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INTARESE

Integrated Assessment of Health Risks of Environmental Stressors in Europe

Integrated Project

Thematic Priority

D22 Transport Assessment Protocol (TAP)

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CONTENTS

1. Introduction

The overall aim of WP 3.1 Transport is to evaluate the health benefits of alternative transport scenarios and measures and to explore the health risks related to urban transport, using the integrated framework and methodology provided by SP1. This will enhance a wider discussion on the health effects of different transport scenario's to balance transport and economic objectives for health.

The transport scoping report (deliverable 9) has served as a starting point and has been elaborated into the present transport assessment protocol (finalized in month 18), followed by a '1st pass' assessment, using the preliminary assessment methods developed in SP1.

This transport assessment protocol aims to provide a framework of the methodology that will be employed in the assessments of the specific policy area of transport. This protocol will serve as a working document, informing participants of the suggested outline of the assessments, generating discussion on methodological and practical aspects of it, and providing a basic structure from which subsequent deviations and adaptations may be made. The protocol gives an overall picture of what we plan to do, and should be adapted in the specific case studies itself. Members of WP3.1 are invited to comment and edit this document as they see fit, ideally then circulating their suggestions to all other members of WP3.1 by means of email.

1.1 Links with other work packages

The assessment protocol is also of interest and utility to those working in SP1 and SP2 (as feedback to their support so far), to SP5 (which will provide common databases to the SP3 work packages), and to SP4, which will be responsible for constructing an integrated assessment toolbox. Members of other work packages are encouraged to use this document as a point of departure for communicating with WP3.1 members and as a means of coordinating extraneous efforts between work packages that arise as the project progresses. For the different WPs requests and needs (from SP3, agreed on during Rome meeting 28th of March 2007) are shortly named in table 1.

Table 1 Requests and needs from SP3 from other WPs within INTARESE

WP	Request	Timescale
1.1	Deliverable (paper) on the assessment framework and INTARESE methodology	Urgent
1.2	Guidance on choice of dispersion modelling (air, water, soil) – with WP2.1	1st pass
1.3	Guidance on using toxicological information for health impact assessment	1st pass
	Guidance on how to combine toxicological and epidemiological information	1st pass
	Guidance on expert elicitation	2nd pass
	Guidance on how to use life-tables (with WP2.3) (note: this is WP1.4 work)	1st pass
1.4	Guidance and methods for indicator definition and development	Urgent
	Methods for DALY calculation	1st pass
	Methods for monetisation (weighting, discounting etc.)	1st/2nd pass
1.5	Training on uncertainty quantification (as well as characterisation)	1st pass
	Guidance on dealing with exposure mixtures	1st pass
2.1	Guidance on which dispersion models to use/criteria for dispersion modelling in different media (with WP1.2)	1st pass
2.2	Guidance on how to make use of biomarkers/biomonitoring	2nd pass
2.3	Baseline data on disease/mortality rates (at appropriate resolution/level of aggregation) – to be requested through 'health data templates'	1st pass
	Guidance on how to use life-tables (with WP1.3)	1st pass
4.1/4.2	Tools for risk and impact assessment (from exposure to health effect/cost) – e.g. based on LSHTM/RIVM spreadsheet models	1st pass
	Templates/guidance for describing indicators used in the assessment (with WP1.4?)	1st pass
6	How to involve stakeholders in further issue-framing and assessment process	2nd pass
	Guidance on further policy scenario selection, development and comparison	

2. Background

2.1 The assessment issue

Transport is an essential component of modern life, and brings with it the potential to improve and erode public health. There are different modes of transport including air traffic, road traffic, railroad traffic, shipping, but also cycling/walking, each associated with their specific kind of impact on society. Main problems related to transport are air pollution, climate change, water and soil pollution, transport accidents and injuries, traffic noise, physical inactivity, psychological and social effects, but also problems with traffic congestion, the use of fossil fuels, the loss of public space/land/natural habitats etc.

Current health concerns focus mainly on the health loss due to air pollution, noise and traffic accidents, although other health aspects are important as well. Air pollution is associated with various health outcomes. The main potential effects reported by epidemiological studies are: respiratory and cardiovascular morbidity (increase in symptoms, hospitalisations, emergency or medical visits, impairment of lung function and its growth) and mortality, and adverse pregnancy outcomes (intra-uterine growth retardation, low birth weight, pre-term birth) (1). For some health outcomes few (epidemiological) studies have been done resulting in remaining uncertainties. According to some recent reviews there is sufficient evidence that (long-term) exposure to noise causes effects on hearing, cardiovascular diseases, annoyance and sleep disturbance in adults and has impacts on children’s learning (2-4). Traffic accidents is a major concern: in the European Union, each year more than 40 000 people die as a result of road accidents and 1.7 million are injured (5). The most vulnerable road users affected by urban road accidents are children, seniors and disabled persons. Furthermore, the risk of death or injury of pedestrians, cyclists and motorcyclists is disproportionately higher compared to car users.

Assessment of transport-related health impacts is an important tool in guiding policy decisions in transport and land use policies and can provide information on the effects of interventions on public health. However, traffic is associated with quite diverse exposures, negative health effects and positive effects. There are inherent uncertainties not only in the exposure-response relationships of these exposures, but also in the potential interactive and cumulative effects of those two, the possible beneficial effects of increased physical activity (walking and bicycling), how to attribute health impacts by the different traffic modes, how to quantify those impacts for the different transport modes and in different contexts (e.g. different countries/cities). To evaluate the effectiveness of current and some future transport policy measures integrated assessments are needed which take into account all these different aspects. One other important aspect is to identify, through these integrated assessments, key information and knowledge gaps that require further investigation.

2.2 Transport policy context

The European Union has set standards for ambient air quality to protect the health of European citizens. To support this policy, the EU has set national emission limits and emission limits for vehicles and has set limits to the percentage of pollutants in transport fuels. At the national level, policy related to air quality is focused on influencing consumer’s behaviour, mainly by economic instruments like taxation and subsidies. At the local level spatial planning and numerous traffic measures are implemented, mainly to reduce the number of hot spots.

The EU also sets emission limits for noise by vehicles and trains, but leaves standards for the acoustical quality to the national governments of the different member states (subsidiary). Noise measures like silent pavements, noise barriers etc. are usually implemented by the (local or national) authority responsible for (new) infrastructure.

The EU sets safety guidelines for vehicles to enhance traffic safety. National policy focuses on influencing consumer’s behaviour by setting rules and regulations to enhance traffic safety, whereas local policy focuses on maintaining those rules and regulations.

In the EU, six out of the seven most important risk factors for premature death (blood pressure, cholesterol, Body Mass Index, inadequate fruit and vegetable intake, physical inactivity, excessive alcohol consumption) relate to how we eat, drink and move (the odd one out being tobacco). A balanced diet and regular physical activity, along with restraining from smoking, are important factors in the promotion and maintenance of good health. Moreover, it is those with lower incomes and education level that are most affected. Therefore, nutrition, physical activity and obesity are key priorities in the EU public health policy and are taken up by the Public health action programme (2003-2008).

In 2005 the Green paper was published (6). Six areas of actions were formulated including the area of action ‘Addressing the obesogenic environment to stimulate physical activity’.

In order to make people regular active, physical activity promotion should focus on activities that can be integrated easily into daily routine (e.g. walking or cycling instead of using motorized transport in order to get to school or work). Transport and urban planning policies can ensure that walking, cycling and other forms of exercise are easy and safe, and address non-motorized modes of transportation. The provision of safe cycling and walking paths to schools could be one means to address the particular worrying trends for overweight and obesity in children (6).

The National Institute for Public Health and the Environment (RIVM) published in 2006 a report on contributions to the Green Paper from a range of stakeholders including civil society, government, and industrial sectors. They recommended the following (mostly local level) policy measures: (7)

1) Accessible and safe recreational facilities in the neighbourhood.

2) Discouraging car use and encouraging active and public transport

3) Physical activity promotion by in- and outdoor facilities

4) Financial incentives

For a more thorough description of the transport policy actions to reduce environmental problems we refer to our Transport scoping report.

2.3 Stakeholders

The key stakeholder groups to be involved in the assessment include the government of different levels (EU, national, regional), car manufacturers companies, branch organizations of mobility related enterprises and consumer organizations for each of the countries in which the assessments are carried out. Only a few stakeholders[1] have been involved in a formal way from the very beginning of the project. During a specific workshop of WP3.1 they were invited to present their information needs and visions on which issues, and policy actions should be preferably addressed in the INTARESE case studies. At a later stage other stakeholders will be contacted and their comments and suggestions will be incorporated into a short report on stakeholder perceptions of the transport assessment protocol and the proposed case studies.

A summary of the stakeholders that have been identified is presented in table 2 below. A more detailed breakdown of stakeholders is given in Appendix 1

[1] Dutch Ministry of transport and water management, Province Utrecht, Municipality Utrecht , TNO, UK institute Harry Rutter, National Environmental Planning Agency

Table 2 Stakeholders identified for WP3.1

	UK	Netherlands	Italy	Spain	Finland	European	International
Government		- Ministry of Transport, Public Works and Water management - Association of Provincial Authorities (IPO) - Association of Netherlands Municipalities (VNG)	- Italian Ministry of Health - Italian Ministry of environment - Italian Ministry of Transport - Rome municipal Department of Environment	- Autoridad del Transporte - Metropolitano (ATM) - Generalitat De Catalunya - Ayuntamiento de Barcelona (City Hall)	- Ministry of transport and communications (LVM) - Helsinki City Planning Department - Helsinki Environmental centre	-	-
Regulators and watchdogs			- ARPA Lazio		- Finnish parliamentary member and Helsinki public transport committee		-
Consumer organisations and branch organizations of mobility related enterprises		- Dutch Cyclists' Union (Fietsersbond) - BOVAG	- Lega Ambiente - ATAC		- Transport consultancy WSP LT-konsultit Oy - City Car Club	-	-

	UK	Netherlands	Italy	Spain	Finland	European	International
Research and data provision		- Transport Research Centre (AVV) - Institute for Road Safety research (SWOV)	- ATAC - ARPA Lazio - Municipal Department of Environment	- CENIT Centro de Innovación del Transporte Universidad Politécnica de Cataluña - GEMOTT Grup d'Estudis de Mobilitat, Transport i Territori	- YTV - Helsinki Metropolitan Area Council - VTT Technical Research Centre of Finland		

3. Scope of the assessment

In this chapter we will shortly review the scope of the integrated health impact assessments (HIA). We have selected 3 relevant transport policy interventions including 1) congestion charging and road pricing and 2) a measure to accelerate replacement of old cars and 3) a measure to promote of public transport and cycling/walking. We will evaluate these interventions in at least three cities across Europe. We will concentrate on the most important environmental hazards related to transport including air pollution, noise, traffic accidents, and the beneficial effects from walking/cycling.

3.1 Assessment framework

Figure 1 provides a general assessment framework for transport and serves as an overview of the full chain model of transport which has been suggested by WP1.1 assessment framework. It is mainly based on the DPSEEA framework. This framework was produced and refined through a series of reviews and comments during the transport workshop. Transport policy interventions can affect the chain in all the different stages. We will evaluate the effects of the different policy interventions/scenario on various stages in the full chain model, depending on the presumed effects of a certain policy. To give an example, if it turns out that a certain policy does not alter emissions but more affects behaviour (time activity patterns) and thus exposure, we will then start from there all the way down in the causal chain.

As is suggested in WP 1.1 we have to be flexible and pragmatic with the full chain assessment framework; thus we do not have to necessarily fill in all the various stages and associated indicators. When evaluating the health effects of a transport policy measure like congestion charts, this measure affects the chain more on the concentration level and exposure level (when talking about air pollution), which makes for example the traffic-activity patterns indicators than if we evaluate a measure to accelerate replacement of old cars, which basically starts with a change in emissions of certain air pollutants and then all the way down in the causal chain.

We will also try to make an effort to look (at least qualitatively) at the possible side effects of a certain policy measure.

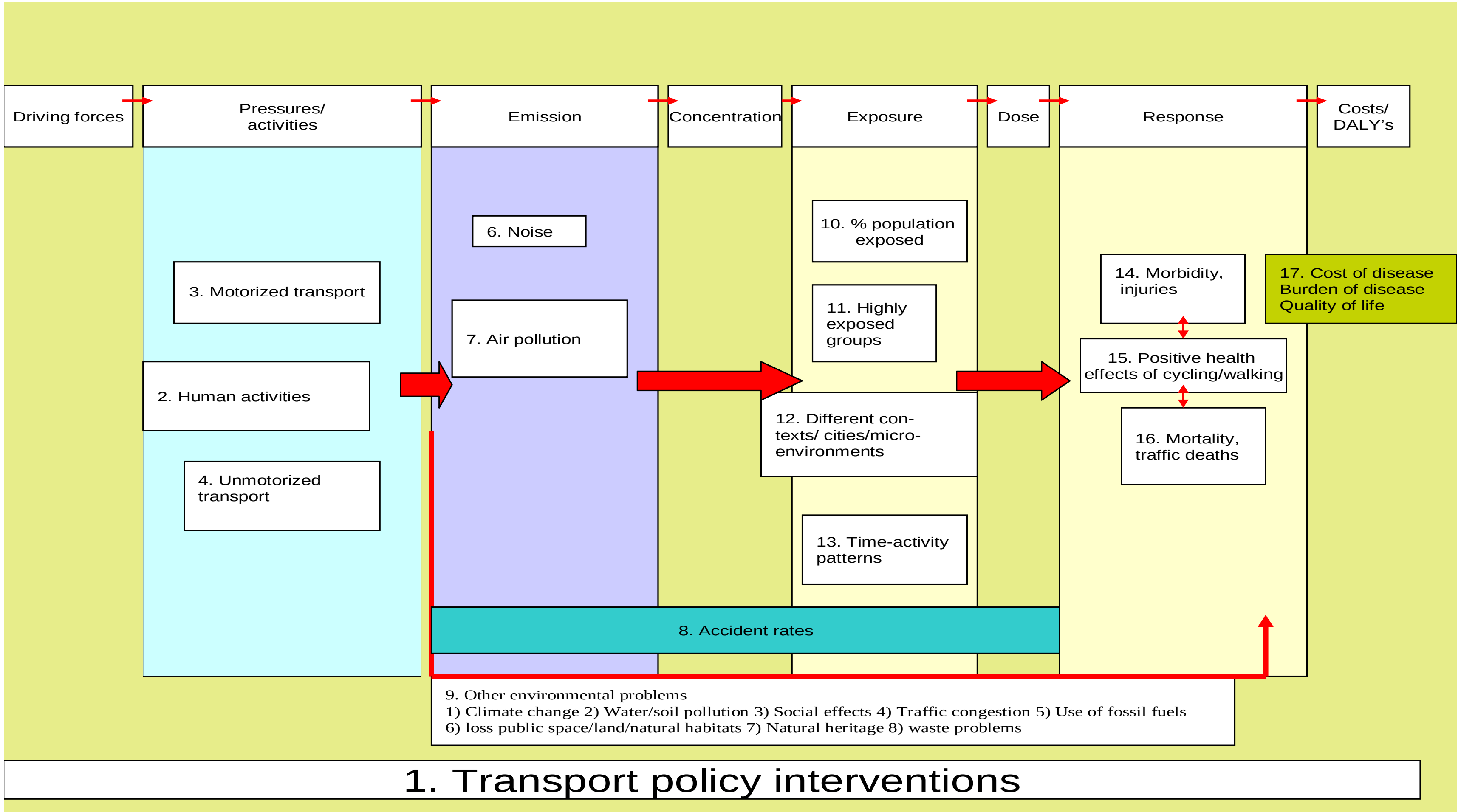

Figure 1 General assessment framework overview (transport)

Short explanation of the transport assessment framework:

a) Transport policy interventions (1) can affect the chain in all the different stages.

b) Pressures/activities are human activities (2) broken down in leisure and economic activities resulting in motorized transport (both freight and passengers) (3), and “un-motorised” transport (4).

c) Environmental problems related to transport are traffic noise (6), traffic-related air pollution (7), accidents (8), and other environmental problems including climate change (9).

d) Exposure to traffic noise and air pollutants affects the general population (10), as well as highly exposed groups (11). The actual exposure depends on time activity patterns (13) and differs in different contexts/cities and micro-environments (12). Time-activity patterns e.g. traffic participation and millions Km a person travelled influences accident rates (8) resulting in injuries (14) and traffic deaths (16). The severity depends, among others, by the use of safety devices etc.

e) Exposure to transport related air pollution and noise can lead to several diseases (14) and even result in death (16), depending on individual disease risk factors and affecting more often vulnerable groups (e.g. elderly). Alternative transport modes (cycling, walking) also have health **benefits**, apart from the risks of increased exposures (15).

f) Instead of expressing the impacts of diseases and deaths in numbers one can also calculate the costs of diseases as well as the burden of diseases and quality of life (16).

See appendix 2 for the specific models of the air pollution, noise, traffic accidents and physical activity separately.

3.2 Key choices regarding the assessment

The scope of the assessments that will be conducted within WP3.1 transport is based on the most important environmental hazards related to transport: air pollution, noise and traffic accidents, respectively. Also the risks and benefits of alternative transport modes will be considered in the assessments.

In our assessment the focus will be on all modes of road transport of persons, since they serve as possible alternatives for the use of cars. Freight is restricted to truck traffic since other modes are not considered as serious alternatives for transportation of goods except for shipping and air traffic. However, exposures related to shipping air traffic (both person and cargo) are taken into account as "background" exposures, since the proximity of these exposures to living areas are rarely close by (table 3).

Table 3 Different modes of transport considered in our planned assessments

		Person	**Freight**
Road traffic	Car	+	+
	Motorcycle	+	-
	Cycling	+	-
	Walking	+	-
	Truck traffic	-	+
Public transport	Train/tram	+	-
	Bus	+	-
Shipping		+	
Air traffic		+	

+: yes. -: no. Shipping and air traffic only to be considered as context and no distinction is made between person and freight transport.

The following criteria were used to create the focus of the assessment:

- Proximity of the exposure to the exposed persons;
- Frequency of exposure to transport;
- Duration of exposure (long term/chronic);
- Public health; effects at community level;
- Individual exposures at community level (immediate environment); occupational exposures such as truck drivers or flight attendants are excluded from this assessment.

3.3 The case studies

The assessments targets at a city/regional scale, in order to ensure that the assessment recognizes the local complexities in transport management and effects. The assessment will address urban/regional-scale policies and interventions that have wider European relevance because they are representative of measures taken in many different cities, or represent what is seen as good practice.

The assessments will address the effectiveness of three road transport measures[2]: 1) congestion charging and road prizing and 2) a measure to accelerate replacement of old cars and 3) a measure to promote public transport and cycling/walking.

In order to select these transport policy questions described above, current literature on generic transport policies was reviewed. Moreover a workshop was organised with experts and primarily Dutch governmental stakeholders. This review and workshop revealed that many relevant transport policy questions exist at various regulatory levels, with a great variety between countries/regions. The suggested transport policy measures will be presented to a group of national and international level stakeholders for feedback.

[2] Measure 1 and 3: at local level, measure 2: usually at national level

3.4 Study area

Per policy intervention, the assessments will focus on at least three cities in a participating EU country, preferable from a range of different EU cities, reflecting wide differences in exposures and factors affecting exposure, population structure, disease baseline rates etc. Although due to practical reasons, we have to restrict ourselves to a limited number of cities, and we preferable want to use the same cities more than once (see table 4). The choice of Bucharest as one city depends on our contacts in that city, as they are not one of the participating EU countries in INTARESE. Of course if it turns out that it is relatively easy to get the relevant data needed for a certain city, we add those cities to our case studies as well.

Policy intervention 1 and 2 will be evaluated in the first phase of the assessments. We will aim to perform case-study 3 in the second pass assessments, although we will gather the available data earlier and together with the other data for the case studies 1 and 2. In the second pass assessments it is also possible that we will evaluate the indicated policy interventions 1 and 2 in more detail and thoroughly than in the first pass assessment and expanded to more cities. Another option for the second pass assessments is that we will incorporate the outcomes of other potential policy scenarios. These scenarios might include the introduction of other measures that reduce the negative health impact of transport related air and noise pollution (subsidy of diesel soot filters for existing cars, road surface measures). Ultimate decisions will be made during the end of the first assessments because only then, we can overlook which progress we have made.

Table 4 Study area per case study

Policy intervention	Cities	Partners
1) Congestion charging and road pricing	**London, UK** Rome Barcelona Helsinki	RIVM will take the lead and do the calculations IC is supervising and helping RIVM. ASL and CSIC are data providers
2) A measure to accelerate replacement of old cars	**Rome, Italy** Bucharest, Romania[1] London., UK	IRAS will take the lead and do the calculations ASL is helping IRAS and will help wit the data TNO will assist with the modelling issues (all the way up to concentrations) IC is data provider
3) A measure to promote public transport and cycling/walking (2nd pass)	**Amsterdam/Rotterdam, the Netherlands** Barcelona, Spain Bucharest, Romania[1]	RIVM and IRAS will take the lead and do the calculations CSIC and Bucharest (name) are data providers

In bold the cities where the policy intervention is of particular interests, because of the policy intervention is already implemented and that there is a lot of data available.

[1]Bucharest is not a participating EU city in our INTARESE project, but we have some contacts there, and this city is of particular interest in a number of ways, including the relatively high amount of 'old' cars.

3.5 Study population

The assessments will primarily focus on the general population of each of the representative cities in each participating EU country. Depending on the policy interventions to be assessed, special attention will be given to vulnerable subgroups. The exposure-response relationships which are available are often based on studies performed in specific age, and/or gender groups. In the case of policy interventions we will certainly consider the risks of vulnerable subgroups like the elderly.

4. Assessment Methodology

The following section provides details of how methods/models and data are to be used in our case studies. In the back of our mind are the steps for HIA which have to be taken: (8, 9)

1. The purpose and framework of the HIA
2. Decide which exposure-effect pathways will be quantified
3. Identify and characterise the population at risk
4. Select or develop a suitable set of exposure-response functions (ERFs) that link (individual) pollutants with specific health endpoints, i.e. % increase in morbidity per µg/m^3 of a pollutant
5. Derive the population exposure distribution
6. Estimate the background rates (i.e. prevalence and/or incidence) of the relevant health endpoints in the population at risk
7. Calculate the burden of disease or death in the population at risk
8. Valuate the burden of disease or death in the population at risk
9. Assess and quantify the uncertainty of the HIA

4.1 From source to exposure

Population exposure will be assessed using a combination of measurements, validated dispersion models and demographic data. Usually, even though concentrations are measured at some locations, concentrations in other regions need to be estimated. Furthermore, the exposure of humans to these emissions is not measured and is therefore generally based on models. However, some effects might occur much later than exposure (latency). It is difficult to allow for these effects. In a HIA, one needs to use the same exposure metric for the population exposure distribution as the one used to derive the exposure-response function (ERF) to calculate e.g. the burden of a certain disease.

Potentially health-relevant exposures to air pollution and noise may occur at different spatial scales. Air pollution exposures can be characterized at the regional background scale (traffic emissions at European scale affect ozone concentrations), urban background scale (traffic in a city affects the urban background) and local scale (high traffic intensity in a specific street may result in high concentration in / near that street). Finally, participation in traffic may result in high air pollution and noise exposures of relatively short duration for the general population. Very little is known about the health effects related to traffic participation, so the focus of our assessment will be especially on the effects of policy measures on urban/ local background concentrations. Nevertheless we probably should not ignore traffic participation, setting the impact to zero is probably incorrect. To some extent the delineation between background and local scale is arbitrary (see section 4.1.2).

4.1.1 Driving force to emission

To predict the effect of a policy measure on the 'pressure' we need to make use of locally available transport models or existing data if a measure was already taken in a specific city. The expertise needed to use these models is not well available within the INTARESE team, contact with local authorities is necessary for this. For pressures we need to define which traffic aspects affect emissions.

Air pollution emissions of motorized traffic in a specific street are governed by traffic intensity, traffic composition (percentage of light-duty, medium duty, heavy duty and buses) and traffic speed. In the Netherlands, standard emission factors have been developed for the average car park, taking into account changes in the composition of the car park (newer cars have lower air pollution emissions than older cars). Therefore the emissions decrease per year where air pollution is concerned. We can use these emission factors to evaluate policy scenarios. Different sets of factors need to be used in other countries, as the composition of the car park differs. In the Netherlands and elsewhere a broad variety of emission measures is available for urban traffic situation, provincial roads and highways separately.

The same factors named above affect traffic noise, although in addition the models need time of exposure (day/evening/night) and:

1. Characteristics of the pavement (e.g street canyon or not)
2. Characteristics of the noise transmission path (e.g. length of transmission path, acoustically hard or soft surfaces, buildings and barriers in between etc.)

3. Characteristics of the receptor (type of building, height of building, noise insulation etc.)

4.1.2 From emission to concentration in the environment

Changes in air pollution emissions affect both the urban background and the concentrations in a specific street. The effect of changing emissions can be assessed with dispersion models that have been developed. Different models need to be used for assessing the effect on the background and the local street scale. Note that while the impact of traffic measures on the local scale concentrations may be larger than on the background scale, this may not be the case for population exposure, as more people tend to live at background conditions. In local dispersion models, an estimate is necessary of the background concentration. This is typically derived from interpolation of monitoring data.

At the local scale, the effect of a certain emission in that street is mostly a function of the configuration of the street, the distance of the axis of the road to the homes façade, presence of trees and meteorological conditions. The presence of obstacles between road and façade is also very important. In a simple Dutch dispersion model (CAR-2) these factors area quantified. Differences in meteorological conditions (e.g. wind speeds) are accounted for by specific regional factors. This is probably not very important when we assess a specific city, but may account fro differences across cities.

Noise may have a variety of health effects and these effects depend on acoustical (e.g. noise level) and non-acoustical factors (like contextual and personal characteristics e.g. age, noise sensitivity, fear of the source), see figure 2. We consider the responses of the target population to be average, and therefore (driven by an expected lack of data), we concentrate on calculating noise levels, the main acoustical factor. For these calculations, we use noise models. The noise models used differ from one country to another. In the Netherlands we make often use of the EMPARA model.

For the HIA, we need two calculations, one before and one after the intervention. As the interventions are all aimed at influencing the source (number, speed or type of cars), it suffices to calculate the difference in emission and then further down in the chain (for uncertainties due to calculations, see e.g. (10).

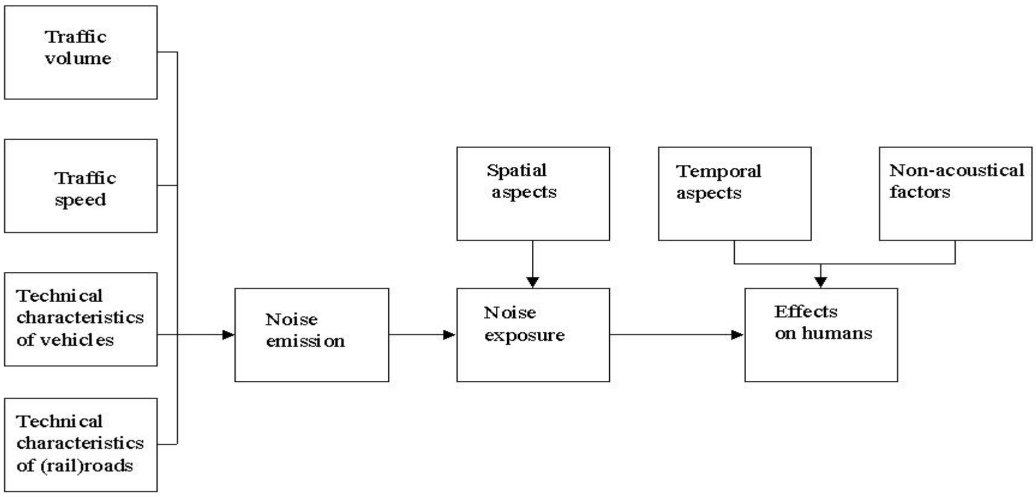

Figure 2 Conceptual model of factors influencing noise effects (10)

4.1.3 From concentration to exposure / dose

For air pollution, ERF's are available for concentrations in the environment expressed as annual average concentrations or 24-hour average concentrations for the short-term effects. It is therefore not very useful to quantitatively evaluate this part of the chain further. An exception to that is the evaluation of exposure during traffic exposures, where shifts of transport mode may be related to changes in doses related to differences in physical activity (e.g. a former car driver who will cycle may receive higher pollutant doses now).

Noise ERFs should consider daytime and night time noise separately. Although sleep disturbance can be considered as one of the most important health outcomes of noise exposure, assessment of this requires detailed information[3] to such an extent that this might not be feasible within these assessments. Where noise levels have been calculated at intervals around the building facades, the highest overall noise level can be determined and assigned this to the dwelling as the value at the 'most exposed

[3] Information re.: Location of sleeping rooms, reduction of outdoor noise (eg outdoor-20dBA) and behavioural aspects (sleeping with open window etc).

facade'. Where grid point calculations have been made, the procedure is the same (having subtracted 3 dB to allow for the reflection from the facade in question), linking each surrounding grid point to all of the exterior facades of each individual dwelling when the area around the grid point (i.e. a square with sides equal to the grid point spacing centred on the grid point) intersects with a facade. Again, take the highest overall grid point noise levels at any façade of the dwelling and assign them to the dwelling. If desired, similarly determine the lowest overall level at a different facade of the dwelling to determine the optional reporting of a 'Quiet Facade', if the '20 dB lower than most exposed facade' criterion is met. The exposure to noise will be assessed for the total population by linking population data to modelled road traffic noise levels. To perform this operation, population data and calculated noise maps are needed.

4.2 From exposure to health effect

Which exposure-response relationships will be used depends strongly on the purpose and frameworks of the HIA's. We will make use of already existing exposure-response relationships instead of deriving summary estimates ourselves, as traffic exposure have been reviewed extensively in the past years.

WP 1.3 Exposure-response stated that if there is no existing ERF available from an authoritative and influential institute or organisation, and due to time constraints you are unable to perform an appropriate systematic review and meta-analysis for every exposure-response from which there is sufficient evidence that it is causal and therefore want to include in your HIA, they recommended the following: (11)

1) Select some core quantitative literature instead of selecting all the relevant studies available of a certain exposure-response relation and try to combine those in a meta-analysis
2) Select an already published meta-analysis of good quality and use those estimates in your HIA
3) Select one individual (preferable international and multi-center) study with a good quality and apply the individual derived ERF in your HIA

4) Look in former HIAs and related projects in your policy area and see which ERFs they have selected and whether you can use those as well for your HIA purposes

Air pollutants that should be considered include PM10, PM2.5, NO2, Black Smoke and ultra fine particles. Which pollutant(s) will be used, depends on the availability of exposure data in the case study. ERFs exist for concentration in the environment and for traffic variables, such as traffic intensity on the residential road. It should be noted that the regulated pollutants PM10 and PM2.5 are least sensitive to changes in traffic emissions. We have already a draft version of the available ERFs used in the areas of air pollution, noise and traffic accidents. The ERFs for the physical activity area is quite difficult to obtain as there is a lot of uncertainty in this area.

4.3 Risk characterisation

Incidence, prevalence, mortality, morbidity, healthy life expectancy, attributable burden of disease measures, Quality Adjusted Life Years, Disability Adjusted Life Years), and monetary valuation (e.g. Willingness to Pay) are the most common health measures used in health impact assessments. All these measures are associated with their specific advantages and disadvantages which have been extensively described elsewhere (12). WP 1.4 describes different methods and tools available for risk characterisation.

Here it suffices to state that the usefulness in the policy context depends strongly on the policy issue in question and what the policy-maker aims with the outcomes of the HIA. Mortality and morbidity figures reveal part of a public health problem and are less useful for complex policy questions related to environmental health. In the case studies included in transport assessment, which intend to evaluate and compare policy measures aimed at the reduction of noise, air emission, and traffic related accidents, mortality/morbidity figures as well as aggregate measures such as Daly's and indicators of monetary valuation will be considered hereby taking their specific drawbacks into account.

Generally, to estimate a certain burden of disease due to a certain exposure we need to combine the population exposure distributions (measured/modelled) with the selected ERF of a certain disease, and the base prevalence of a certain disease. If there are no base prevalences available (e.g. in the case of annoyance and sleep disturbance), another options is than to apply the ERF directly to the population (noise) exposure distributions.

In principle the same period for the background rates is chosen as for the estimated/calculated exposures. Prevalence baseline data will be ideally be taken from routinely collected national age specific mortality and morbidity registries. If prevalence data are not available, modelled or estimated values will be used.

4.3.1 DALY's

For the calculation of DALYs we need apart from information on exposure to the environmental factor, and exposure-response relationships (relative risks), base prevalences at the reference level information on the duration, and severity for all associated health effects.[4]

The advantage of a measure such as the DALY is that it allows for a comparative risk-analysis. Also it supports the evaluation of the effectiveness of environmental interventions in terms of health gains and in this way the cost-effectiveness of certain interventions can be calculated. The DALY can, moreover, be used to map the spatial accumulation of environmental stressors. All of this in spite of the fact that many uncertainties in the calculation of the DALY, due to gaps in knowledge on exposure-response relations, the distribution of the exposures, duration, and the severity of the health outcome limit the interpretation of the results (13).

[4] The distribution of environmental burden and health over societal groups , which is not accounted for in these methods will be described separately.

4.3.2 Monetary valuation

Another approach to health impact assessment is monetary valuation. The cost aspect more and more is considered in decision making regarding environmental interventions. The costs of measures are often easily estimated, but the health benefits are harder to express in money. Monetary valuation measures use money as a unit to express health loss or gain, thereby facilitating the comparison of policy costs and benefits. It can help policy makers in allocating limited (health care) resources and setting priorities. There are different approaches to monetary valuation such as 'cost of illness' and 'willingness to pay/accept'.

The 'cost of illness' (COI) approach estimates the material costs related to mortality and morbidity. It includes the costs for the whole society and considers loss of income, productivity and medical costs. This approach does not include immaterial costs, such as impact of disability (pain, fear) or decrease in quality of life. This could lead to an underestimation of the health costs. Furthermore, individual preferences are not considered.

The 'willingness to pay' (WTP) approach measures how much money one would be willing to pay for improvement of a certain health state or for a reduction in health risk. The 'willingness to accept' (WTA) approach measures how much money one wants to receive to accept an increased risk. WTP and WTA can be estimated by observing the individual's behaviour and expenditures on related goods (revealed preference). For example, the extra amount of money people are willing to pay for safer or healthier products (e.g. cars with air bags), or the extra salary they accept for compensation of a risky occupation (13). Another similar method is contingent valuation (CV), in which people are asked directly how much money they would be willing to pay (under hypothetical circumstances) for obtaining a certain benefit (e.g. clean air or good health). Advantages of these approaches are that the values represent individual preferences and include certain indefinable costs (e.g. pain, quality of life). The values also appear to be fairly stable in Western countries (13). A disadvantage is that the values are restricted to individual costs. Social costs are not incorporated. The reliability of the answers obtained in contingent valuation studies can be discussed, as people are spending ‘hypothetical’ money for ‘hypothetical’ health benefits. In addition, willingness-to-pay values have shown to be dependent on income.

In monetary valuation studies on environmental noise originally only social effects (such as noise annoyance) were included in cost benefit analysis, but more recently also health other effects are included, such as respiratory or cardiovascular diseases Several steps can be discerned in the monetary expression of a given environmental burden (2) running partly parallel to those used in the calculation of extra cases due to a change and Daly’s. In cost-benefit studies regarding air pollution the Cost of Illness has been included more often e.g. by means of Value of Life Years (VOLY) and Value of a Statistical Life (VSL).

In the Transport Assessment (1st pass) we might include COI, depending on the available data. Existing Willingness to Pay and Willingness to Accept studies will be reviewed, but the issue will only be included at a later stage.

4.4 Case-studies further specified

The two case studies as described earlier will be used to test and develop the methods as suggested by SP1. Below a short summary is given of these for the first pass selected case studies. In appendix 3 more details are given. These case specific protocols do not give detailed work plans of all the steps to be taken for the assessments in the different cities, but describe the plans for the two cities were the policy measure has already been implemented. The transferability issue will be addressed at a later stage.

See table 5 for a preliminary list of the indicators used the assessments. Detailed descriptions of the final set of indicators to be taken up in the assessment will be guided by WP 1.4 and where available based on already existing indicator descriptions (WHO/ENHIS project).

4.4.1 Congestion charging

In the case of policy scenario 1) congestion charging and road pricing, Imperial College, London, will take the lead in this assessment, as a congestion charging scheme is introduced in the London city centre already in February 2003. This policy intervention is kept under continual and thorough review by Transport for London (TfL). (http://www.tfl.gov.uk/tfl/).

The framework as shown in figure 3 describes the major concepts and pathways to be included in the assessment. The rationale behind these choices has been described in previous paragraphs.

Exposure estimates to noise and air pollution will be made at the residential address. It is likely that air pollution modeling with the use of GIS will take place over the period 2000-2006, to include periods both before and after the implementation of the CCZ.

For noise the plan in London is to take a more simple approach by further developing and applying a simple screening approach, based on the calculation of road traffic noise (CRTN), that uses generalised inputs on traffic volumes and land use to estimate noise levels at individual receptor locations. This is a GIS-based model and can, given suitable calibration, be transferred to other cities. So far the model has been tested in Leicester, as part of the EU-funded HEARTS project, where measured noise data are available for model validation.

For traffic accidents, a vehicle accident (crash prediction) model with explanatory data (traffic and site characteristic data) generated within a GIS will be used, which can predict the total number of accident each year on individual road sections. Most of the modelling work undertaken in other studies has concentrated on one or two sections of specific road types.

See appendix 3 for more details about this planned case study.

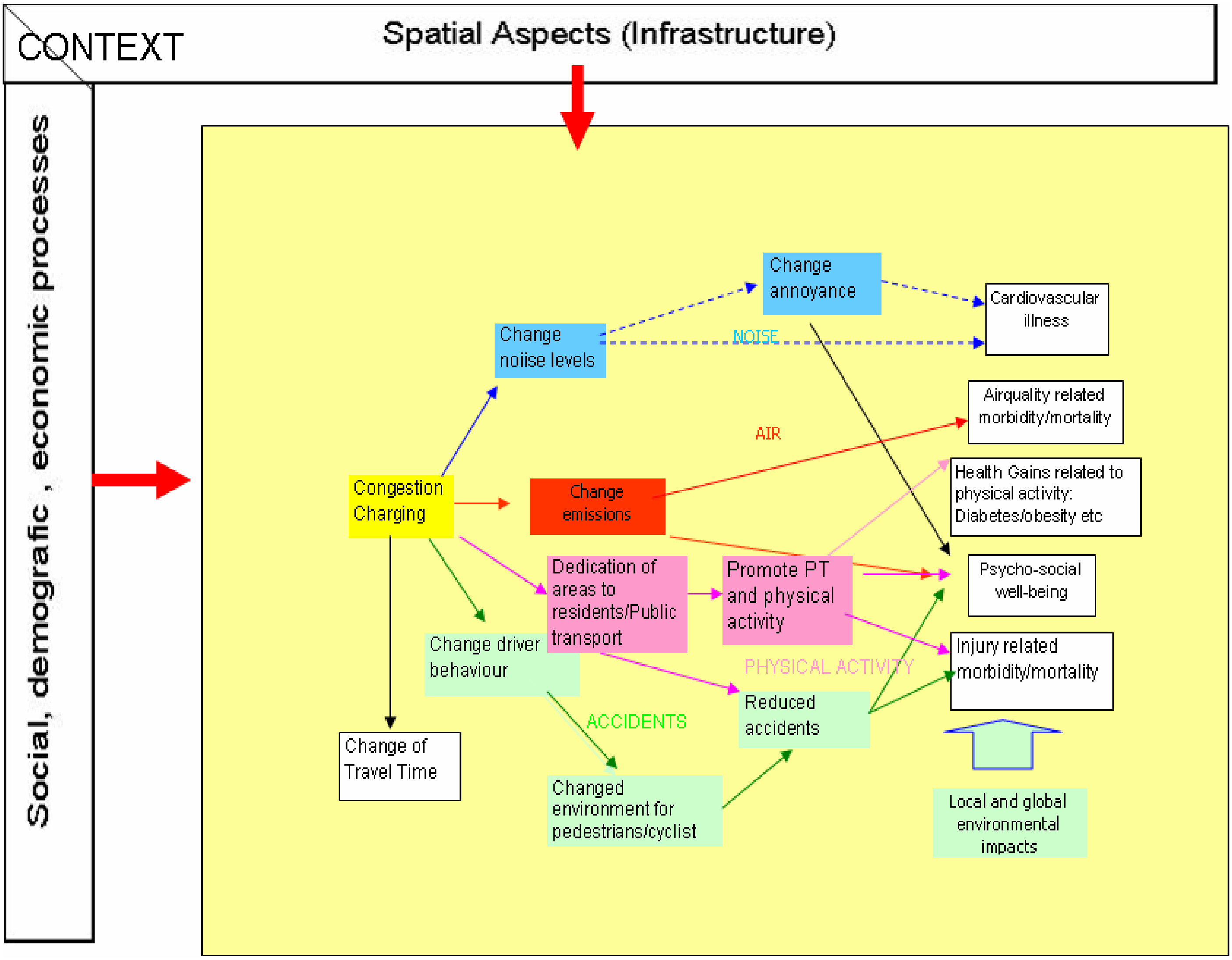

Figure 3: preliminary Framework Congestion Charge Zoning

4.4.2 A measure to accelerate replacement of old cars.

In the case of policy scenario 2) replacement of old cars, ALS, Rome will take the lead in this assessment, as traffic limitations measures to old cars and their removal were implemented in Rome since a few years.

The framework as shown in Figure 4 describes the major concepts and pathways to be included in the assessment. The rationale behind these choices has been described in previous paragraphs. The odour part will be difficult as there is hardly any data available on that.

Total number of vehicles by type and age will be circulating in Rome will be collected for the years 2001-2004. Changes will be calculated, together with the changes in emissions of these vehicles. Air pollution concentrations are available of the following pollutants at the fixed monitor stations for the same years: PM10, NO2, CO, benzene and ozone. PM2.5 and PM0.1 are only available from one fixed site monitor for these years and thus probably useless. Changes in air pollution concentrations will be modelled to evaluate the net change given the meteorology, which we know affect the levels.

The evaluation based on numbers of cars (by type), emissions, and annual city concentrations from fixed monitors (and then linking to (attributable) burden of disease) will serve the purpose as interpolation of those fixed monitor levels to exposure levels at the residential addresses by the use of e.g. GIS is not a realistic option. In Rome, there are too few monitors, and it is not a real spatial distribution. Attempt to use dispersion models for PM have been done already but with no success up to now due to the fact that there are several factors involved.

How to deal with the noise part is less clear cut, since noise maps (Rome) are only available recently and thus changes due to the intervention are hard to estimate. However it might be possible to model the noise levels based on available data on transport-volumes, speed and the road network. Accidents statistics will be obtained for the years 2001-2004. The question whether (changes in) accident and injury rates can be attributed to the policy intervention -changes in the car fleet – will have to be studied and discussed extensively during the first phase of the assessment.

See appendix 3 for more details about this planned case study.

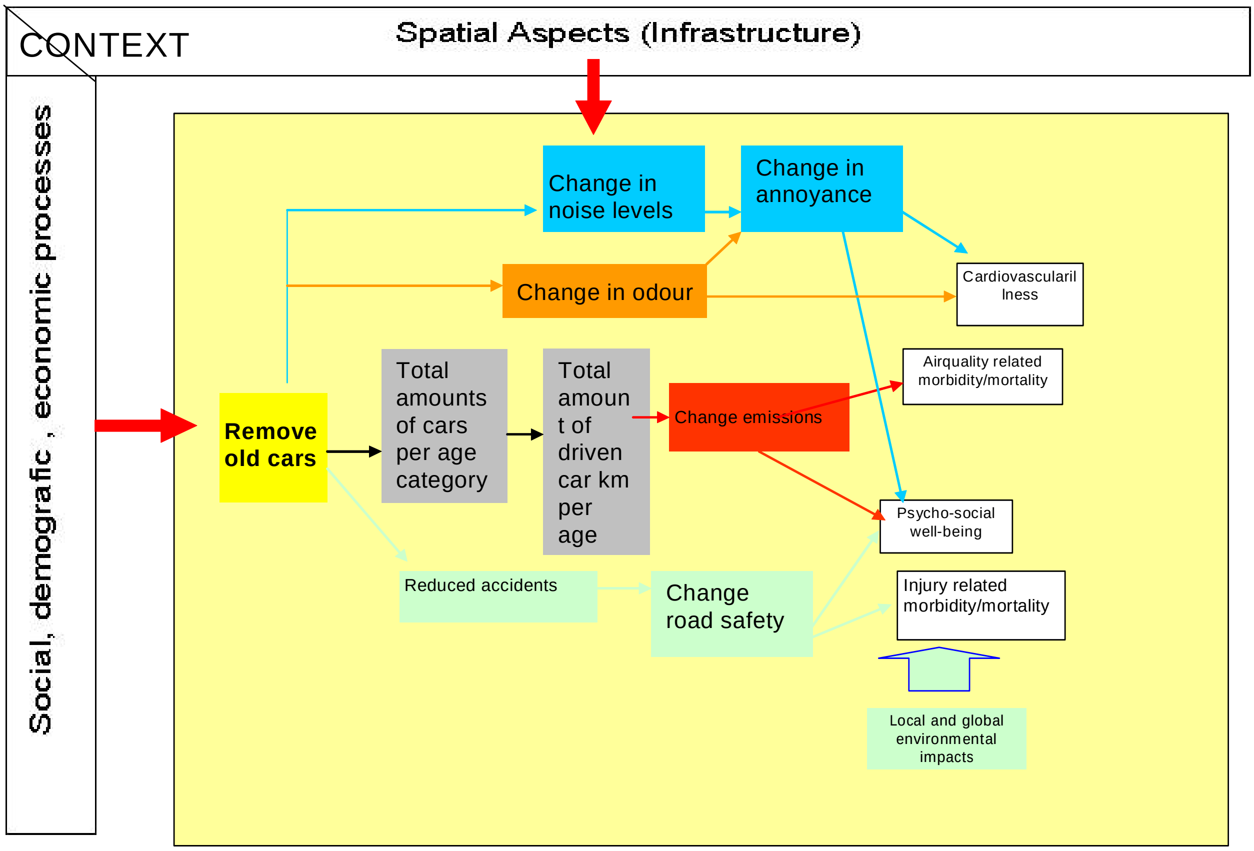

Figure 4 Preliminary framework replacement of old cars

Table 5 Preliminary list of indicators in the transport assessments

Data set	Definition	Application	Calculations	Case study in which applied
Indicators related to driving forces/pressures/emissions of transport				
Road geography	1:1250 vector coverage with individual lanes	Noise, Air, Accidents		CS1, CS2, CS3
Air pollution emissions	Annual average emissions for a range of pollutants (CO, VOCs, SO2, NOX, PM10)	Air		CS1, CS2, CS3
Noise emissions				
Accidents	Location and nature (severe, fatal etc)	Accidents		CS1, CS2, CS3
# “journeys” per transport modus Per age group/length of trip		Physical Activity		CS3
Total # of vehicles by type in 2001-2004				CS2
Network of cycling lanes/footpaths	Inclusive of interconnectedness of these	Physical Activity		CS3

Indicators related to concentrations/exposure of transport				
Air pollution monitoring	Daily and annual mean concentrations of PM10, NO2, CO, benzene, ozone for 2001-2004. The available fixed monitors will be considered and only stable monitors will participate in the evaluation	Air	Calculate annual mean levels and change 2001-2004.	CS1, CS2, CS3
Noise monitoring	Noise measurements within the areas	Noise (model validation)		CS1, CS2, CS3
Noise monitoring data	Noise maps for 2001-2004 period/If not available modelled noise			CS1, CS2
Digital Elevation model	Gridded height data (circa 1m resolution)	Accidents (visibility indices)		CS1, CS2, CS3
Street characteristics	Location of pedestrian crossings and junctions Site length, Road curvature, visibility	Accidents/Physical Activity		CS1, CS2, CS3

Age specific data on physical activity (commuting behaviour)		Physical Activity		CS3
Important transport related health effects (responses)				
Baseline health data	annual mortality rates, annual hospitalization rates (see for details separate table			CS1, CS2, CS3
Subjective health data	Annoyance data based on surveys	Air/Noise/Odour		
Contextual Data				
Meteorology	Daily and annual statistics for wind speed, wind direction, cloud cover, temperature, precipitation	Air, Accidents (precipitation)		CS1, CS2, CS3
Population data	Age and gender specific population dates at city level for 2001-2004s			CS1, CS2, CS3

Population Density				
Traffic volume	Annual Average Daily Traffic (AADT) per traffic mode	Noise, Air, Accidents	2001-2004 differences will be calculated.	CS1, CS2, CS3
Traffic speed	Average speed per road section	Noise, Air, Accidents		CS1, CS2, CS3
Land use	Detailed vector coverage of land use from local authorities Twenty five classes of land use	Noise, physical activity		CS1, CS2, CS3
NB Attitudes toward intervention (differences between groups/differences between cultures				
Inequity Issues				

CS1 = case study 1 congestion charging and road prizing; CS2 = case study 2 a measure to accelerate replacement of old cars;

CS3 = case study 3 a measure to promote public transport and cycling/walking

5. Anticipated Limitations of the Assessment

5.1 Major Sources of Uncertainty

The assessment for WP3.1 will, in common with other risk/health assessment-type evaluations, be confronted with a number of limitations. An overall review of the uncertainties has been given in the document on cross-cutting issues in Risk Assessment Integrating Uncertainty to Integrated Assessment (WP 1.5). Important uncertainties in the exposure-response assessment are described by WP 1.3 and will be considered as well.

Since the aim of the case studies is to make these gaps in knowledge on associations between environment and health, data gaps and the lack of generalized exposure effect relationships transparent, the uncertainty associated with the assessment should not necessarily be viewed as a limitation, but rather as an indication of the extent to which the policy issue at stake is affected by lack of knowledge.

Ideally we want to make use of some intervention studies which investigate the effect of a policy measure on emission/concentration and then further down in the chain which measures (changes) in health effects. However, as these types of studies are rather rare, we need other approaches/methods/tools and models to evaluate a certain policy measure in terms of health, and therefore we need to make inherent assumptions and uncertainties in basically every step in the HIA process. Below the important ones are shortly outlined below together with some ‘solutions’ (definitely not conclusive):

Identify and characterise the population at risk

- Assumptions and uncertainties involved about where and when and in whom the health effects will take place;

Select or develop a suitable set of exposure-response functions (ERFs) that link (individual) pollutants with specific health endpoints, i.e. % increase in morbidity per μg/m^3 of a pollutant

- Uncertainties /lack of consensus about exposure-response function, see WP1.3 Protocol;
- Exposure- response function only available for specific groups based on individual studies;
- The potential interactive and cumulative and/or combined effects of air pollution and noise;

Derive the population exposure distribution

- Lack of data about the effect of a policy intervention on the distribution of exposure: alternative is to calculate/model estimate the change in emission/exposure; uncertainties in the attribution of the exposure change to specific policies is difficult;
- Often only measured air pollution data available at fixed site monitors;
- Then maybe interpolation to residential addresses of the population at risk needed, or fixed site monitors serves the purpose already;
- Choice of the air pollution exposure indicators;
- Measured noise data hardly available, sometimes calculated (then sometimes problems with comparability); Quality of modelling is highly dependent on the quality and availability of the input data;
- Also data needed on climatic/meteorological conditions (could also be modelled);
- Identification of activities that differentiate individuals for exposures of interest versus those activities varying little between individuals;

Estimate the background rates (i.e. prevalence and/or incidence) of the relevant health endpoints in the population at risk

- Health effect data only available for some health endpoints and problematic for other (e.g. annoyance, sleep disturbance, subjective health);
- Health data often only available at regional or national level;

- Health data ‘biased’ by availability of care in a certain city/region (e.g. hospital specialised in heart disease or cancer;
- Data on traffic deaths and injuries;
- Choice of endpoints might be influenced by the availability of exposure data;

Calculate the burden of disease or death in the population at risk

- Inherent uncertainties in the DALY calculations, see WP 1.4
- City-specific adjustments needs to be made to time trend of diseases as well as exposures (air pollution tends to deceases over time)

Communication

- Uncertainty in methods employed in the development of a science-stakeholder-policy interaction (i.e. selection of stakeholders, indicators, and ‘language’);
- Clarity and effectiveness in communication of health impacts to stakeholders;

5.2 Expected Problems in the Assessment Process and how they will be Resolved

The major problems foreseen in the assessment concern the data availability (at the relevant scale level) and comparability. Source to emission to concentration to exposure modelling is another source of concern. Also it is questionable whether the information needed to perform a monetary valuation is available. The transferability of the outcomes/effectiveness of a policy action in one city to other locations is also problematic since so many variables can play a role.

6. Reporting and Communication

6.1 Tentative Work Plan for Assessment

The table below gives a first indication of the expected work to be carried out under WP3.1 per type of task for the first pass assessments

Tasks	Who	Provisional date
Data Collection - measurements -review noise maps at EU level	All RIVM/WS	May-Okt 2007
Data collection - modelled data : AIR - modelled data: Noise	TNO RIVM/MNP	May-Okt 2007
Meta-analysis based overview of exposure-response functions for Air Noise Accidents Physical Activity	IRAS RIVM Expertise sought RIVM	May-August 2007
Perform health impact assessment of policy measures: Case study 1: CCZ Case study 2: ACR	All/ support RIVM, IC All/support IRAS , ASL	Sept 2007-March 2008
Draft report	RIVM/IRAS with input from all	Dec 2008

6.2 Results Communication

Results will be made available primarily by way of a written report that will be distributed by partners to those stakeholders that were involved in the scoping process, to those sub-projects that will use these results (e.g. SP2, SP5 & SP4) and, of course, to all partners involved in the INTARESE project. In addition, all outputs of WP3.1 will be made available to partners on the INTARESE-Wiki at www.pyrkilo.fi/intarese/index.php/WP3.1_Transport and the INTARESE website at www.intarese.org.

The first draft transport assessment protocol was completed mid-April and distributed to the WP3.1 partners for comments and discussed at the WP meeting in Barcelona. A complete final draft of the document was be submitted and adapted based on the SP1 workshop on May 22-23. During the same period some key stakeholders were asked to comment on a summary of the Assessment Protocol and the choice of case studies. The stages outlining the overall development of this document are listed in the timetable below.

Timetable for TAP

Task	Provisional date
First draft of TAP completed	23 March 2007
Discussion protocol at SP3 meeting	28 March 2007
Provide draft of TAP to partners	30 March 2007
Draft of returned with comments	5 April 2007
Inclusion comments on TAP from partners	14 April 2007
Full project meeting Barcelona	**19-20 April 2007**
Provide adapted draft to partners and selected stakeholders	9 May 2007
Submission of final draft of TAP	12th May 2007
Workshop SP1/SP3	22-23 May 2007
Adapt TAP based on outcomes of the workshop	29 May 2007

An interim report of the results of the first-pass assessment (month 18 – month 30) will be prepared in month 25 (December 2007). This will be distributed to all SP3 work packages, posted on the INTARSE-Wiki websites and distributed to SP1, such that lessons learned can be incorporated into their guidelines for improving the assessment methodology for the second-pass assessment (month 30-36).

At month 30 (June 2008) a final report on the first-pass assessment will be completed and delivered to SP3 partners, INTARESE partners and stakeholders. Both stakeholders and partners will be given the chance to comment on the report and to evaluate potential improvements to the assessment methodology ready for the second pass assessment. There will then follow a period of six months for a full review of the methodology (to be carried out at the same time as the second-pass assessment) leading up to submission of the final report in month 36 (November 2008).

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Appendix 1 – Stakeholders identified for WP3.1

Stakeholders from the Netherlands

Stakeholder type	*Name of national organisation*	*Role/institutional aims and objectives*	*Assumed aspects/issues of interest to the stakeholder*	*Anticipated positions on these issues/aspects*	*Contact details*
Government	**Ministry of Transport, Public Works and Water management**	The Ministry of Transport, Public Works and Water Management is active in numerous policy areas. The most well-known tasks are undoubtedly to protect our coastline and to take care of the infrastructure in our country. Ministry matters also include other policy areas, such als shipping and aviation. The core tasks of this Ministry are: guaranteeing safe, versatile and reliable accessibility both over land and water and through the air; offering protection against floods; and, ensuring the existence of clean water and sufficient supplies thereof.		Regulatory and policy-making role	Website: http://www.verkeerenwaterstaat.nl Visiting adress: Plesmanweg 1-6 2597 JG Den Haag P.O. Box 20901 2500 EX Den Haag Phone: +31 70 351 61 71 Fax: +31 70 351 78 95 Email:venwinfo@postbus51.nl

	Association of Provincial Authorities (IPO)	The Netherlands which is divided into 12 provinces which are all working together in the IPO. The IPO is active on a whole range of different areas including environment, land use, social policy issues, spatial planning, housing, economy and transport. Core tasks are: representation of interests, communication and innovation.			Website: http://www.ipo.nl Visiting adress: Muzenstraat 61 2511 WB Den Haag P.O. Box 16107 2500 BC Den Haag Phone: +31 70 888 1212 Fax: +31 70 888 1280 Email:ipo-info@wb.ipo.nl
	Association of Netherlands Municipalities (VNG)	The VNG is the organisation for all of the 458 municipalities in the Netherlands (2006). Consultation with the other two layers (provincial and national level) of government takes place on a regular basis. Core tasks are the 1) Representing the Members' Interests 2) Provision of services 3) Providing information to the members 4) Facilitating the exchange of knowledge and experience.			Website: http://www.vng.nl Visiting adress: De Willemshof Nassaulaan 12 2514 JS Den Haag Phone: +31 70 373 8393 Fax: + 31 70 363 5682 EMail: vng@vng.nl
Regulators					

Consumer organisations and branch organizations of mobility related enterprises	**Dutch Cyclists' Union (Fietsersbond)**	The Dutch Cyclists Union campaigns for better cycling conditions in the Netherlands.The Fietsersbond has 33,000 members. With 130 local branches and over twenty employees at the National Office, they work towards:1) a well maintained, smooth and direct cycling routes 2) more and improved parking spaces for bikes 3) action against bicycle theft 4) more safety in traffic for cyclists The Fietsersbond is a member of the European Cyclists' Federation (www.ecf.com)			Website: http://www.fietsersbond.nl Landelijk bureau Fietsersbond Visiting adress: Balistraat 59 3531 PV Utrecht P.O. Box 2828 3500 GV Utrecht Phone: +31 30 291 8171 Fax: +31 30 291 8188 Email: info@fietsersbond.nl
	BOVAG	BOVAG is a branch organization of more than 11,000 transport companies including garages, companies			Website: http://www.bovag.nl/ Visiting adress: Kosterijland 15 3981 AJ Bunnik P.O. Box 1100 3980 DC Bunnik Phone: +31 30 659 5211 Fax: +31 30 656 7835 Email: BOVAG@BOVAG.nl

Research and data provision

Transport Research Centre (AVV)	The AVV, Transport Research Centre (part of the Rijkswaterstaat organisation) makes an active contribution to improving the Dutch transport system by supplying knowledge for the formulation and implementation of Dutch transport policy. The AVV's task is to enable safe transport on Dutch roads, rails and waterways for as many people and as much freight as possible, but with a minimum of damage to the environment and living conditions. The AVV does this as part of the Directorate-General of Public Works and Water Management of the Ministry of Transport, Public Works and Water Management, and is an integral part of the Dutch research infrastructure.			Website: http://www.rws-avv.nl Visiting address 'De Nieuwe Maas' Building Boompjes 200 3011 XD ROTTERDAM P.O.Box 1031 3000 BA ROTTERDAM The Netherlands Phone: +31 10 282 5600 fax: +31 10 282 5640 Email: avvloket@avv.rws.minvenw.nl

	Institute for Road Safety research (SWOV)	SWOV is the Dutch national road safety research institute. It is SWOV's task to contribute to improving road safety through scientific research.			Website: http://www.swov.nl Visiting address: Duindoorn 32 2262 AR Leidschendam Post adress: P.O. Box 1090 2260 BB Leidschendam Phone: +31 70 317 3300 Fax: +31 70 320 1261 Email: info@swov.nl

Stakeholders from the United Kingdom

Stakeholder type	*Name of national organisation*	*Role/institutional aims and objectives*	*Assumed aspects/issues of interest to the stakeholder*	*Anticipated positions on these issues/aspects*	*Contact details*
Government					
Regulators					

Consumer enterprises					
Research and data provision					

Stakeholders from Spain

Stakeholder type	*Name of national organisation*	*Role/institutional aims and objectives*	*Assumed issues of interest to the stakeholder*	*Anticipated positions on these issues/aspects*	*Contact details*
Government	**Autoridad del Transporte Metropolitano (ATM)**	Transport coordination in the metropolitan area of Barcelona			Muntaner, 315-321 E-08021 Barcelona. España www.atm-transmet.org
	Generalitat De Catalunya			Regulatory and policy-making role	Consellería de Política Territorial i Obres Publiques Av. Josep Tarradellas, 2, 4 y 6 E-08029 Barcelona. España Teléfono : +34 93 495 80 00 Fax: +34 93 495 80 01
	Ayuntamiento de Barcelona (City Hall)			Regulatory and policy-making role	Pl. Sant Jaume, 1 08002 Barcelona Tel. Centralita 93 402 70 00 http://www.bcn.es
Regulators					

Consumer organization mobility related enterprises					
Research and data provision	**CENIT** **Centro de Innovación del Transporte Universidad Politécnica de Cataluña**	To promote transport research, innovation and development and the management of mobility, stimulating the creation of both national and international work teams.			Website: http://www.cenit.es C/ Jordi Girona, 29, 2-A (Edificio NEXUS II) 08034 Barcelona Phone: +34 93 413 7667 Fax: +34 93 413 7675 E-mail: cenit.bcn@upc.edu
	GEMOTT **Grup d'Estudis de Mobilitat, Transport i Territori**	To carry out basic academic research on mobility, systems and forms of transport, and territorial organisation, understanding that the desired social and environmental sustainability goals can only be achieved through the knowledge of these elements			Website: http://mobilitat.uab.es Universitat Autonoma Barcelona Dep. de Geografia. Facultat de Lletres. 08193 Bellaterra Phone: +34 93 581 4810 E-mail: gemott@uab.es

Stakeholders from Italy

Stakeholder type	*Name of national organisation*	*Role/institutional aims and objectives*	*Assumed aspects/issues of interest to the stakeholder*	*Anticipated positions on these issues/aspects*	*Contact details*
Government	**Italian Ministry of Health**	Responsible for public health of the nation	Regulatory and policy making role		Dr. Donato Greco Minister of Health Viale della Civiltà Romana, 7 00144 Rome Tel. +39 06 59943883 Fax +39 06 59943577 d.greco@sanita.it
	Italian Ministry of environment	Responsible for environment of the nation	Regulatory and policy making role		Ing Bruno Agricola, Ministry of Environment Via Cristoforo Colombo, 44 00147 Rome Tel. +39 06 57223001
	Italian Ministry of Transport	Responsible for all transport issues of the nation	Regulatory and policy making role		TBA
	Rome municipal Department of Environment	Responsible for all the environmental issues of the city of Rome	Regulatory and policy making role		Dr. Donatella Donati Dr. Eugenio Donati Assessorato Ambiente Comune di Roma Piazzale di Porta Metronia, 2 00183 – Rome Tel. +39 06.67109301-2-3

Regulators	**ARPA Lazio**	Responsible of air pollution monitoring of Rome			Dr. Sergio Ceradini ARPA Lazio Via Giuseppe Saredo, 52 00173 Rome Tel. 06.41435645
Consumer organisations and branch organizations of mobility related enterprises	**Lega Ambiente** **ATAC**	It is a NGO, interested in environmental issues, sustained from private citizens Controls private and public mobility in Rome and	Air quality modelling starting from traffic problems		TBA Ing. Fabio Nussio ATAC Roma Via Ostiense 131/L 00154 Rome Tel. +39 06.46959469 fabio.nussio@atac.roma.it
Research and data provision	**ATAC**	Controls private and public mobility in Rome	Data on number of vehicules and emissions		Ing. Fabio Nussio ATAC Roma Via Ostiense 131/L 00154 Rome Tel. +39 06.46959469 fabio.nussio@atac.roma.it
	Municipal Department of Environment	Responsible for all the environmental issues of the city of Rome			Dr. Donatella Donati Dr. Eugenio Donati Assessorato Ambiente Comune di Roma Piazzale di Porta Metronia, 2 00183 – Roma Tel. 06.67109301-2-3

	ARPA Lazio	Responsible of air pollution monitoring of Rome	Data on pollutants		Dr. Sergio Ceradini ARPA Lazio Via Giuseppe Saredo, 52 00173 Rome Tel. 06.41435645

Stakeholders from Finland

Stakeholder type	***Name of national organisation***	***Role/institutional aims and objectives***	***Assumed aspects/issues of interest to the stakeholder***	***Anticipated positions on these issues/aspects***	***Contact details***
Government	**Ministry of transport and communications (LVM)**	The Ministry of Transport and Communications of Finland promotes national well-being and the efficient functioning of society by making sure that people, commerce and industry have access to high-quality, safe and reasonably priced transport and communications networks, and by furthering the competitiveness of transport and communications companies.			Website: http://www.mintc.fi/ Tuula Ikonen - tuula.ikonen@mintc.fi Raisa Valli – raisa.valli@mintc.fi
	Helsinki City Planning Department	Transportation and traffic planning, a part of land-use planning, includes all modes of transportation: public transport, vehicular traffic, parking, as well as cycling and pedestrian networks. In Helsinki's planning one of the top priorities is to promote the fluency and service level of public transport. Improving traffic safety is also a central objective in all planning.	Accident data of the Helsinki district should be retrieved from KSV		Website: www.hel.fi/ksv/ Kirsti Nieminen – kirsti.nieminen@ksv.hel.fi

	Helsinki Environmental centre	The environment centre produces and distributes adequate, current and reliable information about the state of Helsinki's environment and food quality, and about the impact of plans and projects on the environment and health.			Website: http://www.hel2.fi/ymk/eng/index_eng.html Pekka Kansanen – pekka.kansanen@hel.fi
Regulators	**Finnish parliamentary member and Helsinki public transport committee**				Jessica Karhu – Jessica.karhu@eduskunta.fi
Consumer organisations and branch organizations of mobility related enterprises	**Transport consultancy WSP LT-konsultit Oy**	WSP LT Consultants Ltd is an international Finnish consulting company. Our core fields of expertise are transport, logistics, infrastructure, landscape, environmental and public design, as well as the related R&D activities.			Website: http://www.wspgroup.fi/lt/index_eng.asp Mari Siikonen – mari.siikonen@wspgroup.fi
	City Car Club	City Car Club offers a cost effective and easy to use way of driving. We have different types of cars and vans available at over 70 locations in the capital area. It's easy to book and collect a car.			Website: http://www.citycarclub.info/ Satu Salonen – satu.salonen@citycarclub.net

Research and data provision	**YTV - Helsinki Metropolitan Area Council**	The principal duties of the Helsinki Metropolitan Area Council (YTV) comprise transport system planning, regional public transport provision, waste management and air quality monitoring for its four member municipalities (Helsinki, Espoo, Kauniainen and Vantaa). It also maintains regional databases and conducts studies on different issues affecting the region.	YTV's Environmental and Transport departments have data we would need for the congestion charge case study		Website: http://www.ytv.fi/eng Traffic department: Raimo Valtanen – raimo.valtanen@ytv.fi (head of unit) Suoma Sihto – suoma.sihto@ytv.fi (head of unit) Timo Elolähde – timo.elolahde@ytv.fi Environmental department: Anu Kousa – anu.kousa@ytv.fi Tarja Koskentalo – tarja.koskentalo@ytv.fi Päivi Aarnio – paivi.aarnio@ytv.fi
	VTT Technical Research Centre of Finland	VTT provides high-end technology solutions and innovation services. VTT helps in decision-making concerning diverse transport solutions and estimate the socio-economic effects of transport and traffic systems.	VTT transport, traffic and logistics might be interested to hear about the congestion charge case study and willing to give their opinion.	VTT is developing a traffic and road toll monitoring system based on long-range RFID remote identification technology in China. The new system could become the foundation for nation-wide traffic and road toll monitoring	Website: http://www.vtt.fi/services/cluster3/index.jsp Risto Öörni - risto.oorni@vtt.fi (building construction engineering researcher) Kai Sipilä – kai.sipila@vtt.fi (engineering researcher) Juhani Laurikko – juhani.laurikko@vtt.fi (engineering researcher)

Appendix 2: Specific models

The WP3.1 assessment essentially follows an exposure-based INTARESE approach incorporating the full causal chain. Figures 5 to 8 the causal pathways are presented in more detail for air pollution, noise, traffic accidents and physical activity separately.

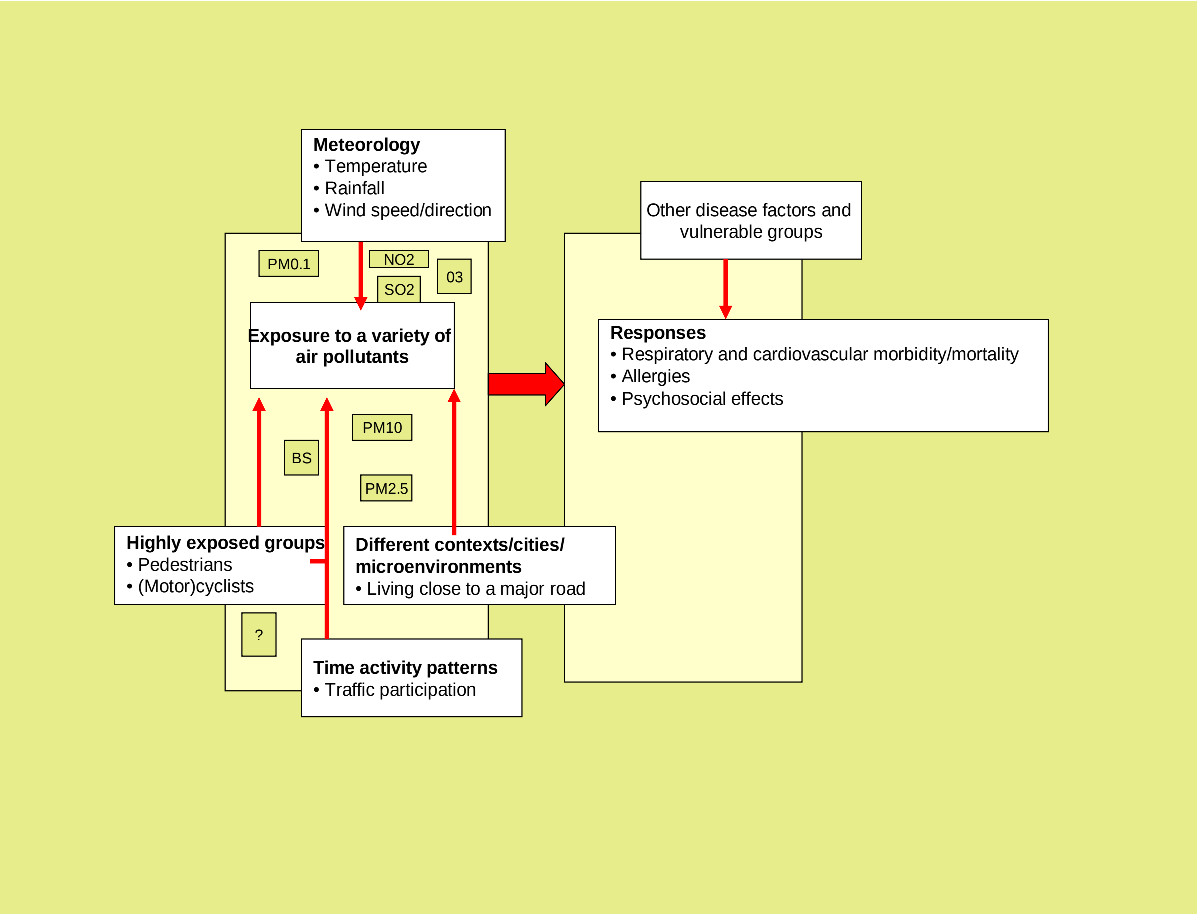

Figure 5: Important aspects in the exposure to response air pollution

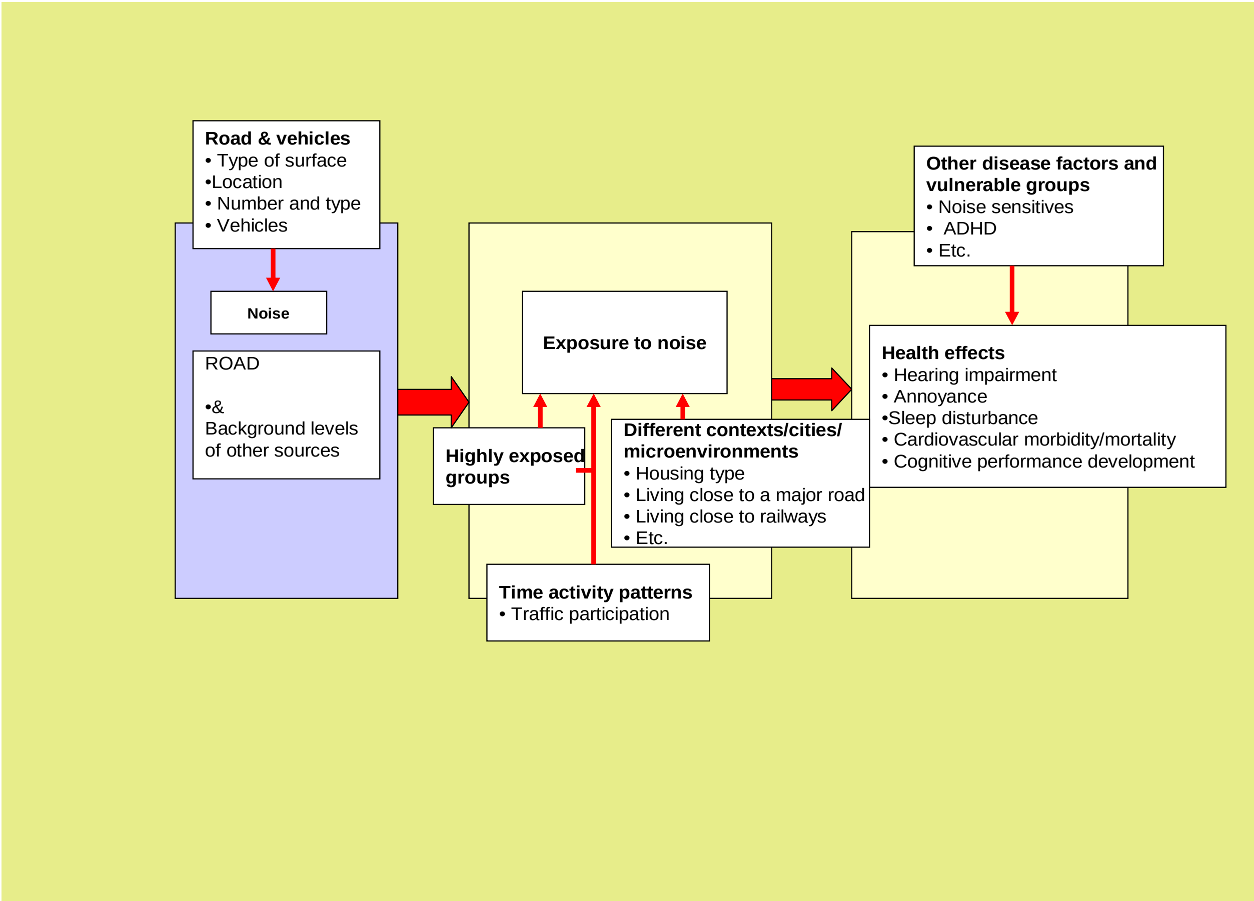

Figure 6: Important aspects in the exposure to response noise

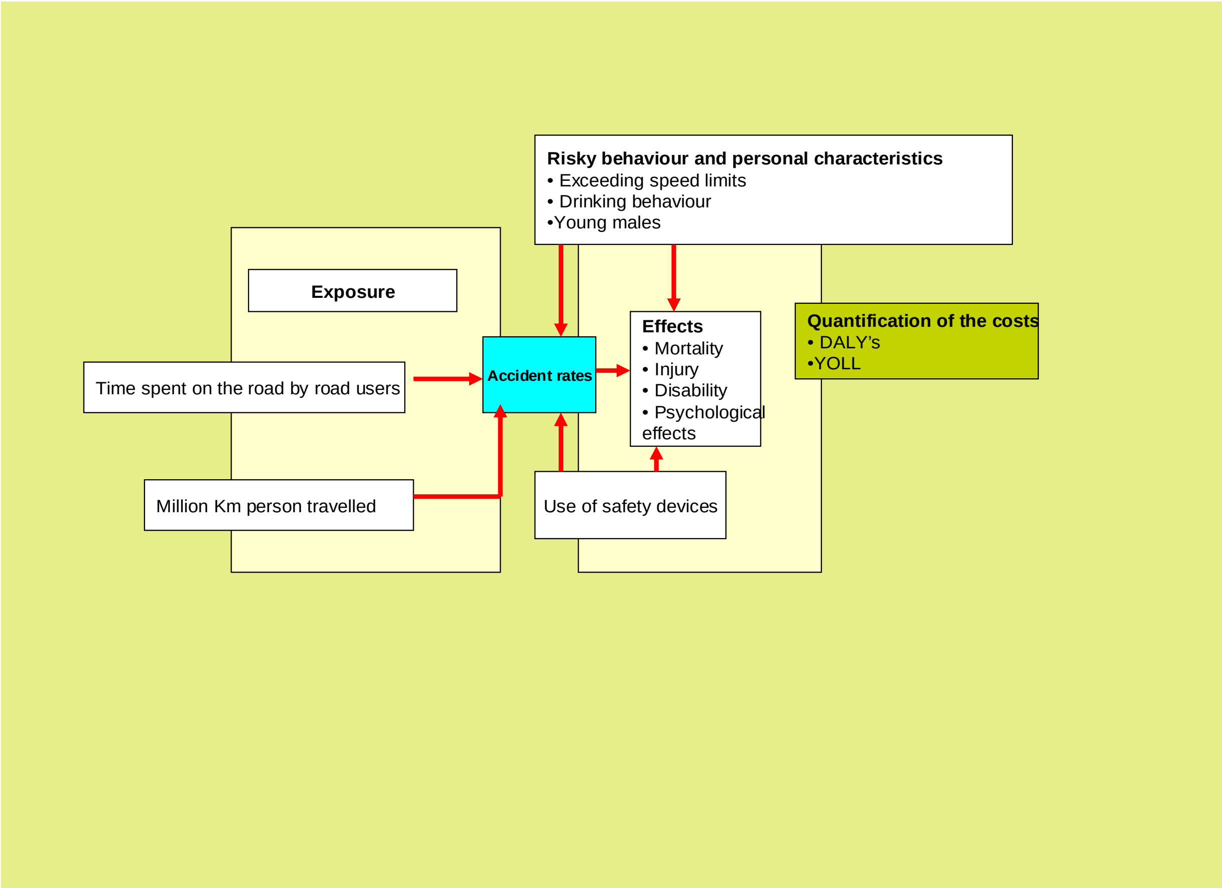

Figure 7: Important aspects in road traffic injuries

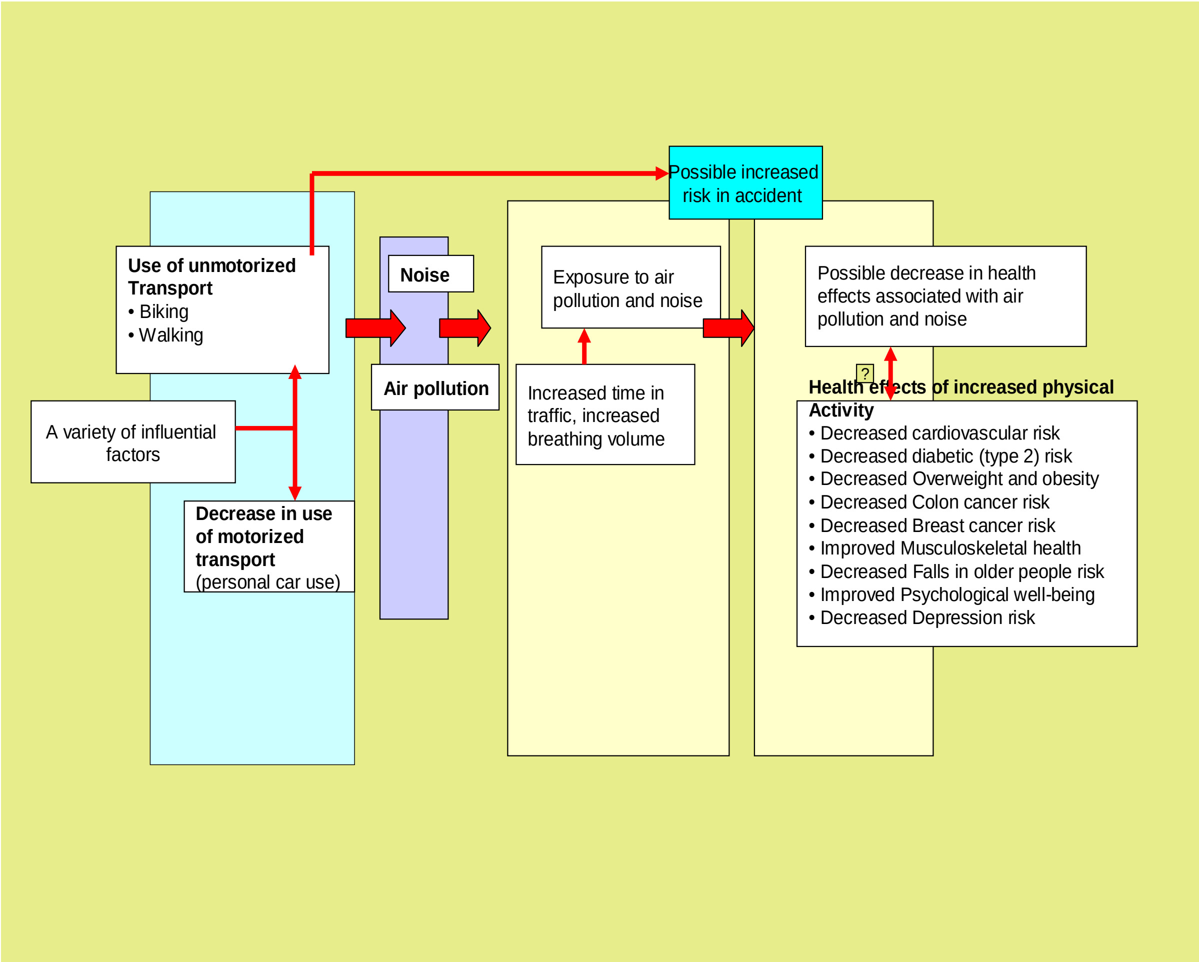

Figure 8: Important aspects in the use of unmotorised transport modes to health impacts from physical (in) activities