SEVENTH FRAMEWORK PROGRAMME

Metronome

A METhodology foR evaluatiON of prOject iMpacts in the fiEld of Transport

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Executive Summary

The METRONOME project (A Methodology for Evaluation of Project Impacts in the Field of Transport) was financed under the 7th Framework Programme (FP) of the European Commission. The project aimed to develop a methodology for evaluating project achievements supported in FP5 and FP6 with particular focus on: Strengthening industrial competitiveness (IndCo); Contributing to sustainable development (SuD); and Improving community and public policies (CPP). The expected impact set for the project was to use the results and findings from the FP5 and FP6 projects to contribute to the definition of intermediate performance targets for FP7 and new research policy objectives.

The developed METRONOME screening, selection and evaluation methodology has three main phases:

1. Identification of European transport research and policy objectives for Industrial Competitiveness, Sustainable Development, and Community and Public Policies
2. Screening and selection of FP5 and FP6 themes and projects for the evaluation
3. Evaluating project impacts through the METRONOME impact model, using a multifaceted approach

The methodology takes a two-dimensional approach to project impact evaluation. On the one hand, it evaluates the projects' achievements in light of the FP5 and FP6 Work Programme objectives and targets set for IndCo, SuD and CPP themes. On the other hand, it evaluates, through the METRONOME impact model, the impacts of the FP research projects according to four impact groups and related indicators. The impact groups are (1) impacts on management and co-ordination, (2) scientific impacts, (3) customer/end user impacts, and (4) societal impacts. The METRONOME methodology proposes the following four complementary approaches (elements) to finding values for the impact indicators within the above groups:

1. Project evaluation and dissemination quality matrices
2. Coordinator questionnaires (and complementing interviews)
3. Lead user interviews
4. Workshop(s)

In the course of the METRONOME project, the developed methodology was applied to a sample of 100 FP5 and FP6 transport projects in the fields of industrial competitiveness, sustainable development and community and public policies. For each of the evaluation themes, a specific application with different mixes of evaluation methods was developed and applied.

In general, the METRONOME evaluation methodology proved to be useful in producing information for the definition of intermediate performance targets for FP7 and of new research policy objectives from the perspectives of: (1) achieving the FP5 and FP6 objectives and targets, (2) FP5 and FP6 implementation and operational environment, and (3) research project outcomes and impacts. Testing the methodology illustrated that different mixes of evaluation methods (both reviewing and surveying) are needed to gain in-depth information on both FP target achievement and potential project impacts over various time perspectives.

The main difficulty encountered during the METRONOME methodological development was the availability of project *result* (e.g. Final Report) data. A structured, up-to-date FP project result database that is ready and available for the evaluators would enable more reliable, less time-consuming and less costly FP impact evaluations. Other major difficulties identified during the methodology development were the relatively low response rates in co-ordinator surveys and interpretation of the multi-level objective and target structures of the FPs as the basis for evaluation. As regards the future methodological development, only a repeated (and simultaneously elaborated) evaluation process can provide more detailed analysis of project or programme impacts. Further, and as a complement to the former, more emphasis and resources are needed in integrating such future elements into evaluation methodologies that can better support the future WP objective and target setting in the changing European transport and research environment.

Based on the METRNOME project reviews, it can be claimed that in general, achievement of FP objectives in both FP5 and FP5 has been good throughout, and in some cases very good. The vast majority of the strategic project objectives of the project sample were fully met. This indicates that on individual project levels, in terms of both substance and practicalities, the projects worked well. A surprising finding was, however, that in the fields of SuD and CPP, both FP5 and FP6 projects were considered to have contributed more to higher level Work Programme objectives than the lower level Key Action or Programme Subdivision objectives, which could be considered more directly applicable to the projects commissioned. This suggests that there could be considerable discrepancies between the different levels of objectives and targets set for the FPs.

Based on the surveys, project coordinators presented slightly more positive views of the achievements of FP5 projects than of FP6 projects. In the case of lead users, however, the result was reversed. Consequently, no meaningful distinction could be made between the two FPs in either the objective achievements or the impacts. The differences could even be due to the temporal implementation of FPs, in a sense that recent FP6 projects are better recalled than the more distant FP5 ones.

Keeping the above in mind, it could, however, be said that in the field of IndCo, major achievements were found in the fields of development of advanced technologies, processes and services, and in the contribution to societal, environmental (e.g. safety, traffic congestion) and financial issues. These same fields were emphasised in both FPs. The main contributions of the SuD projects in both FPs were identified as developing, integrating and managing a more efficient, safer, more secure and environmentally friendly transport system to provide user-friendly door-to-door services. Contribution to the development of decision-making tools was the main achievement of CPP projects also in both FPs.

Scientific publications and a high level of scientific expertise in general were considered as the main immediate impacts of FP5. Improved networking between researchers and public/private organisations and strengthened networks between international parties were seen as the major immediate impacts of FP6. Also patents and standards produced in the IndCo projects (especially in FP6) represent the immediate impacts, even though the transport industry and service sector seem not to have been greatly involved .

As regards the intermediate impacts, the major impacts of both FPs can be seen as strengthened expertise, development of decision-making tools, co-operation with end users in the projects, and usage of project results by the public sector or other societal actors. Contributions (often indirectly) to new transport policy development but also to new products or service developments were also seen as somewhat positive. The evoked networking or co-operation seems to be strongest among project research partners, but can be also identified among stakeholders in both the public and private sectors.

Transferring project results into standards, norms or regulations and failure to raise new unsolved research questions were considered weaknesses of the FP5 and FP6 transport projects. This indicates that even though tools for decision-making have been developed and some contribution made to e.g. transport and SuD policies and strategies, the practical, regulatory outcomes have been modest or are not known. In addition, the identified discrepancy between the FP objectives of different levels and the low level of achievement of European level objectives by projects in matrix evaluations supports this finding. The above illustrates that the impacts of projects in both FPs have been strongest within the impact group of management and coordination. Also scientific and end-user impacts have been adequate, but wider societal impacts quite modest.

If one looks at the potential impacts of FPs on the shaping of the European Research Area (ERA), the most critical issue is the availability and dissemination of FP project result data. This concerns both lower, individual project level and centralised EC level. Currently the project results are not easily available for the use of individual projects/persons or for FP evaluation purposes. Consequently, the FP output quality needs improvements both on a project level (e.g. longer supported maintenance of web sites) and community level (centralised FP project output database).

Another important issue is the lack of consistency identified between the different levels of objectives set for FP Work Programmes. Only a few of the evaluated projects met simultaneously their own strategic objectives, Work Programme (WP) objectives on two levels and relevant European policy objectives. In order to clarify the FP future evaluation in terms of objective achievements, the consistency of the WP objective structure should be increased.

Other aspects identified as relevant for future FP evaluations, which METRONOME time frame and resources did not allow, were the following: Closer co-operation with technology platforms and EC officials in project evaluations, detailed investigations regarding follow-up research project paths, including transport projects commissioned under other programmes than transport (e.g. Information Society, Environment and Security) into the evaluation, and considering very carefully the point in time for FP evaluation.

To conclude, it seems that FP5 and FP6 have certainly played a significant role in the European science and technology agenda. For evaluation of the FPs' role on the global map or on the contribution to EU research competitiveness at international level, the project sample does not give a representative insight. The finding of the METRONOME evaluation should, however, be relevant to all national and European civil servants and researchers both within industry or public bodies and interested in the future of European transport research, both in thematic and practical terms.

1 Introduction

1.1 Objectives and scope

The METRONOME project (A METhodology foR evaluatiON of prOject iMpacts in the fiEld of Transport) had the objective of developing a methodology for evaluation of impacts of projects supported in the Framework Programmes (FP) 5 and 6 of the European Commission with particular focus on three themes. The themes were: *Strengthening industrial competitiveness (IndCo); Contributing to sustainable development (SuD)*; and *Improving community and public policies (CPP)*. In practice, the project aimed to fulfil this objective by:

1. Developing a methodology to evaluate the achievements of projects supported in FP5 and FP6 from the three above themes/perspectives

2. Evaluating the performance of FP5 and FP6 in respect of the three themes by evaluating a sample of FP5 and FP6 projects with the developed methodology

3. Producing recommendations regarding future transport research objectives based on the evaluation results

4. Producing guidelines to the Commission for the further use of the methodology

The expected impact set for the project was to use the results and findings from the FP5 and FP6 projects to contribute to the definition of intermediate performance targets for FP7 and of new research policy objectives.

1.2 Content

This final Deliverable presents the results of the METRONOME project, financed through FP7 of the European Commission in 2008-2009 (Call Sustainable Surface Transport (TPT)-2007-RTD-1). The Deliverable is structured as follows: Section two presents the scientific background for evaluation of research and recent European FP evaluation practices. Section three introduces the METRONOME approach for evaluation of the impacts of research projects and programmes. Next, section four presents the three different evaluation applications and the results of thematic project evaluations. Finally, sections five and six discuss the results and conclude by presenting recommendations on future research needs.

2 Background

2.1 Scientific background for evaluation of research

According to the classical definition of Scriven (1991), "Evaluation is the process of determining the merit, worth and value of things." It is the process of distinguishing the worthwhile from the worthless, the precious from the useless. Vedung (1997) argues that evaluation is more than impact assessment, it is careful, retrospective assessment of merit, worth and value of the administration, output and outcome of interventions, which are intended to play a role in future practical situations. That is, evaluation should be useful. Chelimsky (1985) emphasises that evaluation by definition is social research. As regards programme evaluation, she points out that it is the application of systematic research methods to the assessment of programme design, implementation and effectiveness.

In transport assessment or evaluation literature, one refers alternatively to ex-ante assessment or appraisal to describe assessment carried out during the planning or policy formulation phase. The primary function of appraisals is to deliver insights into the expected outputs, results or outcomes of the project, programme or policy. Assessment carried out during implementation or the decision-making phases — often referred to as mid-term assessment or monitoring — has the function of observing developments to deliver the preliminary assessment of the project's, programme's or policy's effects or of the extent to which it is proceeding according to original plans. The third assessment type carried out once the project, programme or policy implementation has been completed is often given the name ex-post assessment or evaluation. Its function is to supply policy makers with information about the results and outcomes of the projects, programmes or policies. On the other hand, evaluations are expected to produce knowledge for the basis of future actions, e.g. policy or strategy design, or research orientation.

The role of the research programme evaluations have traditionally been to legitimate the past research activities. Consequently, the focus of impact evaluations has been on ex-post evaluations with inadequate attention to the elements of future development, learning and strategic long term planning, the elements, which are growing strong in the contemporary evaluation literature. In the METRONOME project, both of these dimensions are included.

The evaluation of R&D activity, e.g. research programmes, makes use of the same basic concepts as evaluation activity in general. These are output, outcome, impact and effectiveness. It is clear that the borderlines between these concepts and their contents are not absolute, but rather flexible. Nevertheless, they are often used inconsistently or even wrongly. It is common, for example, to regard impact and effectiveness as interchangeable. The concepts, and their contents, are presented in detail below.

1) Output: the concrete research result of a research undertaking
2) Outcome: the concrete products arising from the research result, e.g. a research report describing project outcomes
3) Impact: the products, events, conditions and/or changes that follow from the direct outcomes, and prior R&D impacts

4) Effects/effectiveness: broad, general societal changes that indicate, for example, the extent to which the impacts of a programme, policy or organisation have promoted the achievement of set goals, either general or specific (Nagarajan & Vanheukelen 1997)

In addition to differentiating between output, outcome, impact and effectiveness, another dimension for analysis is that of temporal scale. We can thus differentiate between immediate, intermediate and ultimate outcomes. This indicates the temporal expectation in achieving impacts, i.e. the expected time required for the achievement of impact and effectiveness. (See Figure 3)

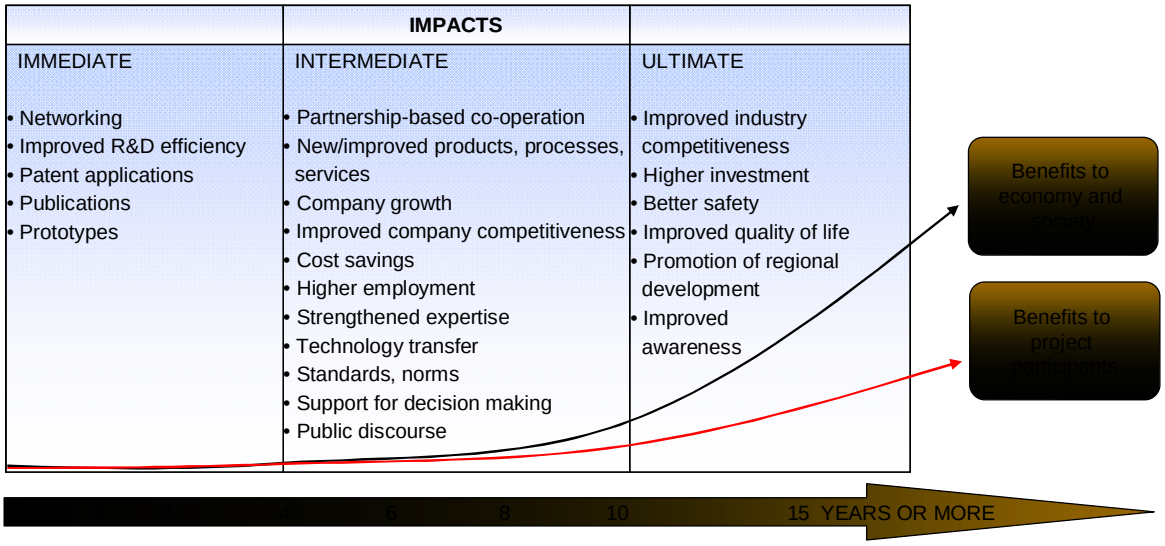

Figure 1. Expected time perspective of impacts (source: Tassey 2003).

Impact and effectiveness evaluation differs from goal achievement evaluation in that the latter does not take into account those side-effects or unanticipated effects that a programme or organisation, or similar, may have. Goal achievement evaluation moreover does not take into account the relevance of objectives or the costs arising from the activity. In this light, it is useful to divide impacts as follows:

- Anticipated and unanticipated
- Inside and outside the target area (or relevant or irrelevant)
- Productive and detrimental (or neutral in impact)

Using the above categorisation, impacts of R&D activities or policies can be classified as shown in Figure 4 (Mickwitz 2004).

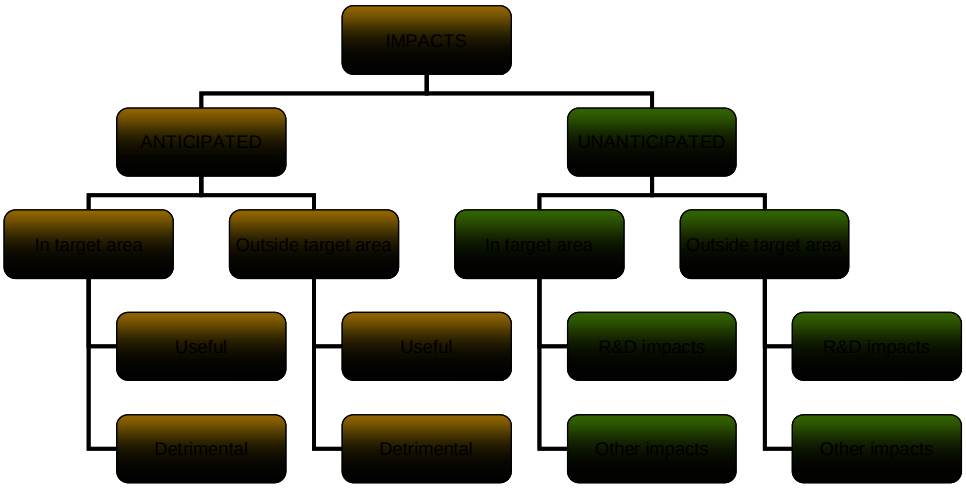

Figure 2. Types of impacts according to degree of expectation and target area (source: Mickwitz 2004).

2.2 Evaluation methodologies

Evaluations of research often include both qualitative and quantitative elements. The qualitative aspect tends to constitute a process of peer review by people with expertise within the appropriate area, whilst the quantitative aspect frequently involves the use of indicators. In the latter case, the data can be obtained e.g. by questionnaire survey.

Peer review is considered the most widely used method of evaluation (Kostoff, 1993 cited in Capron et al, 1997). It can be used as a way to review any aspect of a research programme, including the evaluation itself, although it is often used to indicate the likely impact of a project and to judge the fundamental quality of research. Many evaluations of research projects tend to have the element of peer review, as the involvement of informed peers is regarded as the most reliable and comprehensive way (and indeed sometimes the only way) to judge scientific quality and societal impact (Arnold et al, 1997; Merkx et al, 2007). Quantitative data, for example that derived from indicators, can be used to support the peer review process (Merkx et al, 2007).

The CHASS model for research quality and impact assessment, devised by the Australian Council from the Humanities, Arts and Social Sciences (CHASS) (cited in Merkx et al, 2007) emphasises the fact that indicators of the impact of research on certain sectors are highly specific. They therefore state that users of this part of methodologies need to be experts, either academic or direct users.

In general, carrying out valid evaluations requires complementary information and knowledge, produced by various methods. In addition, the nature of produced knowledge depends on its use, i.e. by whom and how the knowledge will be used. For example, for legitimising purposes, the knowledge can be indicator based and quantitative, but if the focus is on strategic development, the knowledge needs to be quantitative and participatory.

In order to assess the different questions that need to be answered along the evaluation process, Kuitunen and Hyytinen (2004) introduce in Lähteenmäki-Smith et al. (2006) the following, very comprehensive evaluation steps:

1) The setting and definition of evaluation objectives - Why is the evaluation being made? Why do we need it? - Who and whose needs are intended to be served by the evaluation? Who sets the evaluation goals and needs? - What questions does the evaluation seek to answer? - Who is doing the evaluation?
2) Choice of evaluation methods - What points of view guide the choice of methods? - How will the evaluation data be collected? - With what methods will the evaluation data be analysed?
3) Specification of goals of the policy, programme, organisation or similar to be evaluated - What are the basic tasks of the policy, programme or similar? Who defines them? - What does the policy, programme, organisation or similar aim to achieve? - What assumptions can be formulated from these objectives?
4) Identification of the evaluation target's impact and effectiveness mechanisms - What makes the policy, programme, organisation or similar function? - What are the presumed key effects of the policy, programme, organisation or similar? - What other effects are to be anticipated, e.g. intended and unintended, positive and negative, relevant and irrelevant? - To what extent are there differences among actors in different sectors, e.g. research, technology and industry sectors, with regard to impacts and impact mechanisms? - How, and through what mechanisms, are the impacts expected to arise? - What factors enable, and hinder, the achievement of impacts?
5) Identification of contextual issues - What contextual factors enable and hinder the achievement of impacts? What hypotheses can be derived from these? - How do external conditions and the environment (e.g. the existing innovation environment, policies, cooperation, infrastructure, funding) affect the production of impacts?
6) Reviewing objectives in relation to observed impacts - To what extent do observed impacts relate to the objectives of the evaluated policy, programme, organisation or similar? - What is required in order to improve the complementarity between the objectives and impacts?
7) Utilisation of evaluation information in setting the goals and future needs - Are evaluations and their findings utilised? - Who makes use of evaluations and their findings? - How, and by what means, are evaluation results utilised? - Why and for what purposes are evaluations and their results utilised? - What factors hinder the use of evaluation findings? What factors promote their use? - Is the future perspective taken into account sufficiently when completing evaluations? - Do evaluations help to delineate and direct future actions, policies, operating strategies, programmes or similar? - How are evaluations utilised in the formulation of future scenarios and strategic planning?

2.3 The European FP research context

Today, research and technological development (RTD) is seen as the main driver of scientific and technological progress and innovation. According to the Court of Auditors (2008), within the wide range of policies implemented in the European Union to strengthen innovation and competitiveness, the RTD Framework Programmes (FPs) are the most important financial instrument contributing to the Lisbon strategy and the Barcelona objectives at the Community level. To our knowledge, Figure 3 illustrates two basic paths of how the European Union policies can be transferred to national, business and organisational levels.

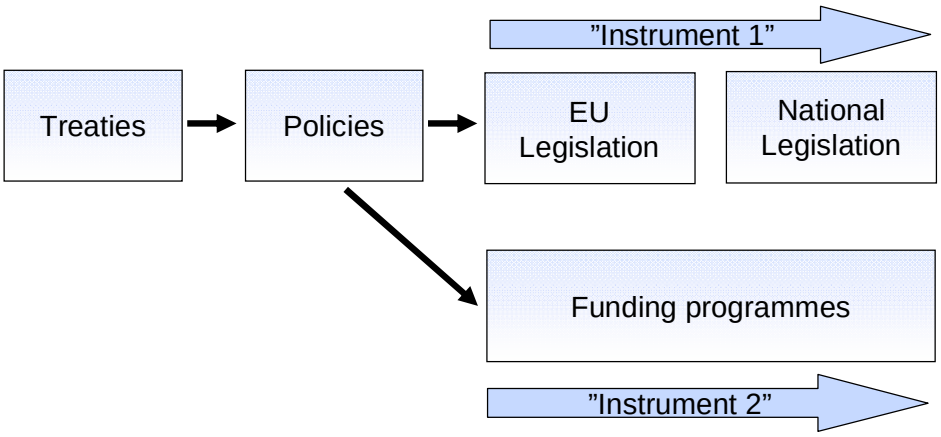

Figure 3. Activities of the EU (Source: Hyperion Ltd. 2009).

Europe has a long tradition of research co-operation. The FPs date from the mid-1980s. The first FP in 1984-87 emphasised IT and nuclear energy. Over time, also the FP orientation has changed from simply solving technical problems under FP4 and addressing specific societal problems under FP5, to encouraging the co-operation of research organisations within the European Research Area (ERA) and contributing to the establishment of a knowledge-based economy and society under FP6 and FP7.

According to the European Commission, the Framework Programmes for Research have two main strategic objectives:

- To strengthen the scientific and technological base of European industry
- To encourage its international competitiveness, while promoting research that supports EU policies

Consequently, the key issues in thinking about the FPs include: “What is the right policy mix?” and “How does one find and use focusing devices that concentrate European efforts on the important things?” The quality and effectiveness of FP design are therefore crucial to its ability to play its intended role. The basic FP planning process is illustrated in Figure 4.

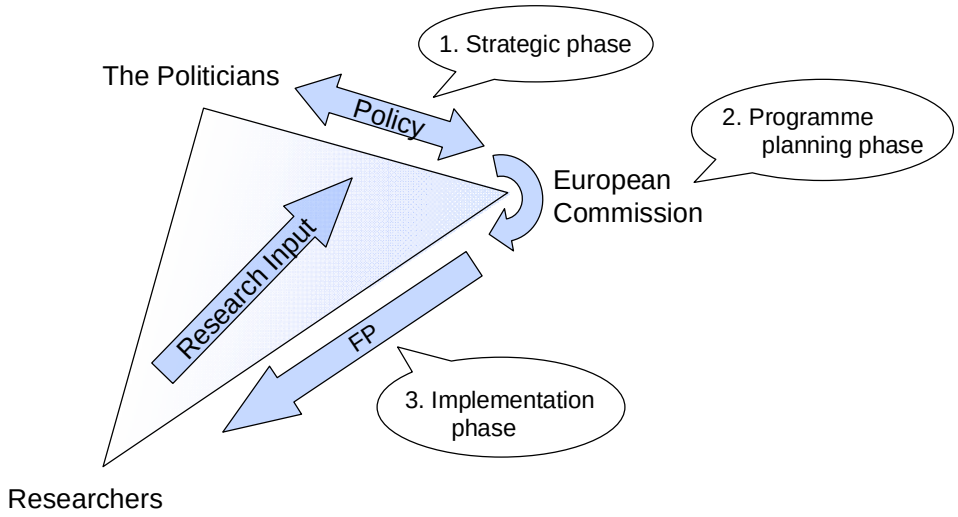

Figure 4. The people and the process (Source: Hyperion Ltd. 2009).

In the future, EU-oriented research co-operation is likely to expand its scope. This is seen for example in recent ECTRI-TRB co-operative effort (TRB–ECTRI Working Group 2009) where EU transport research is suggested to be linked more strongly to corresponding US activities. This might have reflections to R&D impact assessment, though not covered in detail by METRONOME.

2.4 European FP evaluation practice

Ex-post evaluations of European Research and Technological Development (RTD) programmes began already in the early 1980s. The launch of the Fourth Framework Programme in 1994 led the European Commission to introduce a new evaluation scheme consisting of annual reporting of continuous monitoring, and a five year assessment that includes the review of two previous research programmes (Georghiou et al, 2004). The five-year assessments are conducted by an appointed panel of independent high-level external experts and are supported by peer review, stakeholder engagement, and input from participants. These panels are made up of people with high levels of responsibility in the field, which in practice results in a balance of experts with either an industrial or an academic background (Durieux et al, 1997).

It is not this panel but rather the independent expert panels that they commission that satisfy the requirements of the methodology used (Bach et al, 1998). Experts are selected by the Commission in terms of their experience and knowledge of community research policy, which indicates that users will be drawn primarily from the knowledge sector. Efforts are also made to ensure a balance among different sectors of the research community as well as a geographic spread of evaluators.

Georghiou et al (2004) detail that in terms of evaluation on a European level, 'there is no single model of good practice,' but peer reviews and expert groups are used for evaluation processes. This is also emphasised by Durieux et al (1997), who state that the most important features in the evaluation of European RTD programmes are independent expert panels, interviews, questionnaires and core indicators.

The most recent ex-post Evaluation of FP6 (Expert Group 2009) deals with the entirety of FP6 and will also provide some input into the interim evaluation of FP7 to be performed in 2010. The Expert Group has aimed to address three broad sets of evaluation issues, particularly: the rationale, implementation and achievements of FP6.

2.5 Users of evaluation methodologies

The range of users of evaluation methodologies and knowledge produced by evaluations is broad, due to the fact that one may conduct evaluations both internally and externally and by different organisations. Users are likely to fall within one of the categories detailed in Figure 5 below. There is a significant diversity of users within each of the categories, hence the expectations of these users for evaluation methodologies may vary a lot. For example, the end users of the evaluation methodologies can be from either the public or private sector, and can be internal or external to the research team or institute carrying out the research under evaluation. Consequently, the nature of produced knowledge depends on its use, i.e. by whom and how the knowledge will be used.

In addition, the utilisation of produced evaluation knowledge seems to be very challenging. Even though FP evaluations are becoming a permanent practice, the development of evaluation methodologies is often too short sighted, not continuous and the results are not disseminated widely to different stakeholders. In order to gain greater role in guiding future policy and research agenda setting, future evaluations need to address these issues carefully.

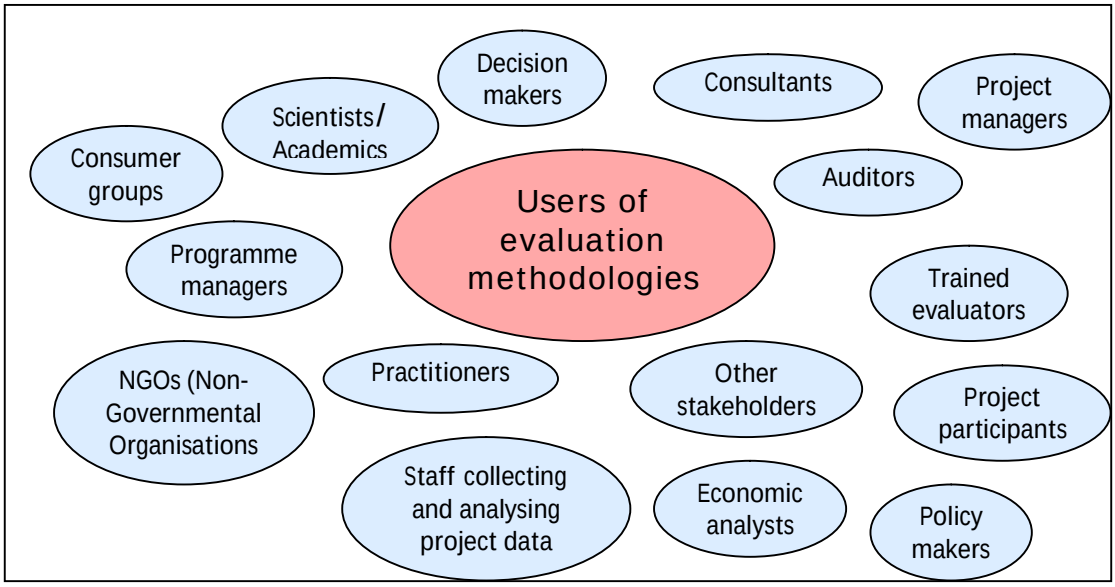

Figure 5. Users of evaluation methodologies (based on Fahrenkrog et al, 2002; IEG, 2007; OECD, 1997a; OECD, 1999).

3 The METRONOME approach

3.1 The framework

Based on the previous scientific and practical evaluation approaches reviewed in section 2, the following METRONOME framework has been developed:

The METRONOME screening, selection and evaluation methodology has three main phases (Figure 6):

4. Identification of European transport research and policy objectives for Industrial Competitiveness (IndCo); Sustainable Development (SuD); and Community and Public Policies (CPP)
5. Screening and selection of FP5 and FP6 themes and projects for the evaluation
6. Evaluating project impacts through the METRONOME impact model, using a multifaceted approach

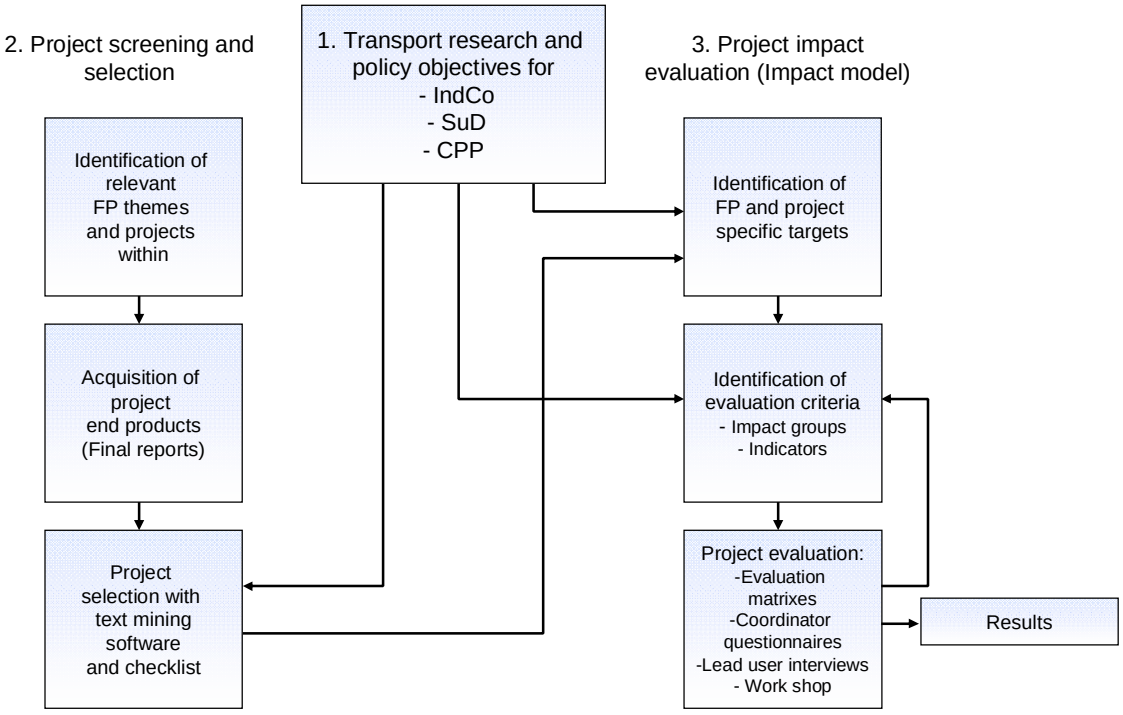

Figure 6. The three phases of the METRONOME evaluation methodology and their linkages.

The phase contents are described in detail in the following sections.

3.2 European transport research and policy objectives for IndCo, SuD and CPP

Identification of European transport research and policy objectives for Industrial Competitiveness, Sustainable Development, and Community and Public Policies serves as the basis for both the project screening and impact evaluation in the METRONOME methodology (Phase 1). The first task here was to identify the relevant European research and policy documents for the three thematic fields. The METRONOME high-level European transport policy objectives for IndCo, SuD and CPP were derived from relevant European policy documents. In some cases, two or three of the objectives were merged into a single more comprehensive one. The identified objectives and the source documents are listed in Appendix I of this Deliverable.

3.3 Project screening and selection

The project screening and selection in the METRONOME methodology (Phase 2) follows the steps presented in Figure 6:

- Identification of relevant FP themes and projects
- Acquisition of project outcomes (final reports)
- Project selection with text mining software and checklist

Details of these steps are provided below.

3.3.1 Identification of relevant FP5 and FP6 themes and projects within

Altogether around 800 transport projects were financed under the EC RTD Framework Programmes 5 and 6 (for details see: http://cordis.europa.eu). Seven hundred of those projects were placed under the following thematic priorities and key actions of the FP5 and FP6.

- FP5 Thematic Programme: Competitive and sustainable GROWTH, key actions:
  - Sustainable mobility and intermodality
  - Land transport and marine technologies

- FP6 Thematic priority: SuD, global change and ecosystems
  - Field: Sustainable Surface Transport

- FP6 Thematic priority: Research for Policy Support

These themes constitute the input data for the METRONOME project. Transport projects financed under the Information Society thematic programme/priority (IST) in FP5 and FP6 were not included in the METRONOME evaluation by request of the European Commission. However, two IST projects were reviewed experimentally under METRONOME SuD evaluations in Work Package 4.

Basic statistical information of the 700 FP5 and FP6 transport projects is presented in Appendix II of this Deliverable. The average size of the projects in terms of both EC contribution and number of partners was slightly larger in FP6 than in FP5. In both FPs, the great majority of the financed projects were under 3 million Euros in size. RTD projects were the main project type financed in FP5. In FP6, EC contribution was distributed fairly equally under the four main financing instruments. The above key actions or thematic priorities of the Work Programmes presented the following main objectives (Table 1) related to METRONOME evaluation themes:

Table 1. Work programme objectives related to IndCo, SuD and CPP.

FP5	*FP6*
Objectives related to Industrial Competitiveness	
• To enhance the efficiency and quality of transport systems and services • To maintain and consolidate the competitive position of the European road, waterborne-based, rail and intermodal supply industries • To develop critical technologies and their integration and validation around advanced industrial concepts	• To develop new technologies and concepts for all surface transport modes (road, rail and waterborne) • To develop advanced design and production techniques • To rebalance and integrate different transport modes • To increase road, rail and waterborne safety and avoid traffic congestion
Objectives related to Sustainable Development	
• To develop tools and methodologies to support the policy development of sustainable mobility • To contribute to the development of improved and innovative transport and mobility services and strategies • To contribute to the operation of seamless intermodal door-to-door transport chains across Europe by infrastructure development and maintenance • To evaluate technologies, develop concepts and identify regulatory requirements to mitigate air pollution and noise from transport • To develop and implement systematic, cost-effective approaches to safety in all modes • To improve the human role and performance in transport • To improve traffic flow management by developing traffic management systems	• To rebalance and integrate different transport modes • To increase road, rail and waterborne safety • To avoid traffic congestion • To contribute to greater benefits for all European citizens
Objectives related to Community and Public Policies	
• To develop strategies and decision-making tools for managing the impact of economic, social, political, demographic and technological developments on mobility demand and transport policies • To deliver the building blocks for a European strategic decision support and information system in the field of transport for policy-makers, authorities, industry and operators • To establish Technology Platforms for technology integration and validation • To provide the foundation for harmonised pan-European safety regulation • To improve governance at different levels	• To support the formulation and implementation of community policies • To ensure timely and effective scientific inputs, covering a wider field of policies than in the past, and with the prospect of improved information, exploitation and uptake of results, at national and EU level • To develop a coherent research base that reflects the increasing integration of community policies and of the science that underpins them • To improve the relationship between research and policy at all levels in the EU • To develop the European Research Area, by encouraging a single “playing field” in relation to policy-related research

3.3.2 Acquisition of project outcomes (Final reports)

In order to evaluate the impacts of research projects, it is necessary to have access to the outcomes (results) of the project group under evaluation (i.e. final reports or similar documents). Currently, however, no extensive database of EC FP transport project results is available.

In METRONOME, the Transport Research Knowledge Centre TRKC (http://www.transport-research.info/web/index.cfm), which is a web service established for the purpose of "giving an overview of research activities at European and national level as well as giving in-depth information on research programmes and projects", was used as the main source for the outcomes of the projects (final reports and other details of project results). The TRKC database features 5800 projects funded at European (FP4, FP5, and FP6) and national levels (covering all 30 countries from the European Research Area). The database includes information about 500 transport projects funded under the research themes relevant to the METRONOME screening (as mentioned in the previous section). Unfortunately, the number of research *results* is currently very limited in the database. Of the 500 project profiles, only around 150 include actual results (not just short project profiles or abstracts, but more comprehensive information about what was produced by the projects). This has posed problems in selecting projects for extensive evaluation of transport research.

Consequently, in the initial METRONOME project screening we had to settle for the source material regarding approximately 400 projects as follows:

- Final Reports of 70 FP5 and FP6 projects from the TRKC
- One-page summaries of approximately 300 DG RTD transport projects from DG RTD synopsis reports

3.3.3 Project selection with text mining software and the checklist

In the METRONOME methodology, the project selection aimed to find a small sample of 'highly relevant' projects in terms of evaluation themes to undergo a detailed evaluation. The project selection was carried out by using text mining software (in our case: RapidMiner). Text mining method enabled the project consortium to find projects relating directly to the identified European transport research and policy objectives for IndCo, SuD, and CPP.

The first phase of the text mining process was to transform the identified European transport research and policy objectives into word strings, *features* that the software can understand. In the second phase, the research project final reports or related documents in the lack of final reports the short project profiles or abstracts were imported into and processed by the software. Thirdly, the software was used for classifying the research project documents into four thematic groups, namely (1) IndCo projects, (2) SuD projects, (3) CPP projects and (4) unclassified projects. The number of the same policy features in project documents as in the research and policy objectives served as the classification criterion. For example, a project document having most IndCo policy features was assigned to the IndCo project group (1). Where no policy features could be identified in the document, the project was placed in group (4), unclassified.

As a result of the project selection, the 20 “best matching” projects from each of the project groups (1) – (3) were selected for detailed evaluation. Projects in group (4) were rejected.

The text mining project selection represented only the initial screening of the METRONOME methodology. In the second-level selection, projects were screened for their suitability in piloting the evaluation approaches for IndCo, SuD and CPP using the approach detailed in the following sections. In practice, the selection was completed by reading through the executive summaries of each research project and drawing different statistics out of the three project groups. This helped to ensure that the selected projects:

- were clearly intended to meet the European research policy objectives that are relevant to that particular theme
- were finalised
- represented a spread (e.g. differing levels of EC contribution; focusing on different modes; different action types; financed by different funding instruments; including industrial partners and not; country of co-ordinator)

In case a project was selected but its final report was not available either on the TRKC or on the project’s individual websites (had been created and was still active), project co-ordinators were used as a source of information. When all efforts to obtain the final report failed, the project was omitted from evaluation and an alternative selected.

3.4 Impact evaluation

The key questions that needed to be addressed by the METRONOME methodology were as follows:

- How can the achievements of research projects towards FP5 and FP6 objectives and targets be measured?
- What kind of impacts can research projects have on the three main themes of the European Policies?
- What kind of indicators can be used to describe the achievement of FP objectives and the project impacts?

The METRONOME methodology takes a two-dimensional approach to project impact evaluation. On the one hand, it evaluates the projects’ achievements against the FP5 and FP6 Work Programme objectives and targets set for IndCo, SuD and CPP themes. On the other hand, it evaluates, through the METRONOME impact model, the impacts of the FP research projects according to the four impact groups presented in section 3.4.2 below.

3.4.1 Achievement of FP5 and FP6 thematic objectives

The evaluation process developed for the IndCo theme and presented in section 5.1 (for details see METRONOME D3.1) gives a comprehensive example of the evaluation of achievements of FP objectives and targets by research projects.

The method of evaluating the performance of research projects against FP5 and FP6 objectives and targets consists of the following main elements: (1) Creation of a project evaluation database, (2) rating the extent to which projects contribute to the FP targets according to the related evaluation indicators, and (3) creation of a justification matrix of

IndCo domains for selecting projects. Examples of the project evaluation database and justification matrix are given in Appendix III of this deliverable.

Another evaluation matrix approach, tested by the SuD and CPP themes and illustrated in section 3.5.1, presents a more simple approach to the evaluation of project achievements towards FP objectives.

3.4.2 The impact model

The project impact evaluation in the METRONOME methodology (Phase 3) is based on the METRONOME impact model (Figure 7), which is founded on and further elaborated from the Impact Assessment Model by Lähteenmäki-Smith et al (2006). The model illustrates how FPs can bring about four kinds of impacts, namely (1) impacts on management and co-ordination, (2) scientific impacts, (3) customer/end user impacts, and (4) societal impacts in the fields of IndCo, SuD and CPP. The main beneficiaries of the research results are listed on the right hand side of Figure 7. The selected four impact groups were identified to reflect best the project impacts in FP research programme evaluation context.

The "lower level" impacts in the impact pile can be seen as enabling factors for the upper level impacts. For example, good management co-ordination impacts enable (but do not guarantee) good scientific impacts.

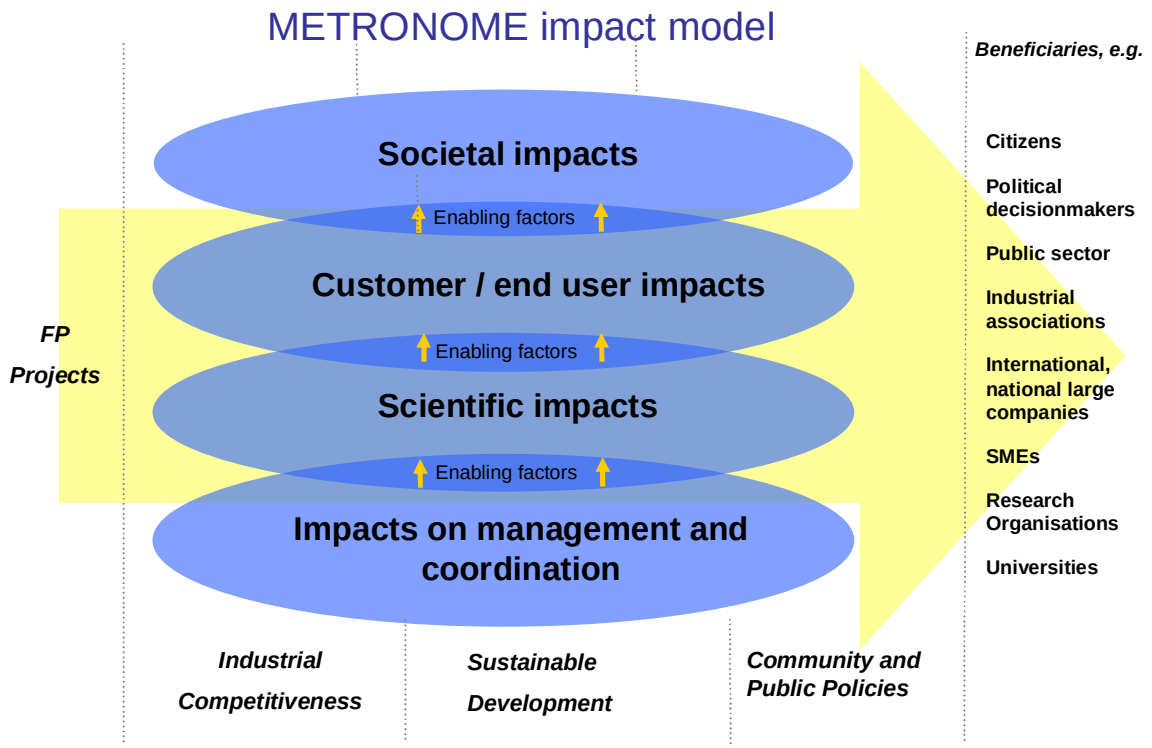

Figure 7. The METRONOME impact model.

The METRONOME impact model thus proposes the following four indicator groups:

a. Impact indicators on management and coordination reflect the 'enabling factors' or 'tools' for complementing the impacts measured in the other three groups below. Examples of indicators:

- Improved networks, new networks with public/private organisations
- Networks with global/EU/national partners
- Systematic dialogue with policymakers
- Customer orientation: customer involvement in project planning
- Efficiency of the research – results (outcomes) versus resources used

b. Scientific impact indicators
These indicators reflect the quality and validity of research project results (outcomes) versus the project's own and FP objectives and targets set on different levels. Examples of indicators:

- Achievements of research projects - outcomes versus FP objectives/targets set
- Fit between framework and data
- The power to address previously unsolved questions
- Number of publications, number of patents

c. Customer/ End user impact indicators
These impact indicators reflect the (short-term) benefit of the research results to their actual end users (e.g. EC, industry, national governments, ministries, research organisations, etc.). Examples of indicators:

- Public-policy initiatives
- New business initiatives/activities
- Long-term product or service development
- Advantage and stability of the research results

d. Societal impact indicators reflect the more long-term effects of the research on the society (e.g. on the transport system end-users: individuals, logistics companies, industry, etc.). Examples of indicators:

- Implementation of research output by policy field, industry or other societal stakeholders
- (Active) use of implemented research output by societal groups
- Contribution of priority setting, e.g. future research goals
- Contribution to strategy processes of public and private organisations
- Norms, standards, regulation

These indicators constitute the main indicator set, which was further developed by each of the METRONOME evaluation themes. For more information on the IndCo, SuD and CPP impact indicators, see the METRONOME Deliverables D3.1, D4.1 and D5.1.

3.5 Methods of impact evaluation

The METRONOME methodology proposes four complementary approaches (elements) to finding values for the indicators outlined above. The approaches, listed below, are presented in the following sections:

1. Project evaluation and dissemination quality matrices
2. Co-ordinator questionnaires (and complementing interviews)
3. Lead-user interviews
4. Workshop(s)

3.5.1 Project evaluation matrices

The first part of the METRONOME project evaluation matrix supports a qualitative evaluation of the extent to which the FP5 and FP6 research projects have contributed to the evaluation theme, e.g. SuD. Based on a review of the FP5 and FP6 research and commissioning structures, three levels of objectives were identified as relevant to many of the transport research projects commissioned under these Framework Programmes. These are:

- Specific 'Work Programme' or 'Thematic Area' objectives
- Key Action (or equivalent) objectives of the Work Programme that the project was commissioned under
- Strategic project objectives

The evaluation matrix enables evaluators to specify whether each of the above objectives have been met fully, partially, indirectly or not at all. In practice the performance of research projects in relation to impact indicators is likely to be more clear cut, with impacts either having been realised or not. In addition, each completed evaluation needs to be accompanied by a textual summary. The summary supplements the evaluation matrix by detailing other relevant and specific information about projects and/or their outcomes.

The research objectives on different levels and impact indicators form the basis of the evaluation matrices. A skeleton template for the approach adopted is shown in Figure 8 below.

The evaluation matrices completed in the METRONOME methodology are based on the published Final Reports of projects. In practice the content of the Final Reports vary, although they should give an accurate and comprehensive overview of project research activities and their outcomes.

		Extent to which the project met/contributed to objectives			
		Fully/yes	Partially	Indirectly	Not at all/no
Work programme objectives					
Key action objectives					
Strategic project objectives					
European SD policy objectives					
Customer/end-user impact indicators					
Societal impact indicators					
Co-ordination indicators					

Figure 8. Project evaluation matrix.

The second part of the evaluation matrix concerns the success of project result dissemination (Figure 9). FP projects typically result in the publication of a wide range of deliverables and outputs, both formal and informal. The METRONOME dissemination quality matrix enables evaluators to specify the characteristics of specific dissemination activities undertaken during and after the project lifetime in order to assess the potential effects of project results and indicate whether estimated impacts upon the objectives are likely to have been achieved in practice. The matrix indicators (list of activities) were selected on the basis that they were comprehensive whilst also feasible to be answered based upon written documents in the public domain.

In METRONOME dissemination quality evaluation, the dissemination reports were reviewed to provide evidence of the scope and nature of dissemination activities conducted. In projects where no dissemination report had been produced, final project reports and project websites (where these had been produced and were still active) were reviewed. Where dissemination reports had been produced at the beginning of the project, final reports or website links were also referred to for actual outcomes. In addition, each completed evaluation was accompanied by a textual summary of the dissemination

information assessment, detailing other relevant and specific dissemination information about projects.

Overview	List of dissemination activities
	Purpose of dissemination activities
	Were potential end-users and beneficiaries of the results directly involved or consulted in the different stages of the project?
	Did dissemination occur throughout the project or only after project completion?
	Was there a piloting of results with potential end-users before finalisation?
	Were plans made to update the results based upon the outcome of the dissemination activities?
	Was there a specific dissemination work package
Events	Type of event(s) organised
	Aspects of the project that were disseminated
	Type of audience at event(s) (if gov. local, national or European?)
	Size of audience at event(s)
	Timing of event in relation to project lifecycle
	Location of event(s)
Publications	Publications
	Aspects of the project that were disseminated
	Nature of publications
	Intended readership/audience
Other	Timing of publication in relation to project lifecycle
	Non-formal dissemination (i.e. discussions with stakeholders)

Figure 9. Dissemination quality matrix.

3.5.2 Questionnaires

A complementary impact evaluation method to project evaluation matrices in the METRONOME approach was a questionnaire designed and distributed to a sample of FP project co-ordinators. The main aim of the questionnaire was to obtain information of the impacts of the research projects in each of the four indicator groups. The questionnaire was composed of four parts according to the impact groups. Further, indicators were identified to describe the impacts within each of the groups. Table 2 also lists the basic weights assigned to each indicator. Here, each group of indicators is weighted evenly by 25%. The weights were tested by sensitivity tests (for more information, see METRONOME D4.1).

Table 2. Relationships between indicators and questions in the METRONOME co-ordinator questionnaire.

Number	*Group*	*Indicator*	*Statement*	*Weight*
1	Scientific	Level of definition of research goals	The research goals required specific elaboration at the start of the project	0.05
2	Scientific	Level of theoretical difficulties in the definition of the methodology	There were theoretical difficulties in defining the research methodology	0.05
3	Scientific	Level of achievement of research objectives	The research objectives were all met	0.05
4	Scientific	Fitness of project resources for the project needs/expenditures	The research budget and human resources available were insufficient	0.05
5	Scientific	Level of publication of results	The project results have been adequately published in scientific journals and/or books	0.05
6	Utility	Transferability into policy initiatives	The project results have been transferred into policy initiatives, recommendations and/or regulations	0.04
7	Utility	Fitness between end-user needs and results	Needs and views of end-users were taken into consideration	0.04
8	Utility	Involvement level of civil servants involved	Civil servants and/or policy makers were involved in the project	0.04
9	Utility	Involvement level of transport operators involved	Transport operators or service sector were involved in the project	0.04
10	Utility	Involvement level of transport industry involved	Transport industry sector was involved in the project	0.04
11	Utility	Encouragement of potential for future research	The project raised new unsolved research questions	0.04
12	Utility	Quality of the dissemination of results	The project results have been adequately disseminated to end-users	0.04
13	Societal	Quality of dissemination through the website	The project webpage was user-friendly and updated regularly	0.08
14	Societal	Level of encouragement received by society from the project	The project encouraged the participation of society in research (development of awareness campaigns, public inquiries, etc.)	0.08
15	Societal	Extent to which the project produced a helpful networking	The project (consortium) has improved networking between researchers and public/private organisations	0.08
16	Management	Level of stability of networking	The consortium members have developed a stable research network	0.06
17	Management	Adequacy of the frequency of project meetings	The project included too many consortium meetings and workshops	0.06

18	Management	Adequacy of output of the project in terms of the extension of reports	Additional effort should be made to reduce the extension of project deliverables	0.06
19	Management	Adequacy of the financial instrument	The financial instrument was adequate for the project	0.06

In the final questionnaire, which included only questions, the following qualitative six-point scale was used for responding:

1 Totally disagree	2 Partly disagree	3 Neutral	4 Mostly agree	5 Totally agree	Don't know

During the METRONOME project, it was discovered that to complement the information from the questionnaires, it is advisable to carry out detailed co-ordinator interviews. Interviews can provide additional information about the projects, dissemination and use of results in order to draw conclusions on the impacts of the evaluated projects.

3.5.3 Lead-user interviews

Identification of potential target or lead-users (end-users) of the research results and their key concerns is essential in terms of the usability and effectiveness of research results. The METRONOME lead-user questionnaire/interview template was designed to assess lead-user (end-user) opinions of the impact and performance of FP5 and FP6 research projects. In order to maintain consistency between the results of interviews by different evaluators (partners), a uniform interview template was developed and applied (see Appendix IV of this Deliverable). The evaluators approached selected lead-users (defined as persons (civil servants, consultants, scientists, policy makers, etc.) really using the knowledge gained from EU research). They were free to use either telephone or face-to-face interviews or distribute the questionnaire by email to pre-selected respondents.

The questions in the template relate to the perceived impact of FP5 and FP6 research in general, the results of specific projects in which the respondents had been involved, the benefits for the respondent and his/her organisation and what did and did not work in FP5 and FP6 projects. The completed evaluations were discussed between the two separate evaluators, and based on these two views the final evaluation format was filled in.

3.5.4 Workshop

In order to get feedback from the EC, but also from other end-users of the methodology, a workshop was arranged at the start of the METRONOME evaluation process. The workshop aimed to identify the needs and preferences of various types of end-users for the evaluation methodology and the results. The workshop participants were from the fields of policy, research and industry, which was considered useful in initiating new co-operation between e.g. the EC evaluation projects and technology platforms in the project evaluation.

4 Results of the METRONOME evaluation

This section presents the results of the methodological development and application of the METRONOME methodology to a sample of 100 FP5 and FP6 transport projects in the fields of IndCo, SuD and CPP. The evaluation applications developed for the three fields have tested different mixes of evaluation methods presented in the previous sections.

4.1 Results of FP5 and FP6 project evaluations in the field of IndCo

4.1.1 Application

The proposed process for the assessment of IndCo comprises twelve steps. Figure 10 provides an overview of these steps together with the data needs and relevant validation requirements. The twelve steps and main tasks required are presented below. A detailed description of the evaluation process can be found in the METRONOME deliverable D3.1.

Step 1- Identification of IndCo domains and types of impacts
Conduct a detailed literature review, both scientific and related to the EU's policy documentation in order to identify the assessment domains. Analyse the domains and interpret them.

Step 2- Identification of Framework Programme-specific objectives and targets related to IndCo
Analyse in detail and thoroughly understand the policy objectives and measurable targets of the FPs to be assessed. Review all related EU decision and implementation documents regarding the Work Programmes of each FP.

Step 3 – Definition of Indicators based on each Framework Programme target
Define qualitative statistics of the Industrial Competitiveness in order to analyze the performance of the Framework Programmes assessed. Transform the FP targets set by the European Union to (qualitatively) measurable statistics and indications or indexes.

Step 4 – Grouping of indicators based on Framework Programme objectives
First, group the indicators according to the objectives that the targets -— which are addressed by each indicator — are related to. Second, reduce the number of indicators that address the same topic both semantically and logically. In this case, two or more indicators — within the same group of indicators per objective — can be reformulated into one indicator that will measure more than one characteristic. This will also provide assistance towards the reduction of a large number of indicators, which are both difficult to measure in terms of both effort and time.

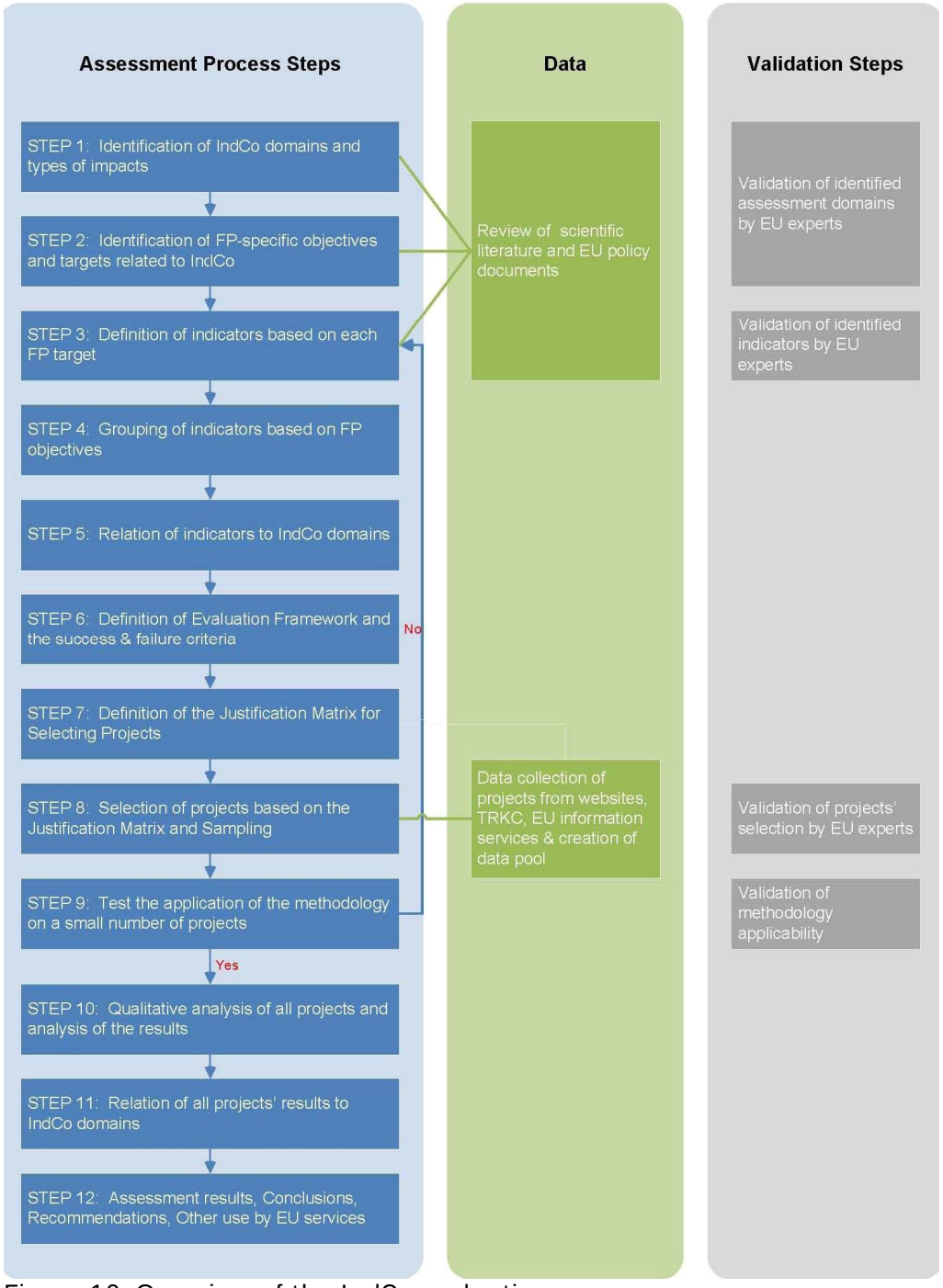

Figure 10. Overview of the IndCo evaluation process.

Step 5 - Relating each indicator to IndCo domains
Associate each indicator with the domains addressed by it. This association (or relation) occurs in semantic and logical terms. The association indicates the exact IndCo domains that each indicator is associated with and provides some useful qualitative insights for each indicator in terms of each relation to these domains.

Step 6 - Defining the evaluation framework and success/failure criteria
Define the extent to which the project can contribute/address the indicators – e.g. fully, partly, indirectly, not at all, or not relevant. An illustration of the project evaluation database is presented in Appendix III of this deliverable.

Step 7 - Defining the justification matrix for selecting projects
Create a project selection justification matrix to specify the selection of the projects to be evaluated. In order for a project to be selected, at least one of the IndCo domains must be addressed by the project. An illustration of the justification matrix is presented in Appendix III of this deliverable.

Step 8 – Selection of projects based on the justification matrix and sampling
Select the projects according to the thematic area addressed by the project, the project objectives and the IndCo domains.

Step 9 - Testing the application of the methodology on a small number of projects
Test the application with a small number of projects. The number of projects is considered sufficient when it reaches 2-5% of the total projects to be assessed.

Step 10 - Qualitative analysis of all projects and analysis of the results
Rate each selected project for each indicator as explained in detail in D3.1.

Step 11 - Relating all project assessment results to IndCo domains
Relate the project results to the defined IndCo domains as explained in detail in D3.1.

Step 12 - Assessment, results, conclusions, recommendations, other use by EU services
Interpret the results and draw conclusions and recommendations.

Horizontal steps are defined as steps that occur simultaneously with the steps mentioned above. These steps include data collection and validation, which occur as illustrated in Figure 10.

4.1.2 Practicalities relating to the application

The following points illustrate potential extensions and improvements, identified during the development process, to the proposed IndCo evaluation application.

1. In order to avoid missing or misinterpreted objectives and targets, input of strategic research objectives and targets of official EU data sources should be ready and directly transferable to the interested party that carries out the evaluation.

2. Technology platforms are important bodies to consult with for the validation of the objectives and targets, which are going to form the basis for the definition of indicators.

3. EC officers need to be consulted regarding the definition of success of previous (or ongoing) FPs. This is to obtain targets for the indicators or whatever means will be used to evaluate the achievement of the objectives and targets.

4. Project evaluations need to be validated with selected experts, who are aware of the project results but did not participate in the projects being evaluated, in order to avoid biased opinions.

5. Where data are collected by means of questionnaires, these should be sent officially by EU bodies, in order to ensure (or demand) a response.

6. Possible exchange of methodologies between similar or cluster projects is important in order to validate each methodology developed. Cluster projects can be used as a validation instrument from the start of the evaluation process.

7. An econometrics expert – either within the consortium or as an external expert – should be included in the evaluation team from the start of the project.

8. Participation of FP research partners in the evaluation process should be considered as a constant parameter of bias for the evaluation results.

9. In order to enable easier, less time-consuming, more reliable and less costly evaluations in the future, a structured project (results) related data and information storage mechanism should be established by the EC.

10. The developed methodology should be applied after the execution of each EC-funded IndCo-related project. The need for the extension should be clarified by a feasibility study, which might result in recommending the creation of an automated software package based on the proposed IndCo assessment methodology to be used by interested bodies.

4.1.3 Results of testing the application

The application presents an extensive method for evaluating the contribution of FP5 and FP6 transport research projects to the IndCO objectives and targets set by the FP5 and FP6 Work Programmes. In other words, the focus is on project evaluations against FP5 and FP6 targets.

As a result of testing the application, the following IndCo Domains were identified as reflecting the contribution of the projects to IndCo: (1) technologies, processes and services; (2) products; (3) infrastructures; (4) patents and standards; (5) societal and environmental issues; (6) legislative issues; (7) financial issues.

To be selected into the test sample, the project was to address at least one of the IndCo domains. Within the field of IndCo, in-depth evaluation of 25 FP5 and 24 FP6 projects was completed. The success of projects in achieving FP objectives and targets on the one hand, and contributing to IndCo domains on the other, was measured with help of appropriate indicators (for details see D3.1). In general, the IndCo targets presented for FP5 and FP6 were satisfied to a very large degree. FP6 projects tended to perform better (but with very little difference) towards the achievement of the Work Programme objectives and targets than those of FP5.

The projects contributed significantly (fully) to the FP targets in more than 50% of the METRONOME cases for all seven IndCo domains in both FPs (see Figures 11 and 12 below).

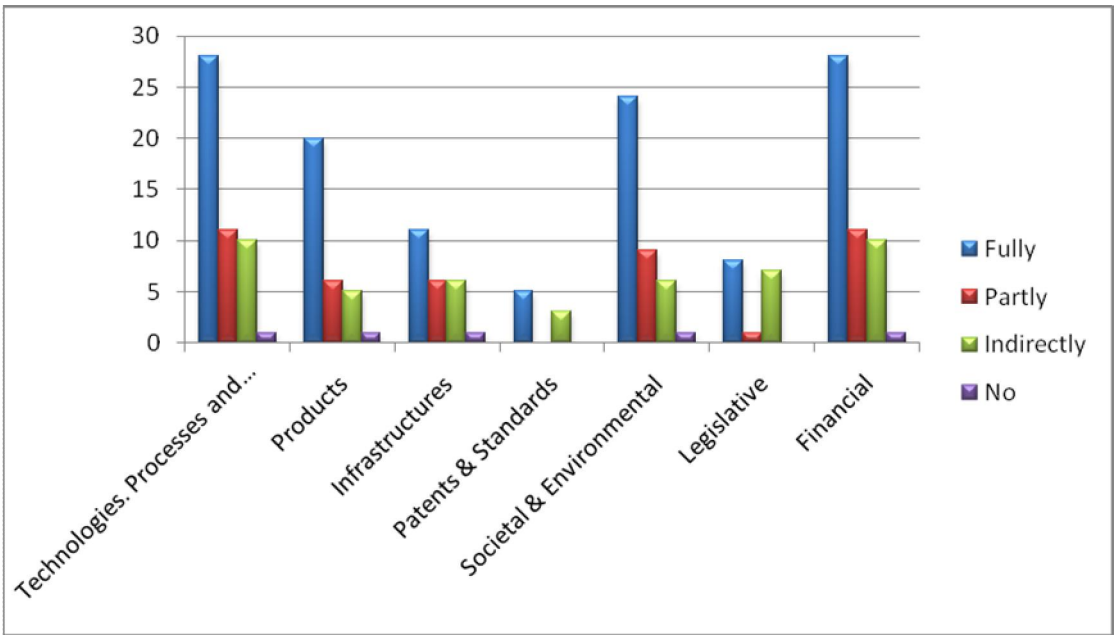

Figure 11. Number of responses (to indicators) corresponding to IndCo domains for all evaluated FP5 projects.

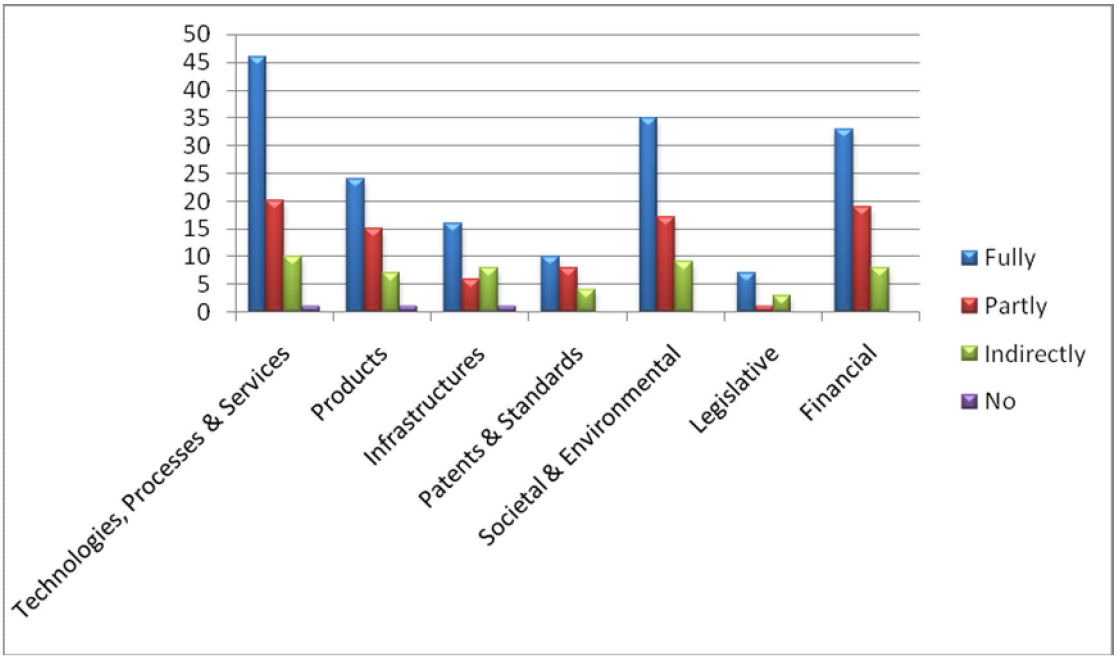

Figure 12. Number of responses (to indicators) corresponding to IndCo domains for all evaluated FP6 projects.

In the IndCo domains of Patents & Standards, Legislative Issues and Products, FP6 projects tended to perform better than FP5 projects. In the other domains, FP5 projects performed better (Table 3).

Table 3. Difference between IndCo domains addressed by FP5 and FP6 projects (percentage = number of times addressed by indicators divided by number of indicators).

IndCo Domain	*Technologies, Processes and Services*	*Products*	*Infrastructures*	*Patents & Standards*	*Societal & Environmental*	*Legislative*	*Financial*
FP5	100%	50%	61%	6%	72%	11%	94%
FP6	85%	52%	37%	19%	63%	28%	69%
FP5 to FP6	*+15%*	*-2%*	*+24%*	*-13%*	*+9%*	*-17%*	*+25%*

Examples of Work Programme objectives (O) and related targets (T) that were achieved almost fully in the FP5 project sample are:

- Enhancing the efficiency and quality of transport systems and services (O) → Contribution to reducing the average viability threshold for intermodal freight journeys in the EU (T)
- Development of critical technologies and their integration and validation around advanced industrial concepts (O) → Contribution to advanced practices and integration of design and production operations (T)

Examples of Work Programme objectives and related targets that were achieved fully in FP6 project sample are:

- Advanced design and production techniques (O) → Use of innovative, advanced design and manufacturing methods, techniques and concepts in surface transport; contribution towards integration and standardisation of enhanced product development tools for design, simulation, prototyping, testing and risk management (T)
- Increasing road, rail and waterborne safety and avoiding traffic congestion (O)→ Contribution towards the decrease of fatalities; new policies and industrial strategies for integrated deployment of traffic management centre information systems (T)

As regards the funding instruments, projects identified as relevant to the IndCo domain in the METRONOME project were all (except one) financed as Cost Sharing Contracts in FP5. In FP6, the evaluated projects (except two) were Integrated Projects.

4.2 Results of FP5 and FP6 project evaluations in the field of SuD

4.2.1 Application

The proposed process for evaluation of the contribution of transport research projects on SuD comprises the following steps. For a detailed description of the evaluation process, see METRONOME deliverable D4.1. The evaluation process is illustrated in Figure 13.

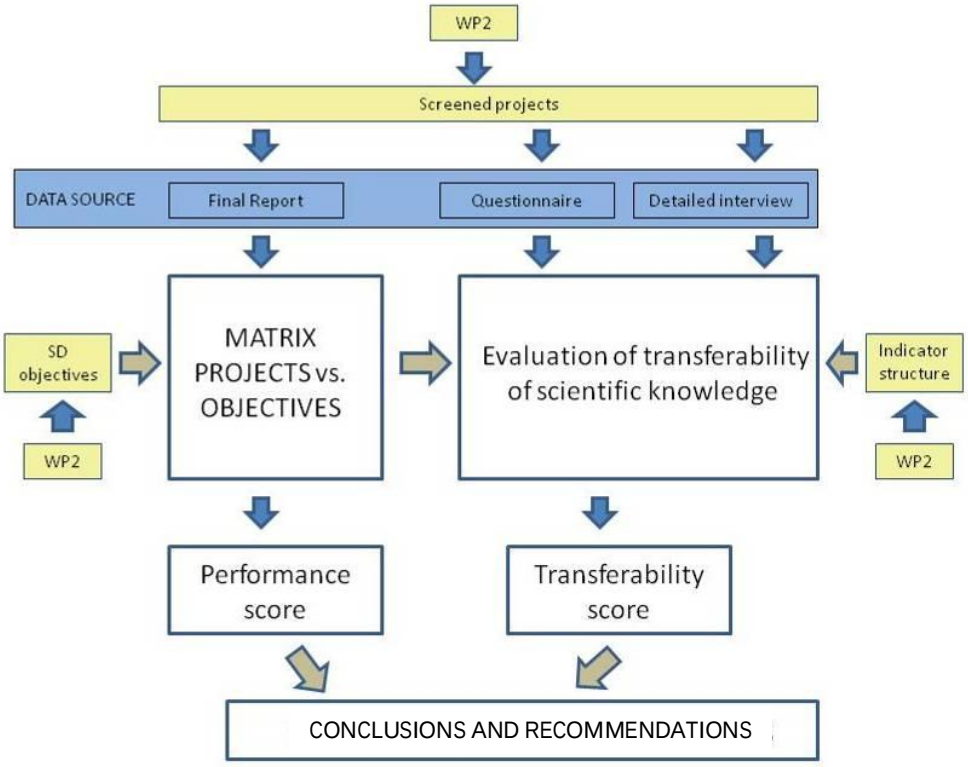

Figure 13. Overview of the SuD evaluation process.

The process includes the following steps:

1. The process begins with the identification of research projects to be included in the evaluation, i.e. screening of FP5 and FP6 SuD research projects. The selection procedure is explained in detail in section 3.3 of this Deliverable.

2. Once the projects are selected, the next step defines the procedure for obtaining information for the evaluation analyses. The data sources fall into two categories: (a) information from final reports, (b) data from questionnaires sent by email to project coordinators and additional detailed interviews.

3. Evaluation of the contribution of projects to SuD consists of two complementary methods relating to the respective data sources:

a. *Project evaluation matrix → Performance score.* This method comprises the evaluation of the contribution of projects to SuD in terms of the objectives achieved and the impacts brought about. Evaluation is carried out with the help of a project evaluation matrix (see section 3.5.1 of this Deliverable), in which the information from project final reports is used. Based on the completed matrices, performance scores for each of the evaluated projects can be calculated.

b. *Survey → Transferability score.* This method comprises the evaluation of the effects and use of knowledge produced within FP research projects. Evaluating the direct contribution of research projects to SuD is a difficult task. Hence, the method proposes that evaluating the quality of the research in terms of its scientific, end-user, societal and management and co-ordination impacts can provide a proxy of the final contribution to SuD. Coordinator questionnaires and interviews provide the main tools for this approach. Based on the questionnaire responses, transferability scores for each of the projects can be calculated in terms of their contribution to SuD within the four impact groups.

4. In the final step, based on the results of performance and transferability (usability) scores and other findings obtained from the implementation of the methodology, a set of conclusions and recommendations can be made.

4.2.2 Practicalities relating to the application

The following points illustrate potential extensions and improvements to the proposed methodology identified during the development process of SuD evaluation application.

1. The exactly same projects should be included in both types of analyses (the matrix evaluation and the coordinator survey) to allow comparisons on the one hand and supplementing results on the other. This kind of approach would serve both the methodology validation and identification of the contribution of FP5 and FP6 projects to SuD. Unfortunately, there are many practical aspects that may hinder such implementation, such as the response rate of the survey, timing and quality of survey answers and availability of project documents.
2. During the evaluation process, difficulties arose in finding information about the project results on the Internet after several years of termination. The problem could be overcome by creating a common EC database with information from all EC-funded transport project final reports.
3. The content of the final project reports varies a lot, although they should give an accurate and comprehensive overview of project research activities and their outcomes. Consequently, in certain instances additional sources of information are needed for the evaluation. In such cases it should be ensured that all projects are evaluated using the same level and amount of information. This serves to retain the comparability and consistency of the reviews. In addition, to reinforce the effectiveness and transparency of the evaluations the projects should be reviewed by two separate evaluators if possible.
4. Difficulties also appeared in analysing the final reports in terms of project performance. It was noticed that project co-ordinators and partners are unlikely to admit failures, gaps, etc. but rather try to present the project in a positive light. This is ex-

pected human behaviour and could be a source of bias. In the questionnaire, the only failure admitted was a lack of resources. This strengthened our view that optional detailed interviews with the project co-ordinator should be included in the methodology to complement the questionnaire survey. This might help avoid biased responses.

5. In mailed surveys an acceptable response rate is within the range 30% to 70%. In our coordinator survey, the response rate was 51%. However, the number of responses was rather low. Some interpretations for the low response rate are as follows:
   - Neither the project co-ordinators nor the partners involved consider the follow-up of a project to be very important. The general view is that all the work has been done once the project is finished.
   - Often the respondents feel that they are not sufficiently aware of the project results and hence they are less capable of answering the survey.
   - Project co-ordinators seem to change jobs quite frequently. Thus 4 or 5 years after the project has ended their contact details may have changed and no one in their previous organisation knows the project well enough to answer the evaluation questions.
   - In general, people are unaware of the exploitation of project results beyond the project's life-time and do not feel responsible for further undertakings.

4.2.3 Results of testing the application

The application presents a twofold approach to evaluating the contribution of FP5 and FP6 transport research projects to SuD. The two complementing parts of the methodology are the following: (1) project evaluations against FP5 and FP6 objectives of different levels (performance score); (2) evaluation of potential project impacts in four groups (scientific, end-user, societal, management and co-ordination impacts) (knowledge transferability score).

The project evaluation matrix presented in section 3.5.1 of this Deliverable provided the tool for evaluation of SuD objective achievement (performance score) at different levels, namely European policy, FP Work Programme and project levels. The questionnaire sent to the project co-ordinators (see also section 3.5.2) provided the tool for evaluation of project impacts (knowledge transferability score). In both cases, the extrapolated Likert scale (1-5) was used to present the result scores.

Altogether 15 FP5 and 12 FP6 projects were included in the evaluation. For 11 of those, a complete evaluation from both of the above perspectives was completed.

Table 4 shows the success of the evaluated projects in achieving the SuD objectives at different levels, on a scale from 5 (fully) to 1 (not at all) based on an evaluation matrix. The set of objectives that were best met were the Strategic Project objectives. This is hardly surprising, since the Strategic Project objectives are those with the most direct relevance to the project. The fulfilment of higher-level objectives, such as Work Programme, Key Action and Programme Subdivision objectives instead indicates whether

the project is likely to have broader impacts on sustainable development in the EU. In higher-level cases, is to be expected that these will not be as fully contributed to as those that the project was commissioned under. It should also be noted that it is not possible to evaluate projects based on the extent to which they have contributed to higher-level objectives. This is largely because the purpose and scope of projects commissioned varies considerably and that the magnitude and nature of the impacts and contributions will vary. A review of contribution to higher-level objectives does, however, provide an indication of breadth of contribution.

The low sample size of the projects reviewed limits the reliability of the findings, but from the projects reviewed the FP5 projects were considered to have contributed more to the Work Programme objectives than to the Key Action objectives, and that the FP6 projects reviewed met the Work Programme objectives better than they did the Programme Subdivision objectives. This is surprising because the lower level objectives (Key Action and Programme Subdivision) could be considered more directly applicable to the projects commissioned. One explanation could be that the higher level objectives are more general and thus easier to meet than the lower level objectives that are more specific. Also, when a project meets its specific objectives satisfactorily, but not the European policy objectives, it might be because the project is focused on one single goal only and thus has been evaluated low for the other goals.

Based upon the reviews conducted, the potential contribution and impact of FP5 and FP6 projects is broadly similar, with no meaningful distinction between the two. Performance is broadly comparable, and although there some differentiation can be seen between the two FPs this could be due to the different sample sizes as much as to differing contributions to SuD.

Table 4. Achievement of SuD objectives at different levels (Scale 1-5, sample 11 projects, method: matrix review).

Framework Programme	*European SuD research and policy objectives*	*Work programme objectives*	*Key action objectives*[1]	*Programme subdivision objective*[2]	*Strategic project objectives*	*Grand Total*
FP5	2.88	4.06	3.75		4.80	3.89
FP6	2.19	3.44		3.18	3.61	3.43
Grand Total	**2.63**	**3.88**	**3.13**	**3.57**	**4.41**	**3.72**

Table 5 shows the potential impact of projects in terms of the scientific, customer/end-user, societal and co-ordination impacts of 28 FP5 and FP6 projects based on the coordinator survey. The FP6 projects got somewhat higher impact scores in all impact groups than FP5 projects, but in general both FPs performed very well with very little variation between the averages of the four indicator groups. In both FPs, the impacts of the projects have been considered highest in the scientific field and lowest in the field of management and co-ordination, but the differences are not significant and could owe here also to the different sample sizes as much as to differing impacts on SuD.

[1] Only in FP5
[2] Only in FP6

Table 5. Potential impact of projects by Impact Group (Scale 1-5, sample 28 projects, method: coordinator survey).

Framework Programme	*Scientific*	*End-user*	*Societal*	*Management and co-ord.*	*Grand Total*
FP5	3.48	3.28	3.26	3.21	3.34
FP6	3.67	3.51	3.55	3.41	3.52
Grand Total	**3.58**	**3.40**	**3.41**	**3.31**	**3.44**

The results of the matrix evaluation regarding the potential project impacts present slightly more positive results than the co-ordinator survey. The project impacts in terms of the customer/end-user, societal and co-ordination indicators used was considered consistently positive across the range of projects reviewed. The scores varied between 2.34 and 5.00, presenting the highest scores for management and co-ordination impacts and lowest for the customer/end-user impacts. The results show evidence that either as part of a conscious effort or as part of standard FP processes the positive impacts were realised in almost all projects.

Appendix V provides an illustration of the suggested twofold approach and evaluation results of 11 projects – in terms of a colour scale. In the example, scores obtained from the matrix evaluation *(performance scores)* are compared with scores obtained from a questionnaire *(knowledge transferability scores)* in terms of sustainable development objectives and different impact indicator groups.

Projects related to SuD were financed by many different instruments in FP5 and FP6. Table 6 shows the average performance (objectives) and knowledge transferability (impact indicator) scores for the different financial instrument project groups. Accompanying measures and networking instruments in both FPs seem to be the most successful ones in terms of both scores. However, very little differences can be found between the financial instruments.

Table 6. Average score of indicators (knowledge transferability) and objectives (performance) by financial instrument and FP (Scale 1-5)

FP	*Financial instrument*	*Indicators Average*	*Objectives Average*
FP5	Accompanying measures	3.22	4.04
	Research and technology development projects	3.42	3.73
	Cost-sharing contracts	3.18	3.85
	Thematic Networks, Concerted Action	3.88	4.00
	Study contracts, assessment contracts	3.36	
FP6	Coordination action	3.33	3.59
	Integrated project	3.83	2.83
	Networks of Excellence	3.50	3.66
	Specific Targeted Innovation Project	3.77	
Grand Total		**3.50**	**3.67**

4.3 Results of FP5 and FP6 project evaluations in the field of CPP

4.3.1 Application

The proposed process for evaluation of the contribution of transport research projects to improving CPP comprises the steps listed in Figure 14. A detailed description of the evaluation process is given in the METRONOME deliverable D51.

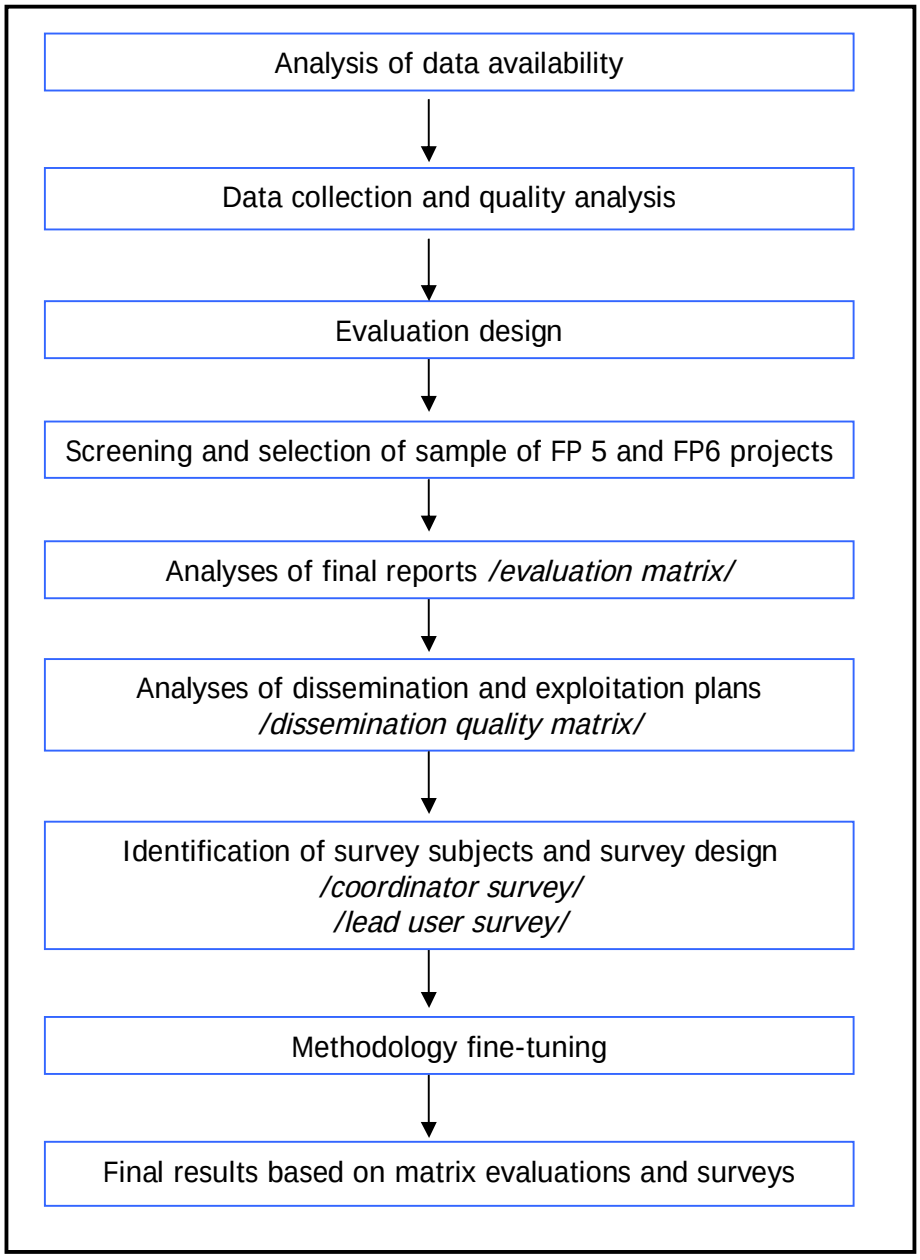

Figure 14. Overview of the CPP evaluation process.

The proposed stepwise approach is sufficiently flexible and allows for different types of projects, key actions and thematic programmes to be evaluated. A combination of theoretical/analytical and surveying methods was considered in the case of CPP as the most appropriate way to proceed. In practice, the following components are included in the methodology for evaluating the programme-level and project-level impacts.

Analytical:

- Project final report estimations and evaluations (evaluation matrix)

- Analysis of dissemination activities (dissemination quality matrix)

Surveying:

- Co-ordinator–oriented questionnaires

- Lead-user (research project result end-user) interviews

The most important type of survey for collecting information on programme/project impacts is the lead-user survey, conducted among potential and target users of the FP5 and FP6 projects.

4.3.2 Practicalities relating to the application

The following table illustrates the main findings regarding the appropriateness of the tested evaluation methods, discovered during the development process of CPP application.

Table 7. The appropriateness of the tested evaluation methods.

	Purpose	*Strengths*	*Weaknesses*	*Feasibility of tool*	*Recommended as a tool?*
Final report analysis *(Project Evaluation Matrix)*	To evaluate the extent to which project results have contributed to CPP objectives.	Provides an indication of the results of each research project evaluated. Provides a holistic summary of the research project findings on contribution to objectives, and estimation of impact areas and types.	Final reports of different types of projects have significantly different formats and contents. The output is theoretical with potential/expected impacts being implied from scientific results and associated dissemination and engagement activities rather than determined from evidence of impact 'on the ground' or from an end-user perspective.	Overall: Yes. Final reports are in almost all instances readily available and, in many cases, contain comprehensive and accurate details of project results. The approach is time consuming but investment of time is necessary if a thorough understanding of the project, its background and what it has achieved is to be gained. This is a prerequisite for evaluating the impact of projects. The matrix is easy to apply.	Yes, but in conjunction with other impact evaluation tools.
Review of dissemination activities *(Dissemination*	To provide an overview of dissemination activi-	Supports the final report analysis by providing a more detailed indication	Highly dependent upon the availability of plan and report, level of detail and	Overall: Yes. The review does not have to be conducted by an expert	Yes, particularly when combined with other tools to demonstrate

Quality Matrix)	ties conducted by projects. To develop a picture of the likely impacts of projects 'on the ground' (i.e. on end-users, audience, domains).	of the likely impacts of research projects.	quality of reports on dissemination activities and engagement. Even where dissemination activities are presented in detail, other forms of engagement and/or the stakeholder's involvement can be limited. Does not demonstrate whether the stakeholders who were engaged with actually applied the project results and therefore whether it had any actual impact.	as the matrix is straightforward and easy to understand.	the project findings disseminated.
Co-ordinator questionnaire survey	To gain information of the co-ordinator view on the societal, end-user and scientific impacts of the research projects and on issues relating to management, dissemination, co-ordination and finance.	Provides a self-evaluation and insight into the contribution of projects to CPP objectives, and into the potential and actual impacts of the project. The results can be used to reinforce the validity of findings from other evaluation methods.	There are numerous barriers to obtaining effective results from self-evaluations, notably respondent bias. This could manifest itself in the desire to cast the project (and institution) in a favourable light. Coordinators may be unable to make an objective assessment of the results and impacts of their project owing to their high level of connection with it. Relies upon co-ordinators being willing to take the time to fully respond.	Overall: Yes. If the actual contact details of co-ordinators are readily available. Minimal time and resource needs to be used by the evaluator. The survey is concise and comprises straightforward answers to questions. It is not likely to take long to complete. The approach is less feasible for projects finalised in the past. If co-ordinators move roles or organisations, they can be difficult to contact; and experience indicates that the more time that elapses between the project completion and being issued the survey the less willing they are to respond.	Not in its current format. It could be used to reinforce findings from other approaches but much caution is required when interpreting self-assessments. The survey adds little to information that can be gleaned from other more objective sources (notably the final report review and dissemination review). To make it more valuable, additional information should be pursued.
End-user interviews	To provide an indication of the degree to which project results are actually being used and applied on the ground, and therefore	Gives direct insight into the extent to which research results are being applied in practice. Provides insight into reasons why the project results are either being used or not being	Participant bias could have a direct impact upon the results. Respondents might, for example, wish to tell the researcher what they want to hear and therefore overemphasise the effects of FP projects. It is difficult to get a	Overall: Not in its present form. Adjustments are necessary. Minimal time and resource needs to be invested by the evaluator but key stakeholders can be unwilling to dedicate enough time to the	Yes, but only if the questions asked are reduced and the sample size is larger and representative enough.

	whether they are ultimately having an impact upon CPP.	used.	realistic indication of the actual scale and purpose for which project findings are being applied. It is not likely to get accurate indication of the actual range of actors who are making use of the project results, nor to determine the actual way in which they are being, or have been, used. Relies upon end-users being willing to take the time to fully respond.	interview to produce meaningful results. Experience showed that the best insights were achieved when end-users were sent the interview questions in advance, which gave the respondents time to think through their answers before the interview. Non-responses can compromise the validity and generality of the findings.	

4.3.3 Results of testing the application

The application presents a fourfold approach to evaluating the contribution of FP5 and FP6 transport research projects to CPP. The four complementary parts of the methodology are as follows:

1. Project evaluations against FP5 and FP6 objectives on different levels – *Project evaluation matrix*
2. Evaluation of knowledge dissemination – *Dissemination quality matrix*
3. Evaluation of potential project impacts in four groups (scientific, end-user, societal, management and co-ordination impacts) – *Co-ordinator survey*
4. Evaluation of lead-user benefits and impacts – *Lead-user interviews*

The project evaluation matrix presented in section 3.5.1 of this Deliverable provides the tool for evaluation of CPP objective achievement on different levels, namely European policy, FP Work Programme and project levels. The dissemination quality matrix (see also 3.5.1) provided the tool for evaluation of knowledge dissemination. The questionnaire sent to the project co-ordinators and the lead-user interviews (see 3.5.3) provided the tools for evaluation of project impacts and lead-user benefits.

Altogether 13 FP5 and eight FP6 projects were included in the evaluation. For eight FP5 and four FP6 projects, evaluation from all the above perspectives was completed.

Based on the evaluation matrix results it is possible to conclude the following:

The set of research objectives that were best met were the Strategic Project objectives. The majority (90%) of these were considered to have been 'fully met' for FP5 projects. For FP6 projects the percentage is lower (51%), but in both cases this set of objectives has been met better than others. The potential contribution and impact of FP5 and FP6 projects to work programme objectives is almost identical. A large percentage of work programme objectives have been achieved. A surprising finding is that both the FP5 and FP6 projects were considered to have contributed more 'fully' to 'higher level' work programme objectives than to the 'lower level' key action objectives.

Contribution to CPP in general is very similar between both FP5 and FP6 projects, and although some differences exist between the two FPs this could be due as much to the different sample sizes as to differing contributions to CPP. The potential impact of projects in terms of the customer/end-user, societal and co-ordination indicators used was consistently positive across the range of projects reviewed. Management and co-ordination impacts received the most positive responses in both FP5 and FP6.

Based on the dissemination quality evaluation it is possible to conclude the following:

The main dissemination channels for both FP5 and FP6 projects were seminars, conferences, workshops, web pages and different kinds of publications. The most typical audiences included EC officials, researchers, civil servants, experts and transport operators.

A surprising finding is that in FP5 only 15% and in FP6 only 25% of the evaluated projects had identified the end-user(s) of project results during the course of the project and involved them in the project proceedings. In both FPs the dissemination activities focused primarily on presenting the results of the final stages of the projects, rather than seeing dissemination activities as consultation opportunities to improve project results.

Based on the co-ordinator survey it is possible to conclude the following:

The project co-ordinators considered the impacts of FP5 projects in all four impact groups to be higher than those of FP6 projects. The most positive answers regarding both FP5 and FP6 projects concerned the scientific competence of consortium, contribution to the development of decision-making tools and involvement of civil servants and policy makers in the projects. In addition, publishing project results in scientific journals or books and financial issues were rated highly in FP5 and improved networking between researchers and public/private organisations in FP6. The most negative results were received concerning questions/statements in both FPs regarding converting the project results into policy recommendations and regulations, and the project raising new unsolved research questions.

Based on the lead-user survey it is possible to conclude the following:

The most positive answers regarding both FP5 and FP6 projects concerned the following issues: a high level of expertise among project participants; improved networking between researchers and public/private organisations (especially in FP6) and strengthened networks between international parties; taking the needs and views of end-users into consideration in the projects; usage of project results by the public sector or other societal actor; dissemination of project results (only FP6, not FP5) and development of decision-making tools.

Contribution to policy goals or policy development received slightly positive answers regarding both FPs. The most negative results were received regarding conversion of project results into policy recommendations and regulations. Also the cost effectiveness of FP5 projects received a negative response, whereas for FP6 projects it was positive.

The results of the co-ordinator and lead-user surveys are astoundingly similar, which allows us to claim that the strengths and weaknesses identified for the FP5 and FP6 projects above can be considered both relevant and tenable.

5 Discussion of the results and Conclusions

5.1 Methodological aspects

Based on the results of the METRONOME methodology, tested with a sample of 100 FP5 and FP6 projects, we can conclude the following: The evaluation methodology proved to be useful in producing information for definition of the intermediate performance targets for FP7 and for new research policy objectives from the perspectives of: (1) achieving FP5 and FP6 objectives and targets, (2) FP5 and FP6 implementation and operational environment, and (3) research project outcomes and impacts. We believe that the following results based on the METRONOME project sample can, on a general level, also illustrate the performance of the whole FP5 and FP6 in the field of transport.

Impact and effectiveness evaluation differs from objective/target achievement evaluation in that the latter does not take into account the side effects or unanticipated effects that a research project or programme may have. Impact evaluation again does not take into account the relevance of objectives set. This is why evaluation of both achievements and impacts (gained and expected) is needed and consequently taken into consideration in the METRONOME evaluation.

Testing the METRONOME methodology illustrated that different mixes of evaluation methods (both reviewing and surveying) are needed for evaluation of projects under the themes of IndCo, SuD and CPP. The main findings regarding the suitability of tested evaluation methods are presented below.

First, the project evaluation matrix provided an indication of the results of each research project evaluated, as well as a holistic summary of the research project findings, their contribution to objectives, and estimation of impact areas and types. The dissemination quality matrix supported the final report analysis by providing a more detailed indication of the likely impacts of research projects. The matrix approaches were easy to apply, but time consuming. However, in order to gain a thorough understanding of the projects, their background and achievements, allocating enough time to their evaluation is necessary.

Second, the co-ordinator survey provided co-ordinators' self-evaluation of the potential and actual impacts of the projects. The results were useful as supplements to other evaluation methods, but by themselves the risk of bias in co-ordinator responses, as always in self-evaluations, is present. The lead-user survey was found to be the most valuable source of information regarding the actual use of research results. This kind of survey should be promoted in the future, combined with in-depth, long-term project impact evaluations, in co-operation with technology platforms and EC officers.

The third motivation for using different methods in the thematic evaluations stems from the different (expected) time perspectives of the thematic impacts. If we exclude publications and networking, the most typical immediate impacts of all projects, IndCo projects are more likely to produce immediate results (e.g. patents and prototypes) than SuD and CPP projects, which focus more on intermediate impacts, like strengthened expertise, public discourse and support for decision making and strategy development (see

also Figure 1). The ultimate impacts in all themes are very difficult to evaluate because of the long-term perspective (10 years or more). In addition, the target areas of the impacts of different themes are different and hence require different approaches (see Figure 2).

The main difficulty encountered during the METRONOME methodological development was the availability of project *result* (e.g. Final Report) data. A structured, up-to-date FP project result database that is ready and available for the evaluators would enable more reliable, less time-consuming and less costly FP impact evaluations.

Other major difficulties identified during the methodology development were the relatively low response rates in co-ordinator surveys and interpretation of the multi-level objective and target structures of the FPs as the basis for evaluation. In order to avoid missing or misinterpreted objectives and targets, input of strategic research objectives and targets from official EC data sources should be ready and available to the evaluators. As regards the surveys, sending the questionnaires officially by EC bodies could improve the response rate; the responses could even be demanded as a part of project proceedings.

In addition, the time reserved for methodology development (18 months) was too short. The input data gathering (project results), FP objective/target analysis and the co-ordinator survey all took much longer than expected. Another important aspect related to the timing of programme evaluation is the continuity of evaluations. As we see it, METRONOME evaluation presents only a first phase in a FP impact evaluation process. As it often takes a long time for project impacts to materialise, only a repeated (and simultaneously elaborated) evaluation process can provide more detailed analysis of project or programme impacts. Further, and as a complement to the former, more emphasis and resources are needed in integrating such future elements into evaluation methodologies that can better support the future WP objective and target setting in the changing European transport and research environment.

5.2 Application results

The following section presents the main findings of the METRONOME evaluation regarding the FP5 and FP6 rationales, implementation and achievements in the fields of IndCo, SuD and CPP.

5.2.1 Rationale

Both FP5 and FP6 presented a wide variety of objectives and targets at different levels. The METRONOME analysis revealed the following three levels of objectives relevant to many of the transport research projects commissioned under the programmes:

- Specific Work Programme (WP) or Thematic Area objectives
- Key Action (KA) of the Work Programme or Programme Subdivision (PS) objectives (or targets)
- Strategic project objectives

Table 8 shows the number of objectives set for the METRONOME evaluation themes at FP5 and FP6 WP level and lower KA/PS level. Within the IndCo theme, the number of KA

objectives is replaced with measurable targets identified from the WPs. The number of thematic objectives indicates a higher significance given to the IndCo theme in FP6 than in FP5. As regards CPP, a similar but weaker trend can be identified. In the field of SuD, the emphasis seemed to be quite similar in both FPs.

The set of objectives that were the best met were the strategic project objectives. This is hardly surprising as these are the objectives that have the most direct relevance to the project. A surprising finding, based on the matrix evaluations, was that in the fields of SuD and CPP, both FP5 and FP6 projects were considered to have contributed more to higher-level WP objectives than the lower-level KA or PS objectives, which could be considered more directly applicable to the projects commissioned. One explanation could be that the higher level objectives are more general and thus easier to meet than the lower level objectives that are more specific. Also, when a project meets its specific objectives satisfactorily, but not the European policy objectives, it might be because the project is focused on one single goal only and thus has been evaluated low for the other goals.

Table 8. FPs and number of thematic objectives/targets set for different levels.

	FP5		*FP6*	
	WP	*KA / PS*	*WP*	*KA / PS*
IndCo	3	10[3]	4	61[3]
SuD	4	6	8	2
CPP	4	4	8	11

WP - Work Programme objections, *KA* – Key Action objectives, *PS* – Programme Subdivision objectives

In the field of SuD only 20%, and in the field of CPP 50%, of the projects reviewed met their strategic project objectives and the relevant KA (or equivalent) objective that they were commissioned under, as well as one or more of the relevant WP objectives. This suggests that there could be considerable discrepancies between the SuD and CPP components of different levels of objectives set.

Based on the co-ordinator surveys, the level of funding was considered sufficient in FP5 projects. FP6 projects, on the other hand, gave different results. For example, in the field of CPP less than 30% of the respondents considered the research budget to be adequate. In addition, the (input) data availability was considered much better in FP5 than in FP6. For some reason the lead-user survey did not complement the above results. The cost effectiveness of the projects in terms of money or resources spent was considered better in FP6 than in FP5.

5.2.2 Implementation

In the METRONOME project sample, all projects in the IndCo domain (except one) were financed as Cost Sharing Contracts in FP5. In FP6, the majority of the projects were Integrated Projects. Projects in the field of SuD were financed by many different instruments in both FPs. Based on both the matrix evaluation and co-ordinator survey, the applied financial instruments were considered adequate in the majority of the SuD cases. Accompanying measures in FP5 and networking instruments in both FPs were considered the most successful instruments, which might evidence the emergence of new research network structures.

[3] Number of measurable targets in WP

In general, project management in both FPs was carried out satisfactorily. The level of expertise among project participants was considered high in both FPs by both the co-ordinators and lead-users. Dissemination of project results, however, seems to be a contradictory issue. On the one hand, the majority of project co-ordinators agreed that the project results in both FPs were adequately disseminated to the end-users. The lead-users agreed with the good dissemination level regarding FP6 projects. On the other hand, in more general terms, e.g. for FP evaluation purposes neither the project result dissemination level nor the quality has been adequate. At present the results are not easily available from a centralised web address.

5.2.3 Achievements

In general, and within all three evaluation themes, the vast majority of strategic project objectives of the project sample were considered to be fully met. This indicates that on individual project levels, in terms of both substance and practicalities, the projects worked well. However, as argued in the previous section, this does not guarantee a positive contribution to higher-level objectives, since there seem to be discrepancies between the different levels of objectives and targets set for the FPs.

In the field of IndCo, major achievements were found in the fields of development of advanced technologies, processes and services, and in the contribution to societal, environmental (e.g. safety, traffic congestion) and financial issues. These same fields were emphasised in both FPs. The main contributions of SuD projects in both FPs were identified as developing, integrating and managing a more efficient, safer, more secure and environmentally friendly transport system to provide user-friendly door-to-door services. Contribution to the development of decision-making tools was the main achievement of CPP projects also in both FPs.

Based on both the lead-user survey and the co-ordinator survey, scientific publications and a high level of scientific expertise in general were considered as the main immediate impacts of FP5. Improved networking between researchers and public/private organisations and strengthened networks between international parties were seen as the major immediate impacts of FP6. Also patents and standards produced in IndCo projects (especially in FP6), represent the immediate impacts, even though the transport industry and service sector seem not to have been greatly involved.

As regards the intermediate impacts, the major successes of the activities of both FPs can be considered to be strengthened expertise, development of decision-making tools, co-operation with end-users in the projects, and usage of project results by the public sector or other societal actors. Contributions (often indirectly) to new transport policy development but also to new products or service development were also considered slightly positive. The evoked networking or co-operation seems to be strongest among project research partners, but can also be identified among stakeholders in both the public and private sectors.

Failure to convert project results into standards, norms or regulations and the fact that the projects did not raise new unsolved research questions were considered to be the weaknesses of the FP5 and FP6 transport projects. This indicates that even though tools for decision-making have been developed and some contribution to e.g. transport and SuD policies and strategies has been made, the practical, regulatory outcomes have ei-

ther been modest or are not known. In addition, the identified discrepancy between the FP objectives of different levels and the low level of achievement of European level objectives by the projects in matrix evaluations supports this finding.

Evaluating the ultimate impacts, which might be realised 10 or more years down the road, is a very difficult task within all of the METRONOME evaluation themes. However, improved transport safety and awareness of environmental impacts from transport and consequent utilisation of developed environmental impact assessment methods or even implementation of transport measures are examples of such ultimate impacts.

In general, achievement of FP objectives in both FPs has been good throughout and in some cases even very good. Potential impacts in all four impact groups (scientific, end-user, societal and management and co-ordination) have been positive. The above indicates, however, that the impacts of projects in both FPs have been strongest within the group of management and co-ordination. Also scientific and end-user impacts have been adequate, but wider societal impacts quite modest. Based on the surveys, project co-ordinators presented slightly more positive views on the achievements of FP5 projects than those of FP6 projects. In the case of lead-users, the result was the reverse. Consequently, no meaningful distinction could be made between the two FPs regarding either their objective achievements or their impacts. The differences could even be due to the temporal implementation of FPs, in a sense that recent FP6 projects are better recalled than the more distant FP5 projects.

To conclude, it seems that FP5 and FP6 have certainly played a significant role in the European science and technology agenda. For evaluation of the role of the FPs on the global map or on their contribution to EU research competitiveness at international level, the project sample does not give a representative insight.

6 Recommendations for future research

Experience from the METRONOME evaluation methodology development and testing has revealed the following future research needs in relation to FP impact evaluation and transport research in general in the fields of IndCo, SuD and CPP.

If one looks at the potential impacts of FPs on the shaping of the European Research Area (ERA), the most critical issue is the availability and dissemination of FP project result data. This concerns both lower, individual project level and centralised EC level. Currently the project results are not easily available for the use of individual projects/persons or for FP evaluation purposes. Consequently, the FP output quality needs improvements both on a project level (e.g. longer supported maintenance of web sites) and community level (centralised FP project output database). Managerial incentives such as rewards and bonuses for successful projects and excellent R&D achievements by the Commission could provide here a possibility to increase the project quality in terms of project results and dissemination activities alike.

Another important issue is the lack of consistency identified between the different levels of objectives set for FP Work Programmes. Only a few of the evaluated projects met their own strategic objectives, WP objectives on two levels and relevant European policy objectives. In order to clarify the FP future evaluation in terms of objective achievements, the consistency of the WP objective structure should be increased. In addition, the supporting role of current and future FP evaluation methodologies in WP objective / target setting should be analysed carefully and methodologies developed further.

Other aspects identified relevant for future FP evaluations, which METRONOME time frame and resources did not allow are the following: First, close co-operation with technology platforms and EC officials in project evaluations might result in a more comprehensive and detailed view of project achievements and enhance the uptake of evaluation results. Second, and related to the former, investigating the follow-up research project paths that certain (groups of) projects have evoked might lead to a detailed understanding of the intermediate or even ultimate impacts of FP projects on a certain field. Third, including transport projects commissioned under other programmes than transport (e.g. Information Society, Environment and Security) into the evaluation could provide a more comprehensive view of the impacts of FP transport research. This concerns especially the evaluation from the points of view of competitiveness and sustainability. Finally, finding the right time for FP evaluation is always difficult. In our case, for example, FP5 and FP6 stand on a different line in the evaluation because of the temporal aspects. Later implementation of FP6 might have evoked, depending on the circumstances, more intense (positive or negative) responses in the surveys than the more distant FP5.

On a thematic level, further development of competitive transport products and services, efficient and harmonised use of pricing measures and contribution to the reduction in transport emission are examples of the research fields identified as relevant for future research during the METRONOME evaluation.

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Appendix I

The European high level transport policy objectives for Industrial Competitiveness, Sustainable Development and Community and Public Policies based on European Research and Policy documents listed below.

Industrial Competitiveness	Sustainable Development	Community and Public Policies
Worldwide excellence in innovation and technologies applied to transport domains; promoting the use of ICT as well as take-up actions on intelligent transport systems (ITS)	Sustainable use of resources, diversified energy for transport, energy-efficiency	Improvements in the relationship between research and policy at all levels in the EU, timely and effective scientific inputs for a wide field of policies
Leadership in eco-industry, eco-innovations; development of environmentally friendly cars and other transport vehicles, and new power train concepts.	Efficient and harmonised use of pricing measures, e.g. taxation and congestion charging	Improvements in the efficiency and transparency of decision making
Definition of a set of systems architectures covering various modes of transport, different types of user, communication means and protocols	Reductions in transport emissions	Improved policy coherence
Rebalancing and integration of different transport modes, promoting interoperability; developing systems for managing modal and intermodal traffic and transport systems	High-quality public services for sustainable transport	Expanded and improved investment in human capital
Improved European infrastructure, eliminated infrastructure bottlenecks	Developing, integrating and managing a more efficient, safer and environmentally friendly transport system to provide user-oriented, door-to-door services for passengers and freight	Development of the European Research Area and scientific support for EU enlargement
Efficient internal market and labour market	Breaking the link between economic growth and increased traffic, and to encourage more sustainable use of the transport system	Better implementation of existing EU environment policies and legislation at the local level
Attractive business environment + entrepreneurial culture	Social cohesion, improved safety and security	Greater coherence between macroeconomic and structural policies
Efficient use of the knowledge society: making R & D a top priority	High quality of urban environment	Good governance
	Limiting climate change	Co-operation between ministries
		Quantitative tools for decision making, reflecting socio-economic objectives

European Policy and Research documents relevant to METRONOME

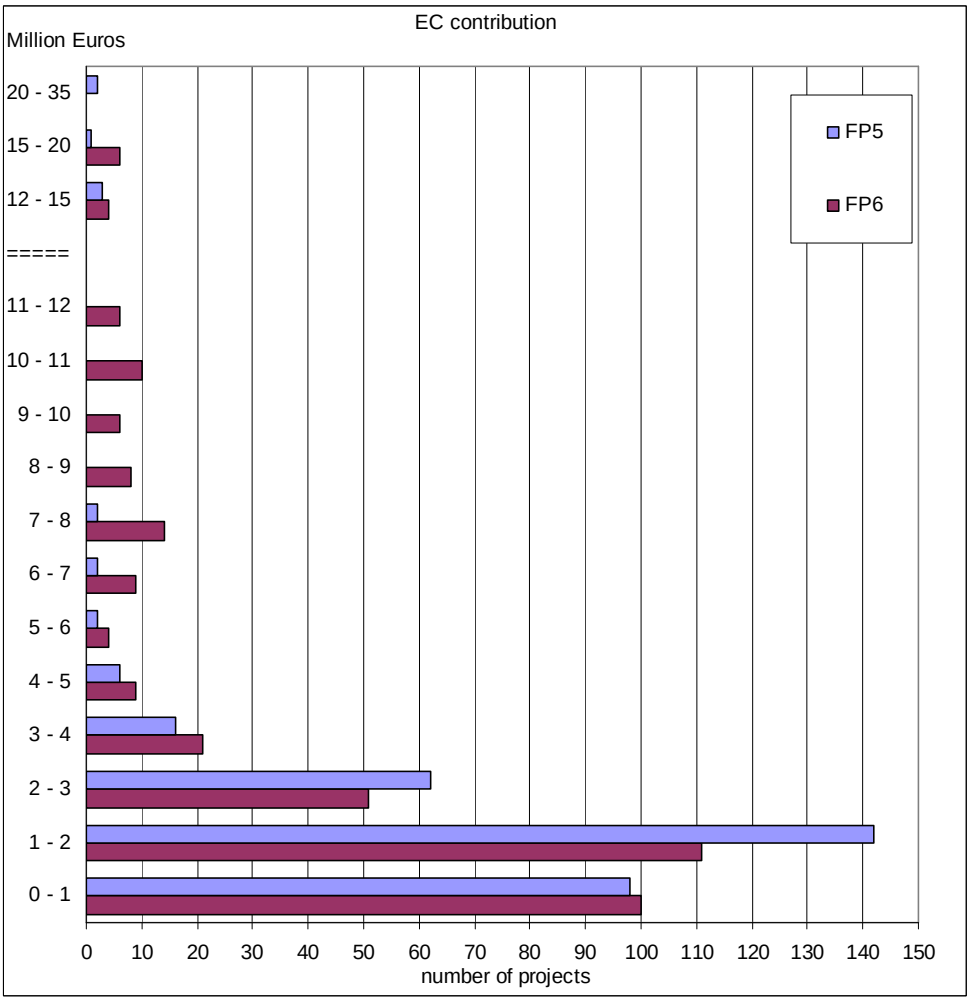
- White Paper - European Transport Policy for 2010: Time to decide (2001)
- Keep Europe moving – White Paper mid term review (2006)
- Integrated guidelines for growth and jobs (2005)
- The Lisbon strategy for growth and employment (2004)
- "Strategic report on the renewed Lisbon strategy for growth and jobs: launching the new cycle (2008-2010) Keeping the pace of change" COM (2007)803 final
- Thematic strategy on the urban environment (2006)
- FP6 Thematic Priority 1.6. Sustainable Development, Global Change and Ecosystems. 1.6.2: Sustainable Surface Transport. Work Programme (2002-2006)
- FP6 Information Society Technologies. A thematic priority for Research and Development under the Specific Programme. Integrating and strengthening the European Research Area. Work programme 2003-2004.
- FP6 Thematic Priority 8.1. Policy-oriented research. Work Programme (2002-2006)
- The European Research Area: New Perspectives. Green Paper (2007) and "Results of the Public Consultation on the Green paper "The European Research Area: New Perspectives" SEC(2008)430
- FP5 Growth Work Programme (2000)
- FP5 Information Society Technologies, A programme of Research, Technology Development & Demonstration (2002)
- The White paper on European Governance (2001)
- "A Sustainable Europe for a better world: A European Strategy for Sustainable Development COM (2001)264
- "The 2005 Review of the EU Sustainable Development Strategy: Stocktaking of Progress " COM (2005)37 and working document on the progress achieved since 2001 SEC (2005)225
- On the review of the Sustainable Development Strategy A platform for action COM (2005) 658 final
- COUNCIL DECISION concerning the Specific Programmes ("Cooperation", "Ideas", "People", "Capacities", "JRC EC", "Euratom" and "JRC Euratom") implementing the Seventh Framework Programme –EC (2007-2013) and Euratom (2007-2011) 15965/06

Appendix II

FP5 and FP6 projects and funding instruments

Number of partners and EC contribution.

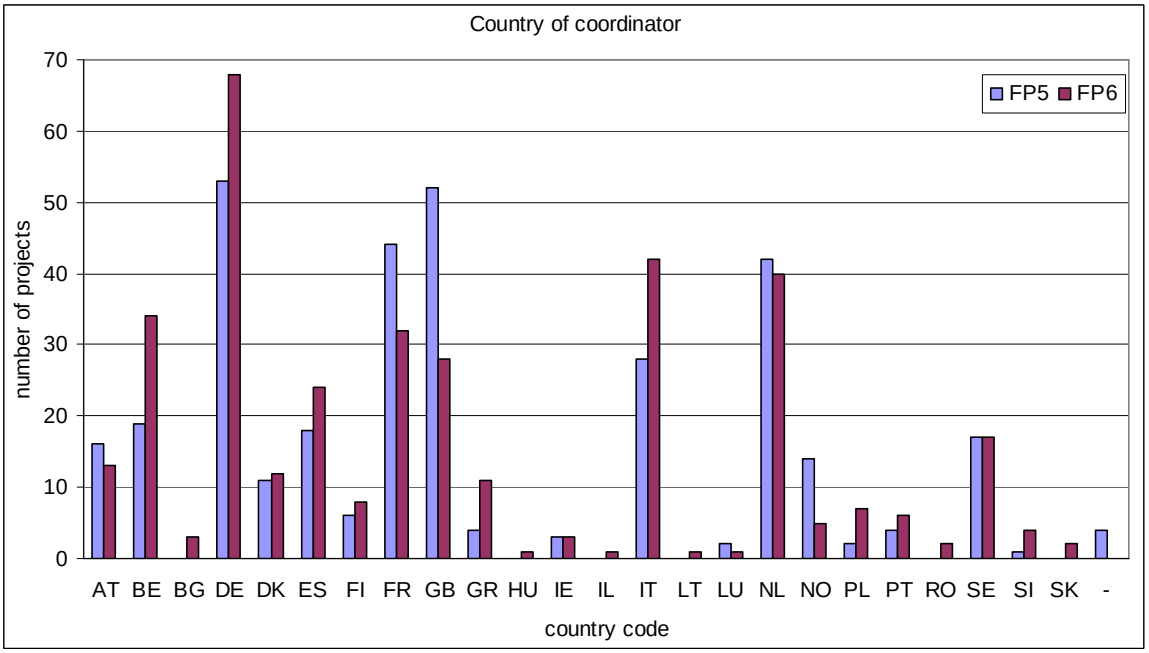
		FP5	FP6
Number of partners	Average	10	13
	Minimum	1	0
	Maximum	45	70
	Median	9	10
	First quartile	6	7
	Third quartile	13	16
EC contribution (€)	Average	1 976 812	3 135 658
	Minimum	1 125	50 000
	Maximum	30 649 912	19 000 000
	Median	1 536 283	1 800 000
	First quartile	916 259	964 396
	Third quartile	2 083 525	3 259 612



EC contribution.

Number of projects funded under the different FPs, different funding instruments and their percentages.

Financing instrument			
FP5			
GMA	Accompanying measures	39	11 %
GRD	Research and technology development projects	218	64 %
GST	Research and demonstration + demo projects ?	35	10 %
GTC	Thematic Networks, Concerted Action	24	7 %
Other		12	4 %
-	Not known	12	4 %
Total		340	100 %
FP6			
CA	Coordination Action	44	12 %
IP	Integrated Projects	73	20 %
NOE	Networks of Excellence	6	2 %
SSA	Specific Support Action	72	20 %
STP		84	23 %
STREP	Specific Targeted Research Project	80	22 %
Total		359	100 %



Country of co-ordinator.

Appendix III

Examples of the Project Evaluation Database and Justification Matrix

An example Evaluation Framework database.

Project:	Acronym	Full title			
Project date:	(Start)	(End)			
Programme type:	FP5	FP6	(Choose relevant)		
Programme Acronym:	GROWTH	SST	(Choose relevant)		
Project type:	IP	STREP	NOE	Other	(Choose relevant)

INDICATORS	Rate the extent to which the project contributed/addressed the indicator				
	Fully	Partly	Indirectly	No – Not at all	Not relevant
1. ...					
2. ...					
3. ...					
4. ...					

Scale	Definition
Fully	The project contributed significantly/addressed the indicator to a very large extent
Partly	The project contributed averagely/addressed the indicator to a moderate extent
Indirectly	The project contributed / addressed the indicator to a moderate extent, although the project did not aim to do so
No – Not at all	The project did not contribute/address the indicator
Not relevant	The project did not contribute/address the indicator, because the project did not aim to do so

An example of Justification Matrix for selecting projects.

No.	Project name	FP – Work Programme	IndCo domain
		(Select appropriate)	(Select appropriate)
1.	XXX	FP5-GROWTH	Technologies, Processes and Services
..	..	FP6-SST	Products
..	..		Infrastructures
..	..		Patents & Standards
..	..		Societal & Environmental
..	..		Legislative
..	..		Financial

Appendix IV

Lead-user questionnaire/interview template

Questions for lead users of EC FP5 and FP6 funded transport projects contributing to C&P Policies

FP5 and FP6 project impacts in general	
B1	FP5 or FP6 projects have contributed to priority setting, e.g. policy goals
B2	FP5 or FP6 projects have contributed to new transport policy development
B3	FP5 or FP6 project results have been transferred into policy recommendations and/or regulations
B4	FP5 or FP6 projects have contributed to development of decision making tools (guidance, models)
B5	FP5 or FP6 projects have contributed to decision making processes of public or private organisations
B6	FP5 or FP6 projects have led to new product or service development in the transport sector
B7	FP5 or FP6 project results have been used by the public sector, industry or other societal actors

Specific FP5 or FP6 project impacts		*YES*	*NO*	*Don't know*
C1	I have been involved in the FP5 or FP6 projects			
	If YES,			
C2	Needs and views of end-users were taken into consideration in the project			
C3	Also transport operators or the service sector were involved in the project			
C4	Also the transport industry sector was involved in the project			
C5	The project results were adequately disseminated to end-users: civil servants and policy makers, public, industry etc.			
C6	The project improved networking between researchers and public/private organisations			
C7	The project built or strengthened networks with global/EU/national parties			
C8	The project was cost effective in terms of money or resources spent			
C9	The project participants had a high level of expertise in the field of the project			
C10	What did work well in the project, and what didn't?			
C11	Main benefit of the FP5 and FP6 projects for me/my organisation			

Please write your specific answers here

C1	Which projects? In what way?
C2	Which projects? In what way?
C3	Which projects? In what way?
C4	Which projects? In what way?
C5	Which projects? In what way?
C6	Which projects? In which way?
C7	Which projects? In what way?
C8	Which projects? In what way?
C9	Which projects? In what way?
C10	Which projects? What worked? What didn't?
C11	Which projects particularly? Main benefits:

Appendix V

Comparing the SuD Scores: Performance Scores and Knowledge Transferability Scores of 11 projects (Scale 1-5).

	Performance Score: Average by group of Objectives								Knowledge Transferability: Average by group of indicators				
	Research Objectives					Impact Indicators							
Projects	Key action	Programme subdivision objective	Work programme objectives	European Sustainable Development Policy objectives	Strategic project objectives	Co-ordination indicators	Customer/end-user impact indicators	Societal impact indicators	Management	Scientific	Utility	Societal	Balanced Score
1	5,00	5,00	4,17	2,97	5,00	4,06	2,32	2,50	4,00	2,78	3,00	2,50	3,18
2		4,06		1,88	5,00	5,00	3,93	5,00	3,50	3,20	3,43	4,00	3,50
3				1,88	1,88	5,00	2,86	5,00	3,00	3,00	3,29	3,33	3,17
4	4,17		5,00	3,59	5,00	5,00	3,93	4,17	3,58	3,87	3,48	3,33	3,56
5	2,50		3,33	1,88	4,58	5,00	3,39	5,00	2,75	2,50	1,71	3,33	2,60
6	3,75		4,38	2,50	4,84	5,00	3,57	5,00	3,75	4,80	3,29	3,67	3,88
7	3,75		3,75	2,66	5,00	5,00	3,93	5,00	3,00	4,20	4,00	4,33	3,88
8	1,56		3,44	2,66	5,00	5,00	3,39	5,00	3,56	3,98	2,61	3,08	3,35
9	3,75		4,17	3,75	4,69	5,00	3,93	5,00	2,33	3,00	4,14	2,33	3,19
10	3,75		4,17	2,81	4,53	5,00	3,13	3,75	3,25	3,60	2,83	3,33	3,26
11		2,68	3,44	2,34	5,00	5,00	3,93	5,00	3,06	3,43	3,56	3,42	3,30
Grand Total	3,13	3,57	3,88	2,63	4,41	4,91	3,50	4,58	3,31	3,50	3,12	3,27	3,32

Categories are defined as follows:

Green: The project achieved more than 75% of the maximum.
Yellow-up: The project achieved points between 50% and 75%
Yellow-down: The project achieved points between 25% and 50%
Red: The project achieved fewer points than 2