to PM 1 0s) are considerably more significant. In simple terms PMs are products of combustion soot etc.

In its report published in May 2001, the Committee on the Medical Effects of Air Pollutants considers that the total effect of long-term exposure on life expectancy for the whole population is about 10 times greater than that estimated for the short-term effects.

The Committee emphasised that although long-term effects were larger than those in the short-term, there were more uncertainties in these calculations.

A significant number of deaths (between 25% - 40% (depending on which government figures are used) can now, without the slightest doubt, be attributed to transport related pollution.

The relative burden of respiratory in the UK is increasing as the burden of heart disease decreases.

1 3. Health Impacts – Costs to the Community

It is not just individuals afflicted by respiratory disease who are impacted by this kind of pollution. There is a whole range of other related illnesses such as heart problems, liver disorder that are also caused by this kind of pollution.
The rising level of stress (that can be seen every day in road-rage incidents) is contributing to the lowering of the quality of life for everyone.

Direct annual health costs to the UK are enormous. UK health consultations in respiratory disease by General Practice (Local doctors) were over 38 million. Three quarters (76%) are consultations with a GP at the practice-base, around one fifth (22%) are with a GP at the patient's home, the remaining 2% are with a nurse (either at home or at a practice). Overall Inpatient hospital treatment exceeded 740, 000 inpatient cases treated for respiratory disease in National Health Service hospitals in 1999/2000.

These represent 9% of all inpatient cases in men and 5% in women.

In children aged 0– 14 years there were over 210,000 inpatient cases for respiratory disease. Indeed, 12% of all NHS hospital admissions are in this age group in 1 999/2000

Around two thirds (67%) of respiratory inpatients are emergency admissions and one-tenth (9%) day cases. In 1999, drug treatment in England alone comprised around 49 million prescriptions dispensed for the prevention and treatment of respiratory disease. Just under half of these prescriptions were for bronchodilators used in the treatment of asthma. The volume of respiratory prescription has increased in recent years. Between 1994 and 1998 the prescription rate from GP's rose by 13%. Is it a coincidence that this was a similar figure to the rise in car usage?

In 1999/2000, there were over 10,500 operations for respiratory disease which cost the UK National Health Service £2,576 million made up as follows: -

To burn is to pollute
Is this where it will all end ?

Primary Care for respiratory disease across the UK cost £647.5 million.
Hospital Inpatient care cost £1,062.2 million
Hospital day case care cost £18.2 million.
Hospital outpatient care cost £40.7 million
2,800,000 bed-days per year used for treatment alone.
In 1999 alone, respiratory disease caused 153,000 deaths (74,000 men and 79,000 women). This is greater than the numbers killed by the great London Fog of 1952.

There is a further cost to the nation in the form of production losses due to

- Respiratory disease £3, 194 million
- Mortality £1,643.6 million
- Morbidity, 28,309,000

Working days lost multiplied by the average daily earnings produces an estimated £2,239 million.

Health impacts of traffic and reduction due to light rail

This paper attempts to calculate the improvements in health which result from traffic reductions caused by a modal switch to light rail.

Basic data:

I have used the input data on health effects from "Liveable Cities: The role of tramways and light rail" (Harkins, 2007). Source: British Thoracic society Report 1998

Transport data are from Department for Transport sources.

All figures are annual – not all from the same year but year-on-year variations are not expected to be large.

Health data

Total deaths from respiratory disease:	153,000
Costs to the nation:	
NHS Costs	£2576 m
Mortality costs	£1644 m
Lost production	£3194 m
Lost working days	£2239 m
TOTAL	**£9653 m**

Harkins (*op. cit.*) says that between 25 and 40 per cent of deaths (depending on which government figures are used) can be attributed to transport-related pollution. For the purposes of this paper we take 30 per cent as being a mid-range figure.

Therefore the number of fatalities and costs associated with transport-related pollution are therefore **45900 deaths** and **£2896 m** per annum.

Traffic data

Total road vehicle-km in 2006 was as follows (Source: Transport Statistics GB 2007):

Cars and taxis	402.4 B veh-km
Motor cycles	5.2 B veh-km
Buses and coaches	5.4 B veh-km
Light Vans	64.3 B veh-km
HGV	29.1 B veh-km
ALL MOTOR VEHICLES	**506.4 B veh-km**

Death rates and health costs per vehicle-km

Death rate per vehicle-km = 45900 deaths/402.4 B veh-km = **0.114** deaths per Mveh-km.

Health cost per vehicle-km = £2896 m /402.4 B veh-km = **£ 7197** per Mveh-km.

(This assumes it's all due to cars, but since cars are 80% of traffic this isn't too drastic)

Light rail data

Total light rail traffic in 2007-08: (Source: Public Transport Statistics Bulletin GB 2008, Table D. Includes 9 systems):

Passenger boardings	201 M pass-jnys
Passenger-kilometres	1184.5 M pass-km

Modal switch

Estimates of the modal switch from cars due to light rail vary in the region of 20 to 25 per cent –that is, 20 to 25 per cent of the passengers on the light rail system formerly travelled by car. We shall take 25 per cent for these calculations, so the number of passenger-km diverted from car is 25% x 1184.5 = **296 M pass-km diverted from car.**

Hence:

Reduction in deaths due to modal switch = 0.114 x 296
= 33.74 deaths per year.

Reduction in health costs due to modal switch = £7197 x 296
= £2.1 m per year.

Impact on Road Traffic Accidents

Accident and Casualty data

Number of casualties 2006: (Source: Transport Statistics GB 2007):

Killed	3172
Seriously injured	29000
Slightly injured	227000
Total	**259000**

Total traffic (all types, see above) **511 B veh-km**

Casualty rates

Hence casualty rates:

Fatality rate	0.62 per 100M veh-km
KSI rate	6.3 per 100M veh-km
All casualties	51 per 100M veh-km

Hence the following reductions in casualties due to Modal Switch:

(reduction in passenger-km = 296 million per annum as above)

Fatalities = 0.62 x 296/100 **=**	1.8 per year
Seriously injured = 5.68 x 296/100 =	16.8 per year
Slightly injured =	131.5 per year
All severities	**150 per year**

Costs of Accidents

We apply to these casualty reductions the following costs per casualty obtained from COBA section 3.1 (2002 £) to obtain:

Fatalities: £1,249,890 x 1.8 =	£2.25 million/a
Serious injuries: £140,450 x 16.8 =	£2.36 million/a
Slight injuries: £10,830 x 131.5 =	£1.42 million/a
Total cost of casualties saved =	**£6.03 million/a**

Total cost savings

Adding the savings in health costs (£2.1 m/a) and accidents (£6.0 m/a) gives a total saving of £8.1 million per annum.

Amortising £8.1 m/a over 25 years (taken as the life of a light rail system) at 5 per cent gives:

Net Present Value of health and accident savings = £ 114 million.

THUS THE NPV OF SAVINGS IN HEALTH AND ACCIDENT COSTS ON THE NINE CURRENT LIGHT RAIL SYSTEMS AMOUNTS TO £144 MILLION.

The NPV of savings in health and accident costs on a proposed new system carrying 20 million passengers a year would be one-tenth of this, say £14 million, and this should be counted in the benefits of the new system.

DAW, LRTA Development Group, 07 March 2009

14. Climate Change Contribution by Transport

The internal combustion engine, when it is are used in large numbers for transport purposes, particularly in urban areas, is literally killing the weakest of our population who are generally the young and the elderly, not forgetting the impact on the planet. It is predicted thaqt road traffic CO2 is going to increase by almost 30% by 2020.

Transport Statistics GB 2005, DfT 2005

Local authorities are well aware of the dangers of the build-up of toxic concentrations of air pollution caused by (often diesel-powered) taxis and buses operating in confined and heavily built-up areas, but have consistently favoured these methods of public transport over light rail based on cost and ease of implementation. This is contrary to the new ethos of "the polluter pays" and will hopefully be revisited in the light of increasing numbers of air quality management areas being declared and pressure to tackle the causes of climate change.

The rest of Society pays the pollution costs that are detrimental to the liveable cities concept. The climate is changing around the globe for the worse.
This is a scenario that cannot continue indefinitely.

Reduced emission fuels, catalysts, scrubbers, low sulphur fuels and other methods fitted to the Internal Combustion Engine can only be regarded as temporary steps on the road to carbon free zero emissions at the point of use.

It is a concern that the UK Government plans for more than 200 roads, which will fuel traffic growth, by planning to spend in excess of £12 billion. *SteveLadyman,Hansard24May2006*

15. "Oslo PM Report"

A

Summary

About Particulate Matters

From

Passenger Transport In

Oslo,

("Svevestøv fra persontransport i Oslo.

En beregning av mengder og kostnader"),

By Otto Andersen

Of the *Vestlandsforsking Research Centre.

Summary translated by Roy Budmiger

www.vestforsk.no/dok/samandrag/r14-98.asp

Summary 19/98

Undertaken 1998 based on figures from 1996 and projected to date (2006)

Particles are divided into five main categories

1. Exhaust from combustion engines
2. Asphalt wear
3. Tyre wear
4. Brake wear
5. Fine grinding of larger particles already torn loose from the road surface

The Regional Transport Strategy role of Tramways & Light Rail

1. Exhaust from combustion engines:

PM 2.5 + PM 10. 133 tons/year.

A total 75% (99.75tons/year) is from private cars, and 25% (33.25ton/year) from buses and taxis.

A total of bus & taxi emissions of

332.5 tons by 2006

Asphalt wear:

PM 2.5+ PM 10: - 179 tons/year.

A total 93% (1 66.47tons) are from private cars, 12.53 tons (7%) from buses and taxis.

This type of emission is anticipated to drop, by 35-71% depending on how the modal split will be due to tyre dubs being banned or highly taxed in Oslo.

There will be no reduction in the bus calculation, as bus & trolley bus do not use dubbed tyres.
A total of bus & taxi emissions of 125.3 tons by 2006

n is

It wears out – where does it go?

3 . T y r e W e a r .

The amount of airborne pollution caused by the wearing down of tyres amounts to a total of bus & taxi emissions of 81.20 tons by 2006

4. Brake Wear.

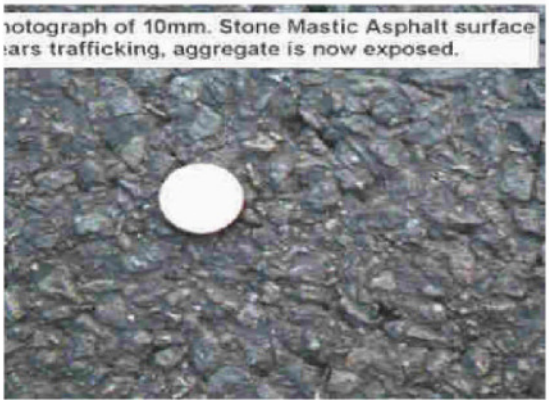
The amount of airborne pollution caused by the wearing down of brake pads and associated equipment amounts to PM2.5+PM 10: 55 tons/year.

A total of bus & taxi emissions of 55 tons by 2006

5. Fine grinding of larger particles already torn loose from the road surface:

PM2.5+PM 10: 78 tons/year.

A total 94% (73.32tons) is from private cars, 4.68tons (6%) from buses and taxis.



The Regional Transport Strategy role of Tramways & Light Rail

The total tonnage for clean bus & taxi in the urban area by 2006 is as follows: -

-Exhaust from combustion engines	332.5 tons
-Asphalt wear	125.3 tons
-Tyre wear	81.20 tons
-Brake wear	55.0 tons
-Fine grinding of larger particles already torn loose from the road surface	46.80 tons
Total Pollution	640.8 tons.

This summary does not give separate figures for buses and taxis.

A separate report from 2003 shows that private cars in Oslo made 32 12 million person-km compared to taxis 175 million.

Assuming the number of persons in private cars and taxis being the same and assuming taxis pollute the same as private cars, then taxis should add 5.2% to the private car figures (and reduce the same from buses only).

The direct pro rata costs incurred from pollution directly attributable to buses and taxis are apparently not included in full when the Cost Benefit Ratio (s) are calculated by DFT.

This results in a bias toward bus-based systems and not the level playing field that is currently claimed by the Department of Transport and the UK Government's statement that Trams & Light Rail are too expensive.

16. Stern Review, The Economics of Climate Review

2006

The effects of our actions now on future changes in the climate have long lead times. What we do now can only have a limited effect on the climate over the next 40 or 50 years. On the other hand what we do in the next 10 or 20 years can have a profound effect on the climate in the second half of this century and in the next.

The benefits of strong, early action on climate change outweigh the costs The evidence shows that ignoring climate change will eventually damage economic growth. Our actions over the coming few decades could create major disruption to economic and social activity, later in this century (and the next) on a scale similar to those associated with the great wars and the economic depression of the first half of the 20th century. It will be difficult or impossible to reverse these changes. Tackling climate change is the pro-growth strategy for the longer term, and it can be done in ways that do not cap the aspirations for growth of rich or poor countries. The earlier effective action is taken, the lest costly it will be.

The risks of the worst impacts of climate change can be substantially reduced if greenhouse gas levels in the atmosphere can be stabilised between 450 and 550ppm CO_2 equivalent (CO_2e). The current level is 430ppm CO_2e today, and it is rising at more than 2ppm each year. Stabilisation in this range would require emissions to be at least 25% below current levels by 2050, and perhaps much more.

Ultimately, stabilisation – at whatever level – requires that annual emissions be brought down to more than 80% below current levels.

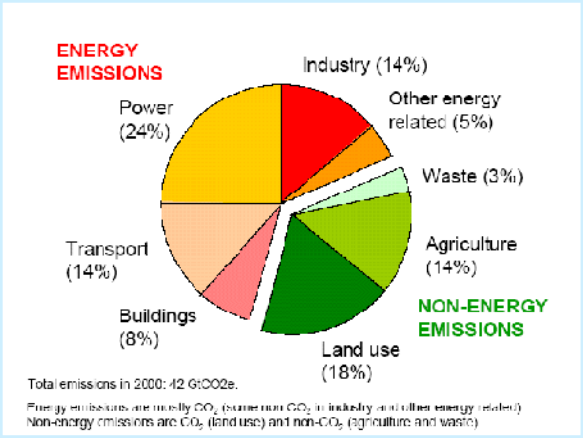
This is a major challenge, but sustained long-term action can achieve it at costs that are low in comparison to the risks of inaction. Central estimates of the annual costs of achieving stabilisation between 500 and 550ppm CO_2e are around 1% of global GDP, if we start to take strong action now.

Costs could be even lower than that if there are major gains in efficiency, or if the strong co-benefits, for example from reduced air pollution, are measured. Costs will be higher if innovation in low-carbon technologies is slower than expected, or if policy-makers fail to make the most of economic instruments that allow emissions to be reduced whenever, wherever and however it is cheapest to do so.

The Regional Transport Strategy role of Tramways & Light Rail

Given that climate change is happening, measures to help people adapt to it are essential. The less mitigation implemented now, the greater the difficulty of continuing to adapt in the future.

Figure 1 Greenhouse-gas emissions in 2000, by source



Source: Prepared by Stern Review, from data drawn from World Resources Institute, Climate Analysis Indicators Tool (CAIT) on-line database version 3.0.

There are four ways to cut gre differ considerably depending on which and in which sector;

1. Reducing demand for emission-intensive goods and services
2. Increasing efficiency, which can save both money and emissions
3. Acting on non-energy emissions, such as avoiding deforestation
4. Switching to lower-carbon technologies for power, heat and transport.

There are two ways to estimate the costs of these changes:

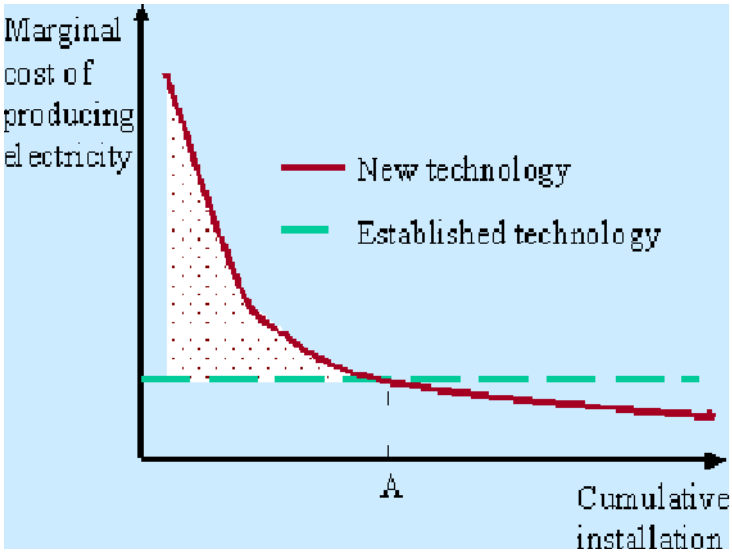
- One is to look at the resource costs of measures, including the introduction of low-carbon technologies and change in land use, compared with the costs of the BAU (Business as Usual) alternative Large-scale uptake of a range of clean power, heat, and transport technologies is required for radical emission cuts in the medium to long term. The power sector around the world will have to be at least 60%, and perhaps as much as 75%, decarbonised by 2050 to stabilise at or below 550ppm CO2e. Deep cuts in the transport sector are likely to be more difficult in the shorter term, but will ultimately be needed. While many of the technologies to achieve this already exist, the priority is to *bring down their costs* so that they are competitive with fossil-fuel alternatives under a carbon-pricing policy regime.

A portfolio of technologies will be required to stabilise emissions. It is highly unlikely that any single technology will deliver all the necessary emission savings, because all technologies are subject to constraints of some kind, and because of the wide range of activities and sectors that generate greenhouse-gas emissions. It is also uncertain which technologies will turn out to be cheapest. Hence a portfolio will be required for low-cost abatement.

The shift to a low-carbon global economy will take place against the background of an abundant supply of fossil fuels. That is to say, the stocks of hydrocarbons that are profitable to extract (under current policies) are more than enough to take the world to levels of greenhouse-gas concentrations well beyond 750ppm CO2e, with very dangerous consequences. Indeed, under BAU (Business as Usual), energy users are likely to switch towards more carbon-intensive coal and oil shales, increasing rates of emissions growth.

An important corollary is that there is a high price to delay. Delay in taking action on climate change would make it necessary to accept both more climate change and, eventually, higher mitigation costs. Weak action in the next 10-20 years would put stabilisation even at 550ppm CO2e beyond reach – and this level is already associated with significant risks.

The average expected cost is likely to remain around 1 % of GDP from mid-century, but the range of estimates around the 1% diverges strongly thereafter, with some falling and others rising sharply by 2100, reflecting the greater uncertainty about the costs of seeking out ever more innovative methods of mitigation.



Historical experience of both fossil fuel and low-carbon technologies shows that as scale increases, costs tend to fall. Economists have fitted 'learning curves' to costs data to estimate the size of this effect. An illustrative curve is shown here for a new electricity-generation technology; the technology is initially much more expensive than the established alternative, but as its scale increases, the costs fall, and beyond Point A it becomes cheaper. Work by the International Energy Agency and others show that such relationships hold for a range of different energy technologies.

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A number of factors explain this, including the effects of learning and economies of scale. However the relationship is more complex than the figure suggests. Step-change improvements in a technology might accelerate progress, while constraints such as the availability of land or materials could result in increasing marginal costs

The removal of barriers to behavioral change is a third essential element, one that is particularly important in encouraging the take-up of opportunities for energy efficiency.

Are Buses a clean option?

17. So what benefits does a tram offer in a Liveable City?

Tramways are planned and operated for many reasons, demanding much joined-up thinking that very few other modes require. This gives them a pre-eminent position as a transport mode plus.

Many traffic problems are solved by reducing congestion enhancing movement of people; unlocking gridlock, reducing the dependency and use of the private motorcar.

A well-planned and ordered tramway enhances the image and ambience of a town or city. The use of a tramway reduces pollution and improves air quality [illegible]

It is an established fact that trams contribute to the regeneration and wealth of the adjacent areas Good examples are to be found in Croydon UK, Nottingham UK and Oporto, Portugal

The very presence of rails and overhead wires are a political statement. It is a commitment made of steel in the road for now and the future

Trams and Pedestrians go together and can be one and the same.

Trams are a high quality form of public transport allowing people to make journeys further than practical on foot without using a car. Politicians should never forget that every passenger is also a pedestrian and potential voter!!

Street Running Trams can run sensitively in restricted city centre streets, squares, malls & arcades. Shopping streets can be pedestrianised and people will still be brought in and out by public transport.

Retail footfall rises in some cases as high as 35%.

Trams have audible warnings to alert pedestrians of their presence when necessary.

In the UK where buses are allowed into pedestrians treets we have the "scatter" effect. A good example is to be seen in Bolton Lancashire. With trams, pedestrians stand just clear of the swept path with no discomfort or alarm.

The Regional Transport Strategy role of Tramways & Light Rail

18. Pedestrianised streets:

Unlike most other modes, trams follow a predetermined set rail pathway; they will not deviate or swerve. When the swept path is tactilely marked on the ground, people know they can stand close and be perfectly safe.

It is a common continental practice for café tables and chairs to be placed close to the swept pathway.

By being so acceptable in pedestrainised streets and in use during service hours, they provide a degree of surveillance and deterrence where chain store, building societies and estate agents dominate high streets during the day and are often dead and no go areas for most citizens after close of business.

As a consequence of trams running after hours, vandalism and violence are generally reduced in these streets.

For the benefit of passengers walking to the tram stop, it is important that they be positioned close to the centre of activities and homes, with clear direct paths leading to them.

Trams often are the first introduction many car drivers have of a quality public transport experience which is pleasant, leading to their repeating the experience and extending this public transport experience to bus use. In shopping areas it is possible to draw funding from the retailers for additional features at the tram stop.

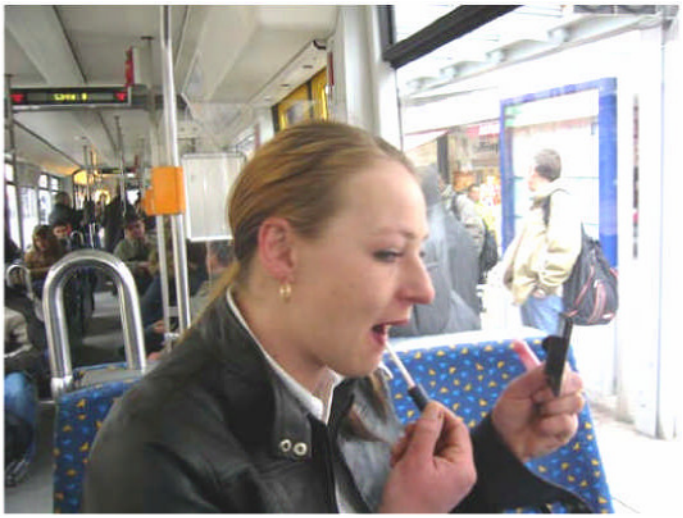
There is anecdotal evidence emerging that additional bus use happens in cities with new trams. This is most likely where there are sensible integrated feeder services. This needs further studies.

The more direct the path to the stop, the larger the Catchment area can be. However as people prefer not to (or cannot) walk far, particularly laden shoppers etc, the stops should be no more than 400m apart.

An off-street suburban or corridor line or where the tram line is serviced by local feeder service buses, such as in Sheffield and the Ruhr systems, can provide an express service and should have longer intervals between stops.

19. Retail Footfalls increase by 35% +:

By offering attractive journey times and town centre penetration trams can offer journey times in comparison with cars and buses by taking advantage of segregated alignments and using the latest traffic engineering techniques to avoid road congestion.



A busy commuter or shopper?

By penetrating the heart of a town or city, passengers are taken to the centre of the commercial, historical or business areas thus considerably increasing retail footfall.

It is important that ticketing must be used as part of an integrated transport policy in conjunction with other modes and operators and not in isolation. The emphasis should be for off-vehicle ticket sales where possible, with genuine through cards accepted and received by other transport modes.

The success or otherwise of ticket machines on platforms sadly reflects greater social problems which are not the remit of this paper.

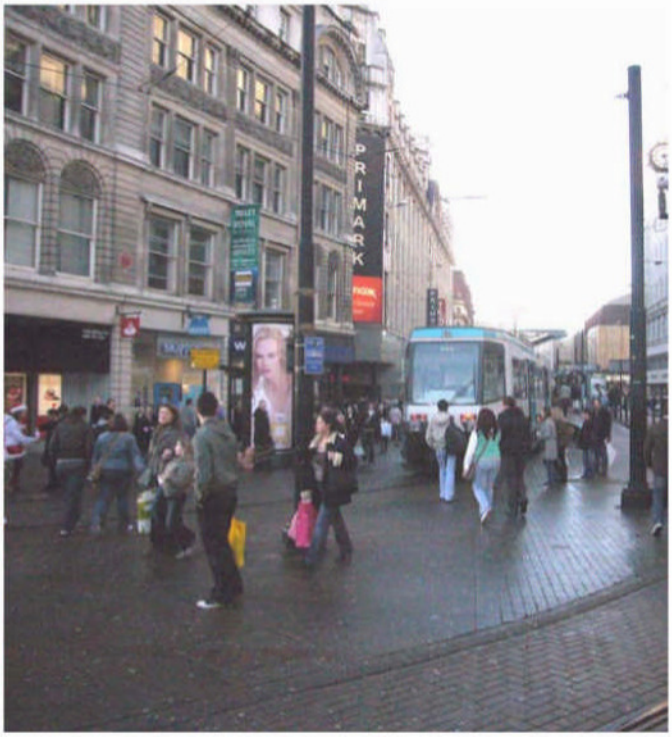
Revenue enforcement measures are essential. Revenue protection officers or customer care executives (formerly known as conductors & conductresses) will need to be used frequently and regularly. Experience in Sheffield and elsewhere show that when Conductors are used, there is a marked rise in “patronage”. In addition, vulnerable groups such as women and the elderly will use the trams in rising numbers. The presence of staff other than the driver reassures and reduces the level of on board vandalism and other anti social behaviour especially at night.

20. Access and Stops:

Trams are potentially the most accessible forms of public transport for the elderly and disabled. If access is made easy for the disabled, it follows that access is easy for all.

Trams have precise alignment with pavements or platforms, smooth ride qualities and, where applicable, low floor vehicles or sections.

The disabled access for crossing points and foot access to stops need to be of high quality: direct, unobstructed, step-free and ramped where possible. Stops should not obstruct other pedestrians. Safe access to the tram stop is important and should be controlled where appropriate by pedestrian crossings etc. Pedestrian bridges and subways should be avoided on the grounds of cost and security but not excluded as a final solution.



21. New off street tramlines

New, off-street tramlines can be built with useful foot and cycle tracks alongside. The use of disused railway alignments will reduce cost considerably but may result in local opposition for the apparent loss of important green space, amenities etc., Careful, sensitive, listening and discussions with local people can eliminate most of the perceived complaints. "Nimbys" will remain however!
The loss of such "amenities" may not be outweighed by the general benefits of the new tramline, especially where there is a parallel street route with important traffic generators. It is to be remembered that trams are a very friendly form of transport provided that people outside the vehicle are given, as must attention as people inside the vehicle.
Once again, politicians forget at their peril that these passengers and pedestrians vote them into *and out* of office!

Photo CourtesyLight Rail Solutions Ltd
A new trambaan, a re-allocation of road space

There is a need to avoid taking the politically easier route of building on parkland or Greenfield areas to avoid reducing road capacity for cars. This does not make for an efficient or sustainable transport system.

Where parkland is used, it is recommended that the tramway is paved, access controlled and shared with co-operating bus companies operating "green buses".

It should be remembered that trams are a very pedestrian mode of transport in city streets

A classic use of quality landscaping

If street tram track was built by the more traditional methods, particularly without the use of deep reinforced concrete slabs, the issues of allowing access to utilities becomes simpler. Most utilities plant does not need to be moved, only protected against physical damage by the passage of the trams, with the possible exception of gas and water pipes, the latter particularly in view of the hidden damage they can do when a leak does occur. Even if a cable, or pipe does need to be replaced, then provided it is not too large, it is possible to dig a trench across the tramway, leaving the rails spanning the gap. At worst, there is such a thing as temporary tram track and pointwork, which allows trams to be temporarily diverted onto the other track whilst major works take place.

At the same time, I suspect that building tram track by the old fashioned methods is actually cheaper than the slab track methods that were used for the likes of Croydon, Manchester and Sheffield, for example.

22. Trams and Community Railway lines:

Trams are very successful for modern liveable cities, towns & neighbourhoods.

The modern tram provides the ambience of a train, but can run and access places where a train cannot, on street penetration of the centre of the town or city.

Trams can and do attract motorists out of their cars at which buses are much less successful.

Running on former rail alignments, light rail vehicles can supply a better service offering a more frequent service at a lower cost than heavy rail.

Trams can stop at more places, stops are closer together and much easier & cheaper to construct than railway stations.

A number of lightly used lines in the Clyde Valley region have been identified as suitable for upgrading to this mode

23. TRAMTRAIN

(A short explanation)

TramTrain is now the term generally given to any vehicle, which can operate both in city streets as a tram, and on fully segregated 'heavy' rail tracks as a train. Through passage is thereby provided for passengers between city centre and distant towns and suburbs without the need to change mode or vehicle.

There are many cities, both in UK and overseas, where the main railway station is a significant distance from what is generally recognised as the city centre, and other major features and facilities in the city. A TramTrain style of operation has obvious merits in making the link between main station and city centre etc. more convenient, easier for the mobility impaired and quicker for all users.

Capital expenditure can be minimised by making the greatest possible use of existing railway infrastructure, and, where they exist, the present tramway lines. Short lengths of special connecting tracks and ramps are, however, required in many cases.
Through operation between railway and street environment has been utilised since the earliest days of rail guided transport systems, but has received a particular impetus in the last 20 years for urban transit networks. Examples include Karlsruhe, Saarbrukken, Nordhausen and Kassel in Germany.
In the UK, several of the second-generation tramways utilise very substantial lengths of former 'heavy' rail infrastructure, with addition of city-centre trackage. Only shared running with main line trains is missing.
This applies to Manchester, West Midlands, Croydon and Nottingham.

A particular window of opportunity in the UK will present itself over the next 15 years with the need to replace local service heavy rail vehicles built in the 1980s, such as Pacers and Sprinters. There are at least 20 cities and conurbinations where such schemes could be implemented, and deliver a major improvement to public transport.

LIGHT RAIL (UK) LTD is now urgently drawing to the attention of all relevant bodies from Department for Transport to Local Authorities the need to seize this opportunity. It is essential to initiate project development as soon as possible because Legal and Financial authorisation procedures are protracted in the UK.

Many TramTrain systems should only require modest capital outlay from Local Authority/PTE sources. Funding for vehicles is virtually assured from heavy rail sources. In many cases, only relatively short lengths of new street track would need to be installed. Diesel engines, or other on-vehicle power sources, could apply in a high proportion of cities, and would avoid the need for expenditure on electrification infrastructure.

Source: LRTA DG Group

The Regional Transport Strategy role of Tramways & Light Rail

A train tram in the town centre
Kassel Germany

Subject to a compatible wheel & track profiles, trams can share track with mainline railways, Examples can be found in Karlsruhe, Bremen, Kassel & Saarbrukken, Germany.

Tramways can be laid alongside main-line tracks, such as Manchester Metrolink and Nottingham's "Robin Hood" line. When part of this corridor has been used for other purposes the alignment can be re-routed round the missing section and return to the original alignment if desirable.

Trams can be on new Greenfield routes, brown field route, mixing on the highway with shared running

In the town of Essen, Germany, forward thinking has provided shared running on guided busways. The tramlines were constructed first, and then the busway was constructed using planks of wood mainly set outside the tram rails and sensibly not set in concrete. The section of busway through the tunnels using planks of wood has been stripped out.

Paris has established Line T4 as a "Tram-Train" running from Bondy to Aulnay Sous Bois and is operated by SNCF's "Transilien" subsidiary, rather than the RATP.

It replaces a leg of an ordinary SNCF Paris suburban service and was launched on the 18th November 2006 the vehicles used are Siemens Avanto Trams and the line runs on A former heavy rail line marketed as “La Ligne des Coqueters T4 Paris

The Regional Transport Strategy role of Tramways & Light Rail

Weatherproofed in Mulhausen

The OEG (Oberrheinische Eisenbahngesellschaft AG) runs from Heidelberg to Mannheim. OEG (Upper Rhine Railway on route number 5/5R.

Bombardier type RNV-6 is a 6-axle low floor articulated tram built in 2003.

All Party Parliamentary Light Rail Group

Mannheim Hautbanhof Photo Unknown

Tram Train – Opportunities for the Future

A presentation to APPLRG by

Ian Ambrose - Future Railway Development Manager November 2007

Key objectives

Development of a new service to rail users

Providing new journey opportunities
Taking the railway to where people want to access it
Providing better access to trains
Continuous improvement in safe efficient sustainable Operation leading to e.g.
Reduced car usage
Reduced carbon emissions
Continuous reduction in maintenance cost base
Continuous reduction in operating costs through energy efficiency
Increasing overall capacity of the network

From branch line to City Centre

– tram trains in Karlsruhe Market Place

Network Rail

How do we achieve this?

Standards revised to support processes

Simplified operating procedures

Infrastructure appropriate for use

Lighter trains

Adopt best practice from other networks

Taking the train onto the tramway?

Potential solutions

Potential solutions for new urban, developing suburban and community railways are:

Lightweight conventional trains

Conversion to light rail

Tram train shared running

Ultra light rail

...all by various power supplies including hybrid power trains

The Regional Transport Strategy role of Tramways & Light Rail

	Lightweight conventional Trains	Conversion to light rail	Tram train shared running
Reduce wear and tear on track	X	X	X
Take advantage of simpler operating methods	X	X	X
Take advantage of "light rail" station design	X	X	X
Capable of running on line of sight if fitted with track brakes	X	X	X
Capable of operating on same tracks as conventional trains	X		X
Only suitable for segregated routes		X	
Capable of being extended into town centres as on street or segregated tramways		X	X
Line of sight operation removes need for conventional signalling systems		X	
Single line operation controlled by axle counters	X	X	X
Frees up capacity at congested main line stations		X	X

Benefits

Light Rail designed stations used successfully on DB branch lines – 50% cheaper than heavy rail equivalent

No bridges or underpasses required for light rail stations

Sits alongside existing plans by Network Rail to reduce station design & build costs.

Diesel tram train at Wolfhagen

Kassel TramTrain

Mixed height platforms

Network Rail

Network Rail's view

'Think rail' using appropriate technology rather than tram or train

More flexible standards need to be agreed with industry and supported by DfT and ORR (HMRI)

Generic vehicle specification beneficial to industry

Available technologies should be trialled in UK to quantify benefits and identify barriers to development

In conjunction with trials, need to engage with scheme promoters to identify best rail based solution

Policy will be evidence based

Network Rail

Is inter-running on network and street tramways possible

Does it provide the right transport solution for stakeholders

Does it offer the best value for money option from a whole life cost perspective

Operation and maintenance savings

Revenue growth

Are required infrastructure changes manageable

e.g. low floor platforms, simplified signalling, line of sight operation

Does it enable passengers to travel from preferred point of origin to preferred destination

Network Rail

What happens next?

Trial between Network Rail, Northern Rail and DfT

Work could establish tram train as a new rail based transport option for the UK

Risk analysis of tram train operation

Acceptable crash worthiness

Acceptable train detection system

Acceptable wheel profile

Work with UK Tram and ORR (HMRI) to establish standards for tram train operation

Ensure Network Rail Route Enhancement teams engage positively with all promoters of tram train schemes

This will enable guidelines for the suitability of the tram train offering to be produced

Network Rail

New link to street tramway, Kassel

Conclusion

Tram train has the potential to provide a new passenger rail transport offering whilst reducing overall costs to UK plc

May drive upfront costs but lower whole-life costs

It will only be delivered if the wider industry work in partnership to make it happen

Network Rail

Department for Transport

Tuesday 18 March 2008 11:57

Department for Transport (Yorkshire and Humber)

Innovative 'Tram-Trains' to be trialed in Yorkshire

An innovative form of public transport called a 'tram-train' is to be trialled for the first time in the UK on a growing railway route in Yorkshire.

Five new tram-trains, which can run on both railway tracks and tram lines, will replace conventional trains currently used on the 37-mile Penistone Line between Huddersfield, Barnsley and Sheffield. Tram-trains are lighter and greener than conventional trains. They use less fuel and weigh less which reduces wear and tear on tracks therefore decreasing the need for disruptive maintenance works. Tram-trains have faster acceleration and deceleration rates so they can also offer passengers better journey times.

The trial, which starts in 2010 and will take two years, will look at the environmental benefits, operating costs and technical suitability of the tram-trains as well as testing how popular the vehicles are with passengers on the route. There is also an option for a second phase which would test the vehicles on the Sheffield Supertram system to see what additional benefits the vehicles can deliver when extended onto city centre tram lines.

The project is a partnership between the Department for Transport, the train operator Northern Rail and rail infrastructure owner Network Rail and seeks to establish whether tram-trains similar to those operating successfully in Europe are suitable for Britain's railway network.

Northern Rail, which is owned by Serco-Ned Railways, will run a competition for manufacturers to build the tram-trains, which Northern will lease, and Network Rail will spend £15m in track improvements and alterations to stations as part of the trial, significant funding in the route. DfT will contribute £9m to fund the operation of the trial and Northern will bring experience from Europe through Ned Railways who operate tram-trains in The Netherlands.

Transport Secretary, Ruth Kelly, said:

"Tram-trains will bring quicker journeys and offer a greener travel option for passengers in Yorkshire.

"This trial, the first in Britain, could herald the start of a new era in public transport. Passenger feedback is a vital ingredient in determining the success of the trial and I look forward to hearing what the people of Yorkshire think about the comfort and reliability of tram-trains."

Heidi Mottram, Managing Director, Northern Rail, said:

"We are very excited to be involved in testing this new form of public transport, which will mean higher levels of comfort and a faster journey for our customers on the Penistone Line.

"This is a great opportunity for us to develop our network and attract more people to use public transport in this part of Yorkshire."

Iain Coucher, Chief Executive, Network Rail, said:

"This trial gives us a fantastic opportunity to see whether the types of technologies used in Europe can be adapted for use on our systems. We expect the lighter vehicles will result in less wear on the infrastructure - extending its lifespan, improve journey times and give the option of running future commuter services closer into city centres.

"We want to use the trial to get evidence about the practicalities of the tram-trains and assess how beneficial they will be to the UK.

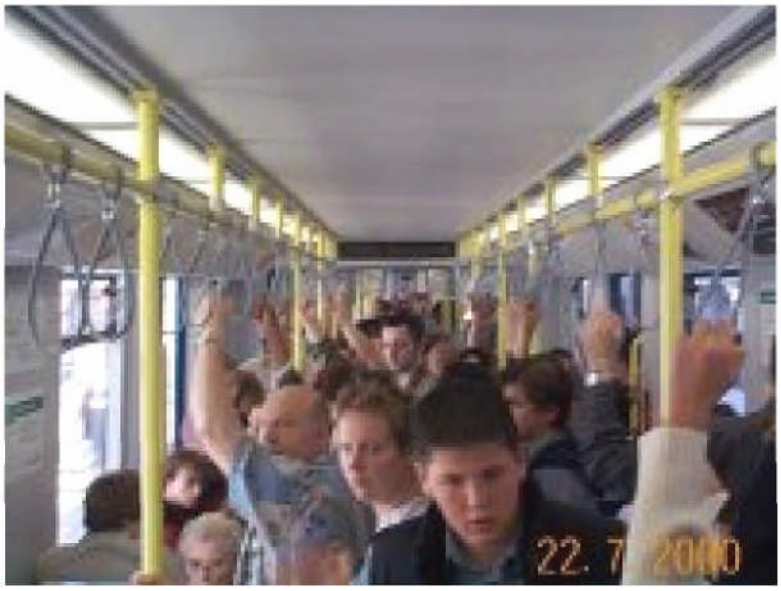
"The partnership between Network Rail, the DfT and Northern Rail ensures that the needs of passengers, operators, the infrastructure operator and the local and wider community are all represented."

The Penistone Line, one of the most successful Community Rail Partnerships, has been chosen for the trial because it offers the chance to test the tram-trains on a route that in part is for passenger trains only and in part for passenger and freight trains. A possible phase two of the trial will offer the potential for testing the tram-trains on the Sheffield Supertram.

24. Capacity

In most applications where trams are considered, the desired carried capacity of the line will be much less than the maximum capacity.

Capacity is only one of many reasons for tram selection over other modes. Environmental considerations can make trams an even more attractive option at lower vehicle capacity levels.



Courtesy Photo © S.J.Parascandolo Croydon Tramlink

Maximum capacity is only likely to be required for a few hours during peak hours, and even here there are variations both day by day and within each hour.

Careful calculations of vehicle requirements will eliminate travel rationing by cost and timetable

The capacity required originates from the route's social characteristics.

Evidence shows a healthy traffic growth outside the traditional peak travel time

25. Wider Benefits

Benefits can include:

The removal of many private vehicles journeys from the highway, freeing up traffic flows, reducing congestion and reductiing noise, pollution, vibration and dirt.

This will improve the local environment for workers, shoppers and visitors. The quality of ride in a smooth and comfortable vehicle is a key factor persuading commuters to leave their cars.

Reliability and public confidence, the sight of shiny rails in the road is re-assuring to the traveller by inducing the expectation of a tram to arrive.

26. Regeneration

A quality fixed rail system means that the authorities can offer a viable beneficial alternative to the dependence upon the car-culture within the Local Transport Plan (LTP) or Local Transport Strategy (LTS).

The city streets involved can then be returned to the original user, the pedestrian, and, where possible and appropriate, the cyclist, yet still be served by clean and sustainable public transport service.

A reclaimed "former red light district" Geneva

27. Utilities

The current UK practices of moving utilities such as gas, electricity, water & telecoms at the promoters' expense can make the building of tramways slow, disruptive and expensive. If street tram track was built by the more traditional methods, particularly without the use of deep reinforced concrete slabs, the issues of allowing access to utilities becomes simpler. Most utilities plant does not need to be moved, only protected against physical damage by the passage of the trams, with the possible exception of gas and water pipes, the latter particularly in view of the hidden damage they can do when a leak does occur. Even if a cable, or pipe does need to be replaced, then provided it is not too large, it is possible to dig a trench across the tramway, leaving the rails spanning the gap. At worst, there is such a thing as temporary tram track and pointwork, which allows trams to be temporarily diverted onto the other track whilst major works take place.

At the same time, I suspect that building tram track by the old fashioned methods is actually cheaper than the slab track methods that were used for the likes of Croydon, Manchester and Sheffield, for example.
Tram operators and developers with a robust attitude when negotiating need not pay for the moving of private and publicly owned utilities provided they allow the owners of the utilities access for maintenance etc. This can be done by initially identifying potential locations and building crossovers either side of the utility and use hypothecated savings to fund if need be, hire buses to connect the tram service.

The recent New Highways Act will require the utility company to restore the road & tramway to the previous standards. The utilities financial director will question the viability of such repairs and probably reroute their services at their expense elsewhere.

There is no legislation in the UK which states that the developer must pay for the moving of the Stats provided that the tram operator is prepared to stop his trams and give access. If the work requires complete access, the continental practice is to stop the trams, the passenger walks to the next tram the other side of the works and continue their journey or if it is just a bit too long the use of shuttle buses would be recommended. A bit of forward planning to established any major works not require yet but possibly at a latter time, cross overs or "Kleiterwieches" should be built

This was one of the main lessons learned from the upgrading of the West Coast Mainline. Customers do return if handled sympathetically and sensitively.

The recent upgrade and bustitution of Manchester Metrolink on the Altrincham & Bury sections are busier now after being closed for a large part of the summer of 2007

It is intended eventually to build Merseytram Line 2 using this
A variation of this method can bring down construction costs of £27m per track kilometer (Edinburgh 2008) to a very low manageable amount eliminating the horrors of construction experienced here in the UK
Some the savings will need to be hypothecated to the operating company
Central Amsterdam road space re-allocated, construction method of allowing access to and not moving the utilities

28. Regeneration and Social Inclusion

The enhancement of the streetscape in conjunction with other authorities such as Highways Dept, Lighting Dept, and Highways Agency etc. can result in a high quality city area and cost savings.

These enhancements can be made by the use of sympathetic and imaginative street furniture, planting etc. Many of these measures on their own enhance the ambience of the street scene.

A good example of this is the Liverpool Road (A5 7) Eccles Salford UK. Such improvements will generate new opportunities for business developments, regeneration of run-down areas through excellent transport links; rectify social exclusion and reduction of transport poverty.

The users from these areas of transport poverty soon become wage earners contributing to the local economy.

Over a longer term, the rails in the road are seen as a political statement and a confidence for the future.

Current experience has shown that these factors listed and others contribute to a greater modal switch, (27 %+) from cars to trams U K.

A tool for regeneration
A57 Salford

29. A direct role in Liveable Cities

Home Zone Logo

Tramway vehicles are generally electrically operated, smooth, quiet and pollution free (at the point of use), a mode of guided public transport. They can be used partly on street, often as part of a package of traffic calming measures e.g. Sheffield Halfway Route and include traffic free areas.

Trams are particularly effective when used as part of other projects such as part of a Clean Zone, Home Street Zone and traffic calming or re-assignment of road space.

Where partly segregated running is used, higher running speeds enable heavier traffic flows to be maintained in safety. At traffic pressure points, traffic lights, junctions etc., priority must be given thoughtfully to this mode as part of the passenger perception of speed and short journey times.

Trams can and do go almost anywhere in a city, town or neighbourhood, their versatility is all-embracing.

Trams can run in many locations & combinations, they can be used in dedicated lanes or trambahns, former heavy rail alignments, in quality bus service type partnership, as part of traffic calming schemes.

This will help to encourage the congestion bound motorist to consider and eventually use public transport.

The central reservation of urban dual carriageways including those with mature trees can be utilised, especially former tramway right-of-ways still available as green meridian strips in many cities.

Sheffield has a very good example of an elevated section used to cross over a very busy multiple junction emerging from the pedestrianised area of Fitzalan Square.

There are over 460 light rail and tramway systems worldwide.

Probably what does come as a surprise is that 76 of them opened from 1980 onwards.

The number of Guided Busways, a known technology, is less than ten worldwide.

30. Low cost Alternatives

Over the years, various low cost alternative solutions have been tried with marginal success. In most cases such as new and better roads, traffic management schemes have been tried and, just like digging in sand, the new roads fill up quickly.

These have generally been short-term gains, lowest cost options mainly involving paint and more signs.

Although many were well thought out, most have been overwhelmed by sheer numbers. The modest success that has been achieved has often been at great expense.

Time and experience have shown that the range of quick-fix solutions have been tried and been found wanting so far! It is only prudent when considering some of these soft or smart options that they may onlysucceed indeferringthe major projectwith asubsequent costs increase when the tramway project has eventually to be built.

A low-cost but expensive try but not as successful so far as a modern tram

The late 1990's approach was to combine these smart, soft solutions with suppression of demand - a mix of artificially altering the economics of private car usage, the provision of attractive alternative modes.

Climate change is with us now and the costs of disruption etc. will have to be grasped. Tinkering simply does not work on the scale needed and there is ample evidence to convince that the "do-nothing" option has gone – if it was ever there.

3 1. Tourist Trams and City Centre People Movers

Trams in another guise in liveable cities are already being used on a large scale. In some cities, notably in the USA, heritage tramways have been built mainly to accommodate tourists, but these have been successful in use for normal public transport.

Many people will be familiar with the concept of a working museum. One such museum in the UK is the Crich Tramway Village. Now take that concept of a vintage tramcar ride and put it back in its real world doing a real job in urban streets. The Heritage Tramway line is the result. Examples are available from many countries. Portland Oregon USA has gone to the trouble to get modern-built old -looking trams (Streetcars) to provide tourist service on tracks supporting the MAX light rail system.

The recent major extension of the "F" line in San Francisco for tourist use has been exceeded by the patronage of predominately local traffic and has achieved passenger loads in excess of initial capacity showing the tremendous payback potential.

A restored vintage car meets the ferry
at Woodside Birkenhead

The newer concept of heritage operation by itself can be seen in a growing number of towns and cities worldwide.

In Britain, the Birkenhead Tourist tram operation is very much a central part of the serious efforts to improve the whole central area although it is proceeding slowly. This tourist or starter line concept can be used very successfully on privately owned land such as Theme Parks, National Exhibition Centre (NEC) and other similar large areas. The concept proved to be a significant attraction at the Garden Festival sites in Glasgow and Gateshead in 1988 and 1990.

It can also play a major part as a people mover for the redeveloping of former industrial areas, which have difficult access, and/or it is undesirable to build additional roads such poor access Brownfield redevelopment sites

A good application would be in the Leith Port redevelopment area north of Edinburgh. A low cost vintage tramway on Port Authority land would not require much in the way of Parliamentary Powers, a considerable saving in itself. This system could comfortably "piggy-back" onto the eventual town tramway system bringing tourists from the central tourist areas of Princes Street and at the same time address inexpensively the transit requirements of the new residents and workers in the port area. A tourist tramline along these lines is proposed for Rhyl North Wales.

Another good example of this is the Max town system in Portland Oregon linking to the commuter light rail system. Many examples of this type can be found in the USA, which has shown that the heritage trolley coupled with traffic management can win over the motor lobby. McKinney Avenue in Dallas, Memphis TN, Lowell MA and Seattle WA plus several more show the starter lines pushing for extensions.

The "F" Line San Francisco tourist line previously referred to was built on the cleared site of the former double deck highway, which collapsed during an earthquake. Originally the line was intended for tourists but when it opened it was found very quickly by the locals and used by them as a routine transport system. This has resulted in a high density frequent service to cope with the unexpected new source of users.In Arnhem, Holland, it is proposed to extend the tramway at the open-air museum along a new radial route into the city centre!

Despite the Exchequer funded cost saving Eddington Report disparaging Grande Projects we have as individuals and collectively, a duty to subsequent generations that follow us. This obligation is very relevant for large projects such as laying down tramways, which will last several generations and straddle the centuries. We lost our tramway inheritance from the last generation but we can rectify that wrong by learning from the past.The last generation was seduced and sent up the dead-end road of the rubber wheeled internal combustion engine and irresponsibly damage our world. This has resulted in a polluted and congested western world, with the third world hard on our heels to repeat our mistakes. It appears that the Department for Transport as the modern successors to the Board of Trade have not learnt from the past and are still advocating the failed policies of the past which have greatly contributed to Global Warming.As a nation and society and in accordance with the recent Stern Report, we have to grasp the costs of change, temporary disruption and costs, acknowledging that these changes will be expensive, time-consuming, and that there are no easy fixes. By installing a tramway in a town, city or connecting dormitory towns in to a larger transport corridor, we will start to prime the pump to reduce the draconian cost to our citizens and nation. This will and help minimise Climate Change effects and additional ill health and death. This will also reflect over a period of time, a reduction in the annual cost to our National Health Service and to any private Health plans we may have.

Although every scheme would like to be the biggest and best, it is possible to build a low cost "Starter" Tramway, Kenosha Wisconsin USA. A successful starter system would then be able to upgrade and expand from its own resources. This method also minimises the cost of any failure.

As part of an integrated transport system, it will be possible to start combating the scourges of congestion and pollution. By doing so people will be given that great gift of democracy - the freedom of movement within our towns and cities.

32 Ultra Light Rail

Ultra-Light Rail provides new options for local transport. Its environmental performance, attraction to passengers (including car drivers) *DfT Statistics,*

Affordability means that transport opportunities previously considered only for large centres of population can now be offered to smaller communities and rural areas.

The Ultra Light Rail mode is particularly suited to solving two of the main challenges facing local transport planning: High Costs and Low Numbers. Implementing high quality ultra-light rail public transport in smaller urban centres will reduce the need for public subsidy to local railway services

With Ultra-Light Rail in this example the Parry People Mover, these two challenges can even be merged into one solution.

Many local railways serve inconveniently sited stations, where housing, leisure and economic activity have moved away from the local railhead. By changing the railway to light rail type operation using PPM technology, the service can be diverted off the existing route and on to streets, and brought directly to local people and businesses.

Community Light Rail at work, ease of access at Stourbridge Station,

Southport Pier, Fully disabled compliant 2006Englands latest Tourist Tramway carried in excess of 20,000 passengers

33. Transport Select Committee Press Release

Publication of Report
DEPARTMENT FOR TRANSPORT ANNUAL REPORT 2006
Department for Transport failing in its duty to the public

The DfT is failing to meet its Public Service Agreement targets. This is the finding of the Transport Committee's Report into the Department for Transport's Annual Report 2006, published today.

In setting the PSA targets in 2004, the Government announced the targets were a contract between the Government and the public: an indication of what should be expected from the expenditure. Despite spending £13.5 billion in 2005–06, the Department for Transport is on track to meet only two of its seven targets: those for road safety and rail punctuality.

The Department is failing to deliver in all other areas: against its two targets for congestion, targets for public transport patronage, air quality and carbon dioxide emissions.

Committee Chairman Gwyneth Dunwoody MP said:

"This is a terrible picture of failure. The Department's only successes are against road safety and rail punctuality targets. And I imagine that most rail users would be surprised to hear their experiences described as the pinnacle of the Department's annual achievements, whilst success against the road casualty targets is subdued by the daily toll of death and injury."
The Report calls on the Department for Transport to recognise its increased political weight among Departments, and calls for high quality administration and strategic planning to match its status. Mrs Dunwoody said: "The Department has not presented any evidence to convince us that the next five years will bring a radical change in performance. The DfT lacks a clear strategy of what it wants to achieve.
Without this vision, it also lacks a timetable of policies which are necessary to bring improvements."

The Report welcomes the Department's efforts to move forward the debate on road pricing. But warns against making local authority road pricing schemes an eligibility criterion for receiving central Government investment. Mrs Dunwoody commented: "We recognise the need to trial road pricing on a small-scale ahead of any national scheme, and support the Department's aim of developing common technologies and approaches at this stage to ensure lessons can be shared. But road pricing will not solve all the problems of the road network, and other measures, including better and affordable public transport, must also be taken forward."

The Report condemned the fact that transport is the only sector of the economy in which greenhouse gas emissions have been rising consistently since 1990 and are projected to carry on rising. Mrs Dunwoody said: "To date, transport has not been pulling its weight in the UK's efforts to avert climate change."
She added: "The Department continues to neglect its responsibility to improve air quality. As a result people die in large numbers each year. It must make air quality a priority." The Report notes that the Committee on the Medical Effects of Air Pollutants Great Britain estimates that respiratory disorders associated with particulates are responsible for 8,100 additional deaths and 10,500 additional hospital admissions in the UK each year.

Members of the Committee: Gwyneth Dunwoody (Chairman) (Crewe and Nantwich), David Clelland (Tyne Bridge), Jeffrey M Donaldson (Lagan Valley), Clive Efford (Eltham), Louise Ellman (Liverpool Riverside), Philip Hollobone (Kettering), John Leech (Manchester Withington), Eric Martlew (Carlisle), Lee Scott (Ilford North), Graham Stringer (Manchester Blackley), David Wilshire (Spelthorne).

Press Notice 1 6/2006–07 15 February 2007

: DfT's Public Service Agreement Targets

PSA Target			**Target met / on track?**
1	Road congestion – strategic roads	By 2007–08, make journeys more reliable on the strategic road network.	x
2	Road congestion – local roads	By 2010–11, the ten largest urban areas will meet the congestion targets set in their Local Transport Plan relating to movement on main roads into city centres. The target will be deemed to have been met if, on target routes in the ten largest urban areas in England, an average increase in travel of 4.4 per cent is accommodated with an average increase of 3.6 per cent in person journey time per mile.	**X**
3	Rail	Improve punctuality and reliability of rail services to at least 85 per cent by 2006, with further improvements by 2008.	/
4	Bus and light rail	By 2010, increase the use of public transport (bus and light rail) by more than 12 per cent in England compared with 2000 levels, with growth in every region. ***Are these two merged to disguise bus failure?***	**X**
5	Road safety	Reduce the number of people killed or seriously injured in Great Britain in road accidents by 40 per cent, and the number of children killed or seriously injured by 50 per cent by 2010 compared with the average for 1994–98, tackling the significantly higher incidence in disadvantaged communities.	/
6	Air quality	Improve air quality by meeting the Air Quality Strategy targets for carbon monoxide, lead, nitrogen dioxide (NO_2), particles (PM 10), sulphur dioxide (SO_2), benzene and 1,3-butadiene. (This is a joint target with DEFRA). ***Modal switch to tram would go a long way to achieve this target!***	x
7	Climate change	To reduce greenhouse gas emissions to 12.5 per cent below 1990 levels in line with our Kyoto commitment and move towards a 20 per cent reduction in carbon dioxide emissions below 1990 levels by 2010, through measures including energy efficiency and renewables. (This is a joint target with DEFRA and DTI). *Again modal switch to tram & local power generation schemes will address this point*	x
–	Efficiency	The SR2004 Efficiency target to achieve annual efficiency gains of 2.5 per cent against the Departmental Expenditure Limit **is not a PSA target.**	/

The Regional Transport Strategy role of Tramways & Light Rail

There are many benefits of the tram can be seen by the number of overseas systems being built but these benefits are steadfastly ignored by the politicians and transport planners on this little island of ours. It is time that this mode was re-adopted for the many reasons given in this paper. By using some of the methods outlined in this paper it is perfectly possible to build a "low cost starter tram system "which with careful consideration and selection of the routes will build up into a beneficial liveable revenue-earning asset to the city, town & community.

A Parry People Mover, Stourbridge, England

Using light rail techniques, the following are made possible:

1. Frequent stopping points, realignment of the route to serve the way people live today,

3. More, easier crossings eliminating of the severance between communities caused by railways

5. A more attractive, more acceptable and more affordable transport system

7. The concept works hand in hand with the growing Community Railways movement, now included in UK Government transport policy.

The near future technology promises a step change in the prospects for this mode of transport, hybrids being a stepping stone towards fuel cell vehicles which will not require overhead wires in the urban area and emitting only water as a by product. Local fuel generation schemes fit comfortably with this mode of transport!

The "back-to-the-future" option of the Heritage Solutions certainly gives many Towns and Cities a low cost option when viewed with a little imagination

Disabled access enabled Tourist tram Southport England

34. The near future tram vehicle:

A little thought for the vehicles themselves must be given and how they will contribute to the Livability of Cities

Most of the technology used is tried and tested using a mixture of electric overhead wire and steel twin rails in the ground but in recent years a number of other technologies are now tried, tested and are in general public service

As an interim step, hybrid trams can use bus technology, some of which is in service in London and in greater numbers in Silicon Valley California. These represent a particularly attractive application of the technology in conjunction with steel rails, since they operate mainly in urban areas, where the fuel efficiency and CO2 reductions offered by hybrids are greatest, and where hybrids' capability to run partly on zero tailpipe emission battery mode is of particular value. Bordeaux operates a modern tram system with much of it devoid of overhead wires by adopting a sub-surface conduit system or current collection in the historic areas while reverting to a conventional wire system elsewhere.

Scotland has a significant bus and the UK a taxi-manufacturing sector which could manufacture these vehicles and will have a strong industrial interest in being in the forefront in the development of hybrid trams as well as buses and taxis. A fuel cell tram has been developed and is in service in Japan. The fuel cell combines hydrogen and oxygen to produce electrical energy. This electrical energy can be used to drive a vehicle, or indeed can be put to any other use.

Fuel cell technology promises clean, efficient and quiet operation and is now being promoted for a range of operations including mobile phones, laptop computers, power stations, combined heat and power applications, including domestic-scale CH P, and motor vehicles This traction technology is not quite here yet so is expensive at the moment but costs will reduce with development and economy of scale

For transport applications, the hydrogen can be stored on the vehicle either in liquid or gaseous form, or in a hydrogen rich fuel such as methanol or petrol. The oxygen is taken directly from the air. Many different manufacturers are developing fuel cell prototypes

A low cost Tram? All it needs are bogies & rails!

35. Cargo Tram

The concept of a Cargo tram is an old idea whose time has now returned. A number of cities around the globe are successfully using trams to take a significant tonnage off the city streets. The latest example of the flexibility of trams is in Amsterdam Holland. This scheme is now in the process of being implemented (24th November 2006). The Amsterdam city administration has set conditions for cargo transport by tram.

The city's appearance will become quieter and bicycle safety will improve. Reducing the number of LGVs will reduce congestion and air pollution. The municipality expects a 1 5% fine particle reduction as a result. The City Council has stipulated that a cargo tram must not interfere or harm passenger trams. Cargo trams are only allowed to ride between 7 am and 1 1 pm. These conditions pose no problem for City Cargo Company. The city council members are enthusiastic about the concept. The trams will only use tram routes that are not heavily used by passenger trams and they will only stop on 'dead tracks' that passenger trams do not normally use.

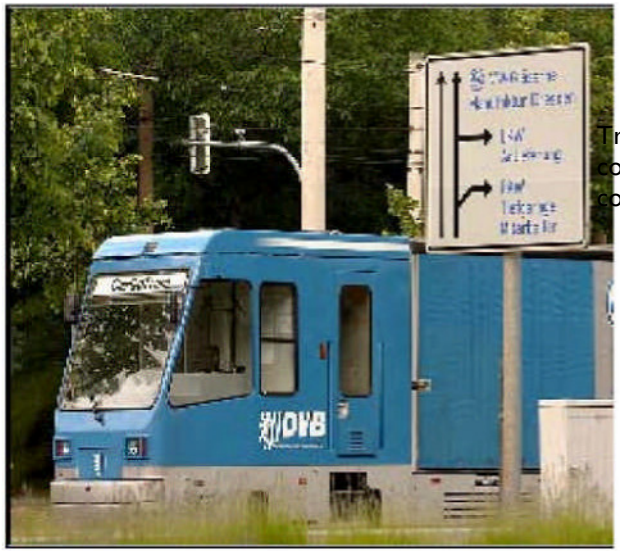
More tram freight capacity will become available when the construction of the North/South line is completed; this will allow certified 'quality taxis' to use the public transport lanes.

City Cargo will start a pilot in Amsterdam West by the end of December 06 or early January 2007. Trams will be rented from the Municipal Transportation Company (GVB) and will be slightly modified.

The company will build its own trams eventually and intend to enter the city from the North, East and south as well. The standard road haulage spoke & hub configuration will be used and established on an industrial area on the outskirts of Amsterdam on a tramline

Potential clients include transportation companies, which now waste considerable time caused by congested routes in and out of town

The Regional Transport Strategy role of Tramways & Light Rail



Trams are used to supply a Volkswagen factory in Dresden and to collect refuse in Zürich, but in those cases the concept is far less complicated.

The Cargo Tram is a good example of how with a little forward thinking, this mode can be developed in the Freight Mode with the subsequent benefits to the concept of Liveable Cities

36. World Oil Production

Steep decline in oil production brings risk of war and unrest, says new study

· Output peaked in 2006 and will fall 7% a year
· Decline in gas, coal and uranium also predicted

Ashley Seager
Monday October 22, 2007
The Guardian

World oil production has already peaked and will fall by half as soon as 2030, according to a report which also warns that extreme shortages of fossil fuels will lead to wars and social breakdown.

The German-based Energy Watch Group will release its study in London today saying that global oil production peaked in 2006 - much earlier than most experts had expected. The report, which predicts that production will now fall by 7% a year, comes after oil prices set new records almost every day last week, on Friday hitting more than $90 (£44) a barrel.

"The world soon will not be able to produce all the oil it needs as demand is rising while supply is falling. This is a huge problem for the world economy," said Hans-Josef Fell, EWG's founder and the German MP behind the country's successful support system for renewable energy.

The report's author, Joerg Schindler, said its most alarming finding was the steep decline in oil production after its peak, which he says is now behind us.

The results are in contrast to projections from the International Energy Agency, which says there is little reason to worry about oil supplies at the moment.

However, the EWG study relies more on actual oil production data which, it says, are more reliable than estimates of reserves still in the ground. The group says official industry estimates put global reserves at about 1.255 giga barrels - equivalent to 42 years' supply at current consumption rates. But it thinks the figure is only about two thirds of that.

Global oil production is currently about 81 m barrels a day - EWG expects that to fall to 39m by 2030. It also predicts significant falls in gas, coal and uranium production as those energy sources are used up.

Britain's oil production peaked in 1999 and has already dropped by half to about 1.6 million barrels a day.

The report presents a bleak view of the future unless a radically different approach is adopted. It quotes the British energy economist David Fleming as saying: "Anticipated supply shortages could lead easily to disturbing scenes of mass unrest as witnessed in Burma this month. For government, industry and the wider public, just muddling through is not an option any more as this situation could spin out of control and turn into a complete meltdown of society."

Mr Schindler comes to a similar conclusion. "The world is at the beginning of a structural change of its economic system. This change will be triggered by declining fossil fuel supplies and will influence almost all aspects of our daily life."

It is estimated simply by projecting the rise of the cost of a barrel of oil over the last 15 years and projecting the same rate of rise forward, by the end of the Olympic oil will be costing around £16.00 per gallon retail. During the summer of 2008, the cost of a barrel cost $149.00 then dropped back to just half the increase. The underlying trend is upwards.

Jeremy Leggett, one of Britain's leading environmentalists and the author of Half Gone, a book about "peak oil" - defined as the moment when maximum production is reached, said that both the UK government and the energy industry were in "institutionalised denial" and that action should have been taken sooner.

"When I was an adviser to government, I proposed that we set up a taskforce to look at how fast the UK could mobilise alternative energy technologies in extremis, come the peak," he said. "Other industry advisers supported that. But the government prefers to sleep on without even doing a contingency study. For those of us who know that premature peak oil is a clear and present danger, it is impossible to understand such complacency."

Mr Fell said that the world had to move quickly towards the massive deployment of renewable energy and to a dramatic increase in energy efficiency, both as a way to combat climate change and to ensure that the lights stayed on. "If we did all this we may not have an energy crisis."

He accused the British government of hypocrisy. "Tony Blair and Gordon Brown have talked a lot about climate change but have not brought in proper policies to drive up the use of renewables," he said. "This is why they are left talking about nuclear and carbon capture and storage."

Yesterday, a spokesman for the Department of Business and Enterprise said: "Over the next few years global oil production and refining capacity is expected to increase faster than demand. The world's oil resources are sufficient to sustain economic growth for the foreseeable future. The challenge will be to bring these resources to market in a way that ensures sustainable, timely, reliable and affordable supplies of energy."

The German policy, which guarantees above-market payments to producers of renewable power, is being adopted in many countries - but not Britain, where renewables generate about 4% of the country's electricity and 2% of its overall energy needs.

36. Light Rail Facts

Since NET (Nottingham Express Transit) Line One opened in March 2004, it has achieved over 8.4m passengers in the first year of operation and 9.7m in the second.

Public transport usage in the NET corridor is up by 20% in the peak periods – road congestion has been reduced by as much as 9%.

30% of NET tram passengers have directly transferred from car or Use Park and ride.

Light rail has a proven ability to attract motorists out of cars - car use has dropped by nearly 19% in Croydon, south London, since the tram scheme began operations in 2000.

The Croydon light rail scheme has encouraged an excess of £2 billion in inward investment into the area, including two major retail schemes (£1 .5 billion), an arena and office development, a rebuilt and redeveloped major concert hall, two multi screen cinema complexes with bars/restaurants and sports club facilities, industrial warehouse/retail development, office development and housing development. A particularly under-privileged area of Croydon has seen a 35% reduction in joblessness since the light rail scheme was launched. Since the Tramway was built, residential property prices in Croydon have increased by 14% more in those areas close to the tram. The Transport for London business case for Cross River Tram quotes economic benefits of more than £ 1 .5 billion and a benefit-cost ratio of more than 3 (or 2 when allowing for the most pessimistic cost estimates).

Significant modal shift - between 20% and 40% DfT Statistics, from the private car has occurred in cities where LRT has been introduced.

22 million + car trips a year have been taken off the roads by light rail schemes in the UK.

There has been a 52% increase in patronage on UK light rail schemes since 1999 according to the Department for Transport.

DfT statistics show that overall traffic levels have increased by over 80% and car traffic levels have increased by more than 85% since 1980.

In 2002/03 Manchester Metrolink carried 18.8 million passengers. Metrolink's research suggested that about 2 million car journeys had been taken off the road each year, equivalent to 10% of total car journeys along the Metrolink corridor.

A survey, carried out in 14 European cities, which has conducted research on the effectiveness of light rail on modal split, showed that on average 1 1% of the new passengers formerly came by car

(Hass-Klau, C. et al, 2003, Bus or Light Rail: Making the Right Choice)

In Karlsruhe, Germany, the Karlsruhe-Bretten integrated public transport system saw a 600% increase in public transport patronage, 40% of passengers were former car users and only 25% of the light rail users were previous Deutsche Bahn rail users

(PTEG, 2005, What Light Rail can do for cities, Appendices, Steer Davies Gleeve).

In Rennes, the proportion of people coming into the city by public transport rose from 35% to 50% following the introduction of the metro. Looking only at the metro corridor this percentage rises even further to 60%, demonstrating a reduction in car usage.

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Summary translated by Roy Budmiger

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*Western Norway Research Institute (WN RI)

WNRI is a non-profit foundation, established as an independent research institute in 1985. The institute is part of Norway's national research system, and has a close co-operation with

The Regional College of Sogn og Fjordane.

WNRI employs a staff of 30.

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