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European Cooperation
in Science and Technology
- COST -

Secretariat

Brussels, 16 December 2010

COST 4210/10

MEMORANDUM OF UNDERSTANDING

Subject :	Memorandum of Understanding for the implementation of a European Concerted Research Action designated as COST Action TU1004: Modelling Public Transport Passenger Flows in the Era of Intelligent Transport Systems

Delegations will find attached the Memorandum of Understanding for COST Action TU1004 as approved by the COST Committee of Senior Officials (CSO) at its 180th meeting on 1 December 2010.

MEMORANDUM OF UNDERSTANDING
For the implementation of a European Concerted Research Action designated as

COST Action TU1004
MODELLING PUBLIC TRANSPORT PASSENGER FLOWS IN THE ERA OF INTELLIGENT TRANSPORT SYSTEMS

The Parties to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 4159/10 "Rules and Procedures for Implementing COST Actions", or in any new document amending or replacing it, the contents of which the Parties are fully aware of.

2. The main objective of the Action is to develop and disseminate up-to-date, comprehensive, and reliable transit assignment models to support an effective and efficient use of public transport resources in the era of Intelligent Transport Systems.

3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 28 million in 2010 prices.

4. The Memorandum of Understanding will take effect on being accepted by at least five Parties.

5. The Memorandum of Understanding will remain in force for a period of 4 years, calculated from the date of the first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Chapter V of the document referred to in Point 1 above.

A. ABSTRACT AND KEYWORDS

The challenge of sustainability that the European Union is facing calls for a shift of the demand for mobility from individual to collective means of transport. Hence more attractive public transport systems are required, above all in urban contexts. Since a shortage of funds for public transport is envisaged for the next years, efforts are needed to allocate money in the most effective and efficient way. Transit assignment models describe and predict the patterns of network usage by passengers, which are a fundamental input for transport planning. The models currently used do not take adequately into consideration the effects on transit operations and transit user behaviour of increasingly advanced and widespread Intelligent Transportation Systems, nor do they exploit to the full the amount of high quality data made available by such new technologies. This deficiency can delay the realisation of the benefits of enhanced passenger information provision. This Action gathers together researchers in the field of transport and urban and regional planning, transport operators and authorities, consultancies and software developers with the main aim of giving rise to and disseminating a new generation of transit assignment models tailored to the era of Intelligent Transport Systems.

Keywords: Public transport; Assignment models; Intelligent Transport Systems; Experimental approach to transit modelling

B. BACKGROUND

B.1 General background

In the history of civilization mobility has always been a key element of development, since an effective transport system is key for a society to flourish within its boundaries and to set steady and fruitful relations with its neighbours. Contemporary life styles are not conceivable without mobility (indeed one of the events which marks the beginning of the modern era was travel, namely that of Columbus to the New World). Transport is fundamental to the economy both as a factor of production and as a productive sector in itself.

In the European Union – and in most developed countries – freight and passenger mobility and wealth have been growing at a similar pace in recent years (as shown by data for European transport systems, see European Commission, 2009, and European Commission, 2010). Such a correlation implies that a rise in the demand for mobility takes place when the economy grows. However, a rising demand for mobility clashes with limits on available natural and economic resources, and increases the number of accidents, with its heavy cost in terms of injuries and fatalities. The sustainability of mobility is further endangered by urbanisation, which is expected to continue steadily, with 84% of European population living in cities by 2050. In fact a greater urban sprawl is likely to augment the current levels of urban traffic which already accounts for the largest share of delays due to congestion and of emissions from road transport. A particular challenge to the EU transport system is posed by the ageing population, which calls for a higher security and reliability of transport and requires an increasing social expenditure (pension payments, health, care and nursing), leading to a reduced availability of public resources for transport.

The reduction of the environmental footprint and energy consumption as well as the promotion of safety and security are strategic objectives of European transport policies at international, national, and local levels. A main means to reach such targets is through a modal shift from road to more sustainable modes of transport. In the context of passenger mobility, such a transfer is from individual to collective means of transport. Much hope is invested in Intelligent Transport Systems (ITS), which can make the demand for mobility more rational, optimize the usage of networks and services, improve the efficiency of vehicles, foster safety and security, and increase trip comfort.

Public transport in the European Union is much less used than private transport: in 2008 in billion passenger kilometres about 4,700 were travelled by private cars, 550 by buses and coaches, 400 by trains only less than 100 by trams and metros. The situation appears even less encouraging when one looks at the trends: whereas the passenger kilometres for private cars increased by about 20% from 1995 to 2008, the analogous increase recorded for buses and coaches is 10%, 14% for trains, and 12% for trams and metros (European Commission, 2010). This occurred notwithstanding the enhancement of the high-speed rail network; the augmented average speed of metros, trams, and buses on dedicated lanes; and the generally increased convenience of collective urban transport.

Efforts have been made with respect to regulation, with the European Commission adopting a Action concerning passenger rights in December 2008. Nevertheless, consumer satisfaction with public transport services (in particular with bus and rail) is still very low. Private cars have intrinsic advantages over collective modes, deriving from their greater flexibility of use.

Given the undoubted benefits of public transport in terms of resource consumption (note that in the developed countries, especially in the urban areas, a scarce resource is space), governments often subsidize public transport to help it compete with cars. Moreover, governments at all levels have to provide at least a minimal public transport service for equity reasons. Hence, around 50% of public transport operating costs are already covered by public funds. In a situation characterized by a general shortage of public funds, increasing requests for the social expenditure, and a slow recovery from the world financial and economic crisis which has reduced the amount of private investment, it is evident that in the near future less funds will be available for further investment in public transport and so increasing its attractiveness will have to rely on efforts to optimize the use of existing resources.

Innovation in general and in particular that in the field of intelligent technologies is crucial in dealing with problems related to mobility, and European Union is heavily investing in this (for example, the GALILEO projects). Currently many applications to transport systems can be found: dynamic traffic management (e.g. adaptive traffic light regulation or enforcement of varying speed limits), electronic tolling, route and parking guidance, driver assistance systems (e.g. electronic stability control or lane departure warning systems), to mention only the better known developments from the land mobility sector. ITS are transforming the way in which transport services of all modes are run by providers and used by travellers. They are also opening up novel research fields by making available new and better data on trip origins and destinations, passenger and vehicle flows, quality of service, and system impacts.

The opportunities offered by ITS for public transport are, when compared to private transport, relatively underexplored. There is a lack of understanding about how ITS can modify passenger behaviour and how these behavioural changes will affect system performance. In particular, there is a lack of transit assignment models which can describe and predict the patterns of network usage by passengers when different forms of information are available to them. Since the knowledge of such patterns is crucial to decide on the allocation of resources to networks, vehicles and human resources, this deficiency can cause inefficiencies and delay the realisation of the benefits of enhanced passenger information provision.

The subsidiary position of public transport with respect to private transport is reflected in the field of transport research, where several groups dealing with transit are active but relatively few focused initiatives (conferences, journals, research projects) exist. As a consequence, research is rather fragmented and a general agenda is missing. The networking opportunities granted by the COST programme will let synergies emerge in the work of academic and non-academic interested groups, will root research more deeply into real world problems, and will facilitate the building of a critical mass of research through better international coordination.

B.2 Current state of knowledge

Assignment models provide estimates of the flows on the links of a network given the demand for trips between node pairs. The existing models in the transit field distinguish between high and low frequency services, generally hypothesising that passengers base their travel choices on the attributes of lines when using high frequency services (models built by developing this hypothesis are usually referred to as frequency-based – FB – models), and on the features of individual services when using the low frequency ones (usually referred to as schedule-based – SB – models). Seminal work appeared between the late Eighties and the beginning of Nineties, and assumes that travellers rely only on rather limited static information (for the FB approach see Nguyen and Pallottino, 1988, Spiess and Florian, 1989; for the SB approach, see Tong and Richardson, 1984). Subsequent research has extended the models mainly by introducing a random element to choice, vehicle crowding, network congestion, and time dependency (Nuzzolo et al., 2003, provide a comprehensive literature review of transit assignment).

Five major shortcomings of currently used transit assignment models that will be dealt with by this Action can be identified as follows:

1. High and low frequency services are usually not considered together, whereas trips often include both and the division between the two can be blurred at times.
2. The behavioural hypotheses underpinning route choice, which are at the core of the assignment models, are generally oversimplified.
3. Assumptions about the knowledge users have of network conditions are not consistent with the present and future level of information that ITS can provide.
4. Time-dependency is still insufficiently addressed in most frequency-based models.
5. Model validity is sometimes not sufficiently supported by experimental tests.

B.3 Reasons for the Action

Several European transport researchers are active in the field of transit modelling, and are promoting collaboration. This cooperation is encouraging both in terms of scientific and technological outcomes and of disseminating interest in the topic. A more structured, long-term collaboration, enlarged to include other companies and academics known to be interested in the field, can help develop transit assignment models that take into account novelties in the operation and the usage of public transport and that exploit the increasing availability of data brought about by the diffusion of ITS. The outputs of assignment models are essential to allocate the resources for public transport to the interventions with the highest payoffs. An intelligent use of resources will contribute to increasing the attractiveness of transit systems and so to fostering the modal shift from individual to the collective land transport modes. Such a transfer is crucial and urgent for Europe to win the challenge of making its mobility (especially in urban areas) more sustainable.

Beyond transport researchers, the Action will involve experts in urban and regional planning, public transport operators, software developers, and consultancies. Planners will provide a wider point of view on how the urban systems in general and the demand for mobility in particular will evolve under the pressure of an increasingly large availability of information and means of communication.

Such an input will be decisive to model transit networks and passenger behaviour in a realistic way. The contribution of public operators is twofold: On the one hand, they will provide fundamental inputs to the Action by helping researchers to remain up-to-date in a sector subject to continuous change driven by public demands and emerging technologies, and by supplying data whenever possible. On the other hand, their involvement, together with that of companies which produce transit assignment software and consultancies with expertise in transport systems engineering, will foster the transfer of the scientific advances and technologies produced within the Action. This mix of participants will ensure that the scientific contributions of the Action will turn rapidly into a benefit for society through more effective and efficient public transport services.

B.4 Complementarity with other research programmes

The Action is complementary in scope with the COST Action TU0903 “Methods and tools for supporting the use, calibration and validation of traffic simulation models”. The Action will make use of the results of the COST Action TU0804 “SHANTI - Survey Harmonisation with New Technologies Improvement”.

A collaboration on ITS topics will be activated with EU-funded NEARCTIS "A Network of Excellence for Advanced road cooperative Traffic management in the Information Society".

Projects funded within the 7th Framework Programme under the "ICT for mobility, environmental sustainability and energy" challenge may also be interested in cooperating with this Action.

C. OBJECTIVES AND BENEFITS

C.1 Main/primary objectives

The main objective of the Action is to develop and disseminate up-to-date, comprehensive, and reliable transit assignment models to support an effective and efficient use of public transport resources in the era of Intelligent Transport Systems.

C.2 Secondary objectives

The Action pursues also the following secondary objectives:

1. Building scenarios describing the role of public transport in the European cities and regions of the future.
2. Organizing and making publicly available a comprehensive knowledge base on the existing transit assignment models.
3. Identifying current and future impacts of ITS on public transport operations and passenger behaviour.
4. Identifying current and future benefits of ITS for research on public transport.
5. Nurturing an experimental, evidence-based approach to transit modelling.
6. Fostering interest in transit modelling by disseminating research outcomes to the transport and urban planning community.
7. Promoting technology transfer in the field of transit assignment modelling.

C.3 How will the objectives be achieved?

The Action will create a forum in which academic and non-academic researchers as well as end users of transit assignment models can share problems, knowledge and ideas. The interAction will allow building and sharing an updated knowledge base on transit systems and ITS, which will be used to evaluate current assignment models and to develop model extensions and innovative model approaches. The outputs of the research activity related to the Action will be collected in deliverables, guidelines, and a text book.

The Action will be directed by a Management Committee which will lead the work of the four Working Groups. Face to face and virtual meetings of the Management Committee and of the Working Groups, and the Short-Term Scientific Missions, will be the core instruments of interAction within the Action. New researchers – especially early stage and women – will be reached through two Training Schools. Bidirectional relations with subjects interested in transit assignment but not directly involved in the Action will pass through a website, which will inform the world of recent developments and activities in the field.

The Action will not fund the research itself but will provide all the instruments to make internal and external interActions possible and effective.

C.4 Benefits of the Action

Numerous benefits are expected from a better understanding of the role of public transport and of the effects of ITS on transit user behaviour. Many behavioural and methodological outcomes of this COST Action will be applicable in other research areas. Advances in transit modelling which allow different combinations and forms of passenger information may stimulate new generations of traffic and multimodal network models.

Improved transit assignment models will predict network flows more realistically and thereby enable more accurate forecasts of the consequences of infrastructure and/or service changes. This will help transit operators plan investments and interventions more successfully, and so deploy resources more productively.

At the end of the process which leads from research to mobility, the possibility of efficacious interventions and improved resource usage made available by the new models can facilitate a better and cheaper mobility experience for transit travellers. Improved investment efficiency can reduce subsidies for public transport. Finally, the increased attractiveness of public transport can lead to a modal shift away from cars with related environmental and social benefits.

C.5 Target groups/end users

Benefits can be anticipated for:

- Academic and non-academic researchers in the sectors of transport and planning. Special attention will be devoted to the involvement of women, who are currently under-represented in the transit research field.
- Transport software developers and consultancies
- ITS companies

- Public transport operators and authorities
- Urban and regional planners
- Authorities subsidizing public transport services
- Public transport passengers and land transport users in general
- Built environments

D. SCIENTIFIC PROGRAMME

D.1 Scientific focus

The scientific activity of the Action will be organized in four Work Packages (WP), each of which includes three main Tasks (T).

WP1: Public transport in the era of ITS

The main trends in transit operations and usage under the effect of an increasing diffusion of ITS will be explored. The acquired knowledge will be used as an input for the modelling WPs of the Action, to evaluate the validity of existing models, and to develop new approaches.

T1.1: The role of public transport in cities and regions

The contribution that public transport can supply to the sustainability of mobility at an urban and regional level will be analysed, and the resources (possibly) available for transit identified to sketch a picture of the current and future role of public transport, in European and non-European (mainly USA and Japan) contexts. Other (non-ITS) technological, organizational, and operational changes in transit systems will be traced.

T1.2: ITS for public transport

A library of case studies of ITS for transit will be created. The scope of the implementation of intelligent technologies to public transport will be examined referring to the planning, managing, operating, and monitoring stages of service provision, and to the important area of transit user information. Plans and ideas of ITS developers will be surveyed.

T1.3: Transit passenger behaviour in the era of ITS

The actual behaviour of transit users will be observed to collect information concerning the comprehension and mental representations of networks as well as route choice criteria. Actual and potential effects of different types of real-time information and modes of delivery to transit users (for example, off-line and on-line) will be studied. The attention will be focused on travellers' attitudes towards transit-oriented navigation assistance.

WP2: Existing transit assignment models

A systematic review of the transit assignment literature will be carried out aiming to compare the existing models from a theoretical and a practical point of view, to verify whether and to what extent they are valid given the characteristics of current transit systems, and to identify the characteristics required by the next generation of models.

T2.1: Review of transit assignment models

Literature on transit assignment models will be collected and organized in a systematic way. The models will be classified according to service characteristics (mode, frequency, regularity), the stop model (passenger and vehicle arrival processes, types of queue, boarding processes), hypotheses about transit user behaviour, the level of transit user information and related uncertainty assumed, and the assignment procedure itself. Similarities and differences will be analysed to build a general framework from which specific models can be derived as particular cases.

T2.2: Pros and cons of existing models

Conditions under which the existing models can be used will be identified. Good qualities and shortcomings of each model in terms of assumptions, applicability to contemporary real networks, and qualities of outputs will be scrutinized through implementations to small and real sized test networks. Recommendations for new models will be derived.

T2.3: Transit assignment models in practice

Preferences and opinions of software developers, consultancies, transport service operators and authorities, and planning agencies will be polled to get a non-academic viewpoint on transit assignment models presently in use. Documentation on best practices will be collected. Skills required in the practice of transit assignment will be investigated to support the design of teaching material for the Training Schools as well as undergraduate and master courses, and to define the contents of the text book.

WP3: Advances in transit assignment models

New realistic, dynamic, easy-to-implement models for transit assignment will be developed. They will be able to deal with high and low, regular and irregular services; to take into account the effects of high quality, real time information provided by ITS; and to consider the quality of service offered by networks and carriers. The models will allow the comparison of different kinds of investment in public transport (like changes in timetables, carrier capacity, and user information).

T3.1: Supply representation

A standard for network and service representation will be and used throughout the Action, to make comparisons between models and data exchange between applications simple. Services will be modelled both in terms of lines and runs. They will be associated with both additive and non-additive, random and non-random cost components. The degree of regularity of services will be taken into account.

T3.2: Route choice models

Traveller behaviour will be represented through spatial decision making processes taking into account the peculiarities of transit and multimodal systems. Passenger cognition maps, learning through repetition, use of heuristics, utility functions, and non-utility decision criteria will be modelled under different assumptions regarding the type and the quality of information and route guidance available to users. The possibility of separating the choice of the specific public transport mode from the route selection process will be investigated.

T3.3: Supply/demand interaction

Line-based (FB) and run-based (SB) approaches will be considered and possibly combined. Existing stop models will be expanded to take into consideration different combinations of mingling and queuing, the possibility of not being able to board the first service of an attractive line because of vehicle crowding, and intermodal changes. Equilibrium and dynamic assignments will be investigated.

WP4: The experimental approach to transit modelling

Passenger behaviour assumptions on which transit assignment is based frequently lack sound evidence. Alternative approaches to assignment are difficult to compare because of differences in the format of data available for calibration and validation. The Action will promote an experiment-oriented approach to transit modelling. This may include the promotion of a new European transit laboratory. While there are numerous examples of traffic laboratories, particularly in the United States, equivalent transit laboratories are rare. The nature of any new European transit laboratory would depend on the capabilities of existing facilities for testing transit user behaviour, passenger information services, data collection devices and of course transit assignment models *in situ*.

T4.1: Review of existing transit laboratories

Existing transit laboratories will be identified and reviewed, giving attention to laboratories using real networks for trials. Their capabilities and deficiencies in providing the experimental foundations for transit assignment models will be highlighted.

T4.2: Experiments in transit modelling

Procedures will be defined to carry out experimental tests of transit models. Every component of transit assignment models – behavioural, stop, and arc components as well as network loading approaches – will be covered. Methods using simulation and *in situ* trials will be covered. A format to disseminate the results will be , which will be clear and transparent as to the limits of conclusions, will contrast alternative models, and will be suitable for different audiences.

T4.3: Formation of a European transit laboratory

The Action will work toward the foundation of a new European transit laboratory, jointly run by academia and transport operators. This could be a new facility or a network of existing facilities, or both, depending of the outcome of T4.1 and consultations with partners. The characteristics of such a new laboratory will be designed with the intent of activating synergies with the existing facilities. Organizational and legal conditions to gather existing transit testing facilities together in a network covering at least the EU, Japan, and USA will be identified and pursued. Possible sources of funding will be investigated.

D.2 Scientific work plan methods and means

Each Work Package will be developed by a specific Working Group under the scientific supervision of the Management Committee. The name of each Working Group corresponds to that of the Work Package of which the Working Group is in charge. Given the close connections between the Work Packages, coordination and collaboration between Working Groups are crucial and will be guaranteed by the Management Committee. In cases in which two or more research Tasks of different Working Groups are highly interrelated, joint meetings of the concerned Working Groups will be held. The following table reports the tasks in which each Working Group will be involved.

	T1.1	*T1.2*	*T1.3*	*T2.1*	*T2.2*	*T2.3*	*T3.1*	*T3.2*	*T3.3*	*T4.1*	*T4.2*	*T4.3*
WG1: Public transport in the era of ITS	M	M	M		I			I			I	I
WG2: Existing transit assignment models			O	M	M	M	I, O	I	I		I, O	
WG3: Advances in transit assignment models	O	O	O	O	O	O	M	M	M		I, O	I
WG4: The experimental approach to transit modelling			I, O	O			O	O	O	M	M	M

Legend: M =Main task of the WG, I =the WG will provide Inputs for the task, O =the WG will make use of the Outputs of the task

Four deliverables (Ds) will collect and disseminate the outputs of the Work Packages: One deliverable is intended for an audience made up of transport authorities, governmental bodies, ITS companies, and the general public.

D1: How ITS are changing public transport and its role in contemporary and future EU society.

Three more deliverables are tailored for the scientific community and the end users (software developers, transport operators and consultants, city planners) of transit assignment models.

D2: State-of-the-art in transit assignment modelling.
D3: Transit assignment models in the era of ITS: From assumptions to implementation.
D4: The experimental approach to transit assignment models.

Draft versions of the Deliverables will be peer reviewed before being published on the website. From the results of the WP 3 and 4 two guidelines will be derived on

- Network representation and data format for transit modelling
- Organization and management of a transit laboratory

The website will be used as a repository for datasets, bibliographical resources and working papers.

E. ORGANISATION

E.1 Coordination and organisation

The Action will be led by a Management Committee, with the responsibilities defined by the COST procedures. An Executive Group consisting of the Chair, the Vice Chair and a representative of the Grant Holder will deal with ordinary management and administrative issues. To speed up the work during the general meetings, the Management Committee may also decide to appoint:

- A Dissemination Board of three people, to look after the website, the publications (deliverables, guidelines, text book), and all the initiatives to give the Action the largest possible relevance to the community of transit assignment model end users

- Training School Directors, one for each school, to manage the procedures related to the selection of trainers and trainees
- A Short-Term Scientific Mission Manager, with the task of organizing the programme of the missions in the most efficient way, taking into account also that they are intended to promote the training and the career development of Early Stage Researchers

The Management Committee and the Working Groups will meet normally twice a year.

The Short-Term Scientific Missions will be used to involve both experienced researchers and Early Stage Researchers in different national research projects, working side-by-side on scientific problems and on the editing of the Deliverables of the Action.

A workshop open to Action participants will be organized to discuss on-going and planned work.

The enlargement of the community currently involved in the Action and the dissemination of results to a larger scientific audience and to the general public will be fostered through two conferences:

- A kick-off conference at the beginning of the Action, to construct an overview of the research trends in the field and involve new participants
- At the end of the project, to disseminate results, to sketch the agenda for further research and to plan follow-ups to the Action

The Action aims to generate lasting effects on education in the field of transit modelling. To reach this target, at the end of the first and third years a Training School will be held, focused respectively on

- Public transportation and ITS
- Transit assignment models

The contributions to the Training Schools will be edited and published in a book on “Transit modelling in the era of ITS” which may be used subsequently as a text book for Master and PhD courses, and as a reference by end users of transit assignment models.

The Action will set up and constantly maintain a web site, which will have a public section for dissemination, and a section with access restricted to participants to host databases, working papers, and sensitive documents. Continuous proactive dissemination of the activities and of important issues related to public transport modelling will take place through the release of an e-bulletin as and when required. The Management Committee will decide on the materials to be published in the public section of the website. The technical design and the maintenance of the site may be delegated to a professional webmaster.

The kick-off meeting, the intermediate Workshop for the Action participants, the Conferences, the Training Schools and the publication of interim and final Deliverables are milestones of the Action.

E.2 Working Groups

The scientific work of the Action will be split among the following Working Groups (WGs):

WG1: Public transport in the era of ITS
WG2: Existing transit assignment models
WG3: Advances in transit assignment models
WG4: The experimental approach to transit modelling

Each Working Group will have a Leader and a Deputy Leader. When possible, at least one of the two will be a woman. The Leader will be in charge of organizing the meetings, taking into account needs and suggestions of all the Working Group Members.

Each Working Group – independently of each other – will propose the schedule of its meetings and the related agenda to the Management Committee, which is in charge of final decisions. The Leaders of Working Groups will promote joint meetings to deal with common issues. The location of the meetings will be chosen with the aim of maximizing the visibility of the Action and promoting exchanges with interested people who do not participate into the Action, especially those from non-COST countries.

E.3 Liaison and interaction with other research programmes

The Action will use the results of the COST Actions TU0903 “Methods and tools for supporting the use, calibration and validation of traffic simulation models” and TU0804 “SHANTI - Survey Harmonisation with New Technologies Improvement”. The participants in the two Actions will be invited to contribute to the Conferences and the Training Schools. A meeting of the Chairs will be promoted to identify possible further collaborations.

The Management Committee will monitor the calls offered by the 7th EU Framework Programme and will take the lead in organizing applications which can fund the research in the fields covered by the Action.

The Action will encourage its participants to be involved in the standing committees and the panel of the Transit Cooperative Research Programme of the Transportation Research Board (TRB), and to propose ideas for the Transit Innovations Deserving Exploratory Analysis Programme of the same institution of the US National Academies. The Action and its advances may be presented at the TRB Annual Meetings.

E.4 Gender balance and involvement of early-stage researchers

This COST Action will respect an appropriate gender balance in all its activities and the Management Committee will place this as a standard item on all its agendas. The Action will also be committed to the involvement of Early Stage Researchers. This item will also be placed as a standard item on all Management Committee agendas.

At the moment women are under-represented in the field of transit modelling, both inside and outside the academia. The Action will therefore be proactive in promoting gender balance in the transit assignment field, in particular targeting the Training Schools so as to attract female researchers. Whenever possible, women will be preferred for leadership positions.

The talents of Early Stage Researchers will be cultivated by fostering collaboration with senior researchers through the programme of the Short-Term Scientific Missions. Moreover Early Stage Researchers will be given key roles in the two conferences.

F. TIMETABLE

The Action will last four years.

The Management Committee (MC) and the Working Groups (WGs) will operate for the duration of the Action. A provisional timetable of ordinary meetings and milestones is reported below.

Year	*Quarter*	*Meetings*	*Milestones*
1	1st	MC	Kick off-meeting
2nd	WG1, WG2, WG3, WG4	Kick-off conference	
3rd	MC		
4th	WG1, WG2, WG3, WG4	Training School on “Public transportation and ITS”	
2	1st	MC	
2nd	WG1, WG2, WG3, WG4		
3rd	MC		
4th	WG1, WG2, WG3, WG4	Intermediate workshop	

3	1st	MC	
2nd	WG1, WG2, WG3, WG4		
3rd	MC		
4th	WG1, WG2, WG3, WG4	Training School on “Transit assignment models”	
4	1st	MC	Publication of interim deliverables
2nd	WG1, WG2, WG3, WG4		
3rd	MC, WG1, WG2, WG3, WG4	Publication of the text book	
4th	MC	Publication of the final deliverables, final conference	

G. ECONOMIC DIMENSION

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest: DE, DK, ES, FR, IT, SE and UK.

On the basis of national estimates, the economic dimension of the activities to be carried out under the Action has been estimated at 28 Million € for the total duration of the Action.

This estimate is valid under the assumption that all the countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

Japan and USA have also expressed their interest to participate to the Action.

H. DISSEMINATION PLAN

H.1 Who?

The Action wants to bring about enhancements to transit assignment models, with the aim of providing the transport community and society in general with up-to-date tools to plan, run and use public transport in an effective and efficient way. Hence particular attention will be devoted to making the opportunities offered by the new models known not only to the interested scientific audience but to all potential end users of transit models.

The main targets for dissemination will be:

- Academic and non-academic researchers in the sectors of transport and urban and regional planning
- Transport software developers and consultancies
- ITS companies
- Public transport operators and authorities
- Urban and regional planners
- Authorities subsidizing public transport services

To attract new researchers, especially women, to transit modelling, the Action will contact undergraduate, graduate, and PhD students.

The general public will be informed as to the future of transit systems in the age of ITS.

H.2 What?

For the dissemination the Action will make use of all the standard channels of scientific communication and of all the opportunities provided by the COST scheme:

- Articles in peer-reviewed journals, both in the transport and in the planning area.
- Contributions to international conferences, both in the transport and in the planning area.
- Action conferences and related proceedings.
- Deliverables ("How ITS is changing public transport and its role in contemporary and future EU society", "State-of-the-art in transit assignment modelling", "Transit assignment models in the era of ITS: From assumptions to implementation", "The experimental approach to transit assignment models").
- Guidelines (Public transportation and ITS, Transit assignment models).
- Text book ("Transit modelling in the era of ITS").
- Website, with public and restricted access areas.
- Emailing list for occasional e-bulletins to a wider community.

H.3 How?

Different dissemination methods will be used for the different audiences, as shown in the following table.

Target	*Method*
Academic and non-academic researchers	Articles in peer-reviewed journals, contributions to international conferences, Action conferences and related proceedings, deliverables, website, e-bulletin
Transport software developers and consultancies	Action conferences and related proceedings, deliverables, guidelines, Training Schools, website, e-bulletin
ITS companies	
Public transport operators and authorities	
Urban and regional planners	
Governments	Deliverable 1, website, e-bulletin
Students	Deliverable 1, Training Schools, text book, website, e-bulletin
General public	Deliverable 1,website

Guided reading tours of the deliverables and of the e-bulletin will be suggested to audiences with different skills and interests.