PROJECT

URBAN TRACK

Urban Rail Infrastructure

Funding: European (6th RTD Framework Programme)
Duration: Sep 2006 - Aug 2010
Status: Complete with results
Total project cost: €18,590,475
EU contribution: €9,998,350

Call for proposal: FP6-2005-TRANSPORT-4
CORDIS RCN: 84718

Background & policy context:

New urban rail systems (LRT, tram, metro) face opposition to the installation of new tracks from residents living nearby. This often-organised resistance delays the necessary authorisations. Their arguments are about noise and vibration disturbance during construction and exploitation, reduced revenues for businesses during construction, and general quality of life concerns over things such as safety, reduced property values and neighbourhood attractiveness.

Besides these human factors, there are also a number of technical issues that increase the project costs and thus require improvement. The cost of classical urban track construction is very high, especially for embedded tram tracks, which include the complete renovation of the roadbed and, in some cases, also the sewerage system. Track renewal methods are cumbersome, time consuming and often need complete closure of a section.

There is almost no standardisation within the same network. On a broader scale, there is no uniformity of functional requirements between networks, making it hard to transfer rolling stock from one network to another. Urban networks often also face internal challenges. Investment costs and maintenance costs are generally covered by different authorities that may have opposing interests, and prevent LCC-based (life-cycle cost) decisions. This is further exacerbated by the fact that no generally accepted method exists to assess the total life-cycle cost of urban track systems.

Objectives:

The general objective of the project is to deliver an integrated series of modular track infrastructure solutions at low cost, with no or little maintenance, high availability, constant comfort and ensuring great punctuality, all this in an environmentally friendly and safe manner. In order to reach these objectives, quality and attractiveness of the tracks have to be increased and new technologies and standardisation (harmonisation) have to be introduced in the process.

The project aims at developing five innovative new products in the urban track sector:

1. Prefabricated track modules (product/solution 1)
2. Green LRT/tram tracks (product/solution 2)
3. Embedded metro tracks (product/solution 3)
4. Alternative low cost tracks for floating slab in tunnel and at grade (product/solution 4)
5. Maintenance free interface between rail and street pavement for embedded tracks (product/solution 5)

as well as six innovative analysis methods:

1. Innovative track installation methods (new tracks) (method 1)
2. Automated track installation (method 2)
3. Fast renewal and refurbishment methods (LRT/tram) (method 3)
4. Cost/benefit analysis method for urban rail infra works (LRT/tram) (method 4)
5. Preventive and predictive maintenance for metro tracks (method 5)
6. Techniques for reducing wear in curves and turnouts (LRT/tram) (method 6)

and three innovative reference documents:
1. Harmonised standard for 'Rail Transit Track Inspection and Maintenance' (metro) (standard 1)
2. Harmonised LCC calculation method (standard 2)
3. Harmonised functional performance specifications (standard 3)

The products will be integrated into a family of solutions within the function of the track type (metro, tram shared, tram segregated) and in function of the network's specific needs. Validation will be carried out in ten networks (each validating another type of infrastructure or solution). The evaluation will be based on criteria such as operational availability and cost.

The project aims at a reduction of the LCC by at least 25% for new projects. The project findings will be validated by integrating them at a large number of test sites belonging to the end-user partners (networks)

**Methodology:**

The URBAN TRACK project, which considers new and existing lines as well as metro, LRT as well as tram tracks, is subdivided in different subprojects with specific objectives.

- Subproject SP1 targets new tracks and revolves around the following new products/solutions: prefabricated track modules, green LRT/tram tracks, embedded metro tracks, alternative low cost tracks for floating slab in tunnels and on gradients, maintenance-free interface between rail and street pavement for embedded tracks, innovative track installation methods, automated track installation.

- SP2 targets existing tracks and covers the following new methodologies for track maintenance, renewal and refurbishment: fast renewal and refurbishment methods of existing tracks (LRT/tram), cost/benefit analysis method for urban rail infra works (LRT/tram), preventive and predictive maintenance for metro tracks, techniques for reducing wear in curves and turnouts (LRT/tram).

- SP3 designs and implements these solutions at selected test sites.

- SP4 develops a LCC model and an associated software tool. It also looks at the socio-economic cost of track construction for nearby residents and shops.

- SP5 develops harmonised technical recommendations for rail transit track inspection and maintenance (as input for future standards), as well as harmonised functional performance specifications. It should be noted that the network operators/infrastructure managers are the drivers of this project.

**Parent Programmes:**
FP6-SUSTDEV-3 - Global Change and Ecosystems

**Institute type:** Public institution

**Institute name:** European Commission

**Funding type:** Public (EU)

**Lead Organisation:**

Dynamics, Structures & Systems International

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## Partner Organisations:

### Société Des Transports Intercommunaux De Bruxelles

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**EU Contribution:** €0


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Key Results:

Of all the work packages carried out, particular attention was given to SP4 ‘Life Cycle Cost / Socio Economic Cost’. The main ambition of Urban Track was to develop and build an integrated family of ‘maintenance-free’ modular track infrastructure solutions, that lead to a substantial reduction (target of 25% of LCC reduction) in track global infrastructure costs, with a significant increase of the availability of track infrastructure. Within the scopes of the work packages of SP4, an LCC methodology and software tool were developed to enable other project partners to evaluate their new systems and procedures and to determine whether or not the expected LCC reduction was obtained.

The other project results could be summarised with development of innovative track products, systems and construction methods, as well as new innovative track maintenance methods, supported by a comprehensive LCC model and its accompanying software. These innovative construction methods are developed in conjunction with a harmonised new item for a standard on ‘rail transit track inspection and maintenance’ and harmonised functional performance specifications.

Technical Implications

The developed track design was tested and designed to cover the demands made on tram tracks. A well covered naturated sight was displayed straight after installation. Life cycle costs were reduced compared to the reference track due to the implementation of high quality long lasting materials and low maintenance needs of the vegetation system. The track is drivable due to plastic paver, which can take up to 20 t axle load. The vegetation system was designed to improve water balance in urban areas.

Laboratory tests proved that sedum plants accumulate fine and coarse dust and thereby help to improve local air quality. The developed vegetation system aimed at mitigation of tram noise by using substrate with bigger grit size and by replacing the reverberant parts of the track by noise absorbing materials (drain concrete, porous rubber, and sedum paver). As laboratory tests showed a noise reduction of at least 2 dB (A) were achieved. Moreover, sedum plants can widely be used within the northern hemisphere, as long as the system is adapted to local conditions. Each location places certain demands to vegetation systems by its geographic position, its micro climatic situation and very local conditions, which need to be considered during planning.

Still, two kilometres of double track already make up one hectare. Thus regarding the urban and climatic trends, the naturation of building surfaces with its huge expanse poses several potentials which should be paid attention to. The developed track design using sedum paver and noise absorber offers a tool to use this potential.

Policy Implications

The harmonised documents developed within the URBAN TRACK project will promote the standardisation of track systems. Besides these cost savings, the improved quality of the track construction methods will result in reduced fatigue damage and longer service life; two factors that benefit safety. The new track systems will benefit the environment through better aesthetics, controlled noise and vibrations.

Documents:  
* [D0602_M48_UITP_SP1.pdf](D0602_M48_UITP_SP1.pdf) (Other project deliverable)

STRIA Roadmaps:  
* Infrastructure

Transport mode:  
* Rail transport

Transport sectors:  
* Passenger transport, Freight transport

Transport policies:  
* Safety/Security, Societal/Economic issues

Geo-spatial type:  
* Network corridors