Impact assessment of road transport projects
What is an impact assessment?

Impact assessment is an attempt to assess all impacts, whether negative or positive and whether measurable in monetary terms or not, that are predicted to occur if a road transport project is implemented. The aim of the impact assessment is to contribute to well informed decision making.

An impact assessment of road transport projects must document all impacts of the project. This gives a sound basis for the choice of solution for the project under consideration, and a basis for prioritizing between this and other projects.

Road and traffic planning in Norway is carried out according to regulations specified under The Planning and Building Act. This law states when an impact assessment becomes mandatory. The law was revised in 2005 according to directives of the European Parliament and of the Council.

The methodology of impact assessment is also used by the Norwegian Public Roads Administration (NPRA) for other types of initiative and plans.

The purpose of the provisions is to ensure that the environment, natural resources and the community are taken into account during the preparation of the plan or project, and when a decision is taken as to whether, and if so subject to what conditions, the plan or project may be carried out.

The importance of the planning process

Impact assessment is an important part of any planning process. Typically, the planning procedure involves the different steps as shown on the next page. It is important to reverse one or more steps if goals are not met or where new solutions or large unexpected impacts are brought to attention.

Current planning assignments are of such diversity, that variations and special adjustments will occur. The planning programs intention is to identify and document such adjustments. There is a great difference in urban and rural planning, and especially complex projects which involve urban transportation can be challenging.

It is essential to involve affected authorities and stakeholders in the planning process, as well as present result in a concise and understandable way.
The basis for comparison
The impacts of a project can be identified when comparison is made between the predicted state of the environment for scenarios with and without the project. In other words a reference scenario (baseline) is needed in order to say something about the impacts of the project.

The reference scenario, which all alternatives are compared to, is called Alternative 0. A description of Alternative 0 assumes the present situation, and superimposes the expected changes which would take place without the project over the appraisal period of the project. In general it is only traffic growth and any planned/committed developments which differ between Alternative 0 and the current situation.
NPRA’s procedure for impact assessment consists of a socioeconomic analysis and, if necessary, an assessment of spatial and social development.

The socioeconomic analysis is based on economic welfare theory, which is a systematic evaluation of relevant advantages and disadvantages. The objective is to choose solutions where the aggregated advantages outweigh the disadvantages.

It is not possible to express all impacts in monetary terms. The analysis therefore distinguishes between monetised and non-monetised impacts.

Impact assessments assume that the relationship between cause and effect is known, so that the impact of a project or plan can be determined.

The socioeconomic assessment is developed in a theoretical and methodical way such that:

- each impact is considered only under one theme, refer to the table on the next page
- impacts due to circumstances not related to the project are disregarded
- it allows for impacts to arise and develop over time
- only one link in the chain of impacts is counted. This is to avoid double counting

Although the impacts on spatial and social development partially or completely are included in the socioeconomic assessment, it is sometimes desirable to handle these separately and by other methods.

Which impacts are to be analysed?

<table>
<thead>
<tr>
<th>Monetised impacts (calculated)</th>
<th>Non-monetised impacts (assessment)</th>
</tr>
</thead>
</table>

Summary of the socioeconomic analysis

Spatial and social development, when required

Recommendation
The socioeconomic assessment covers the main themes as shown in table.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Main theme</th>
<th>Sub-theme</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport users</td>
<td>Benefit for transport users</td>
<td>Time, distance dependent travel costs, other travel expenses, costs due to inconvenience with ferry connections, health effects due to increased physical activity (pedestrians and cyclists), unsafe conditions for pedestrians</td>
<td></td>
</tr>
<tr>
<td>Operators</td>
<td>Operator benefit</td>
<td>Operating company’s (public transportation companies, road toll companies, ferry companies, parking companies) costs, user income and subsidy/transfers</td>
<td></td>
</tr>
<tr>
<td>The government</td>
<td>Budget effect</td>
<td>Investment, management, maintenance, subsidy to public transportation, tax income</td>
<td></td>
</tr>
<tr>
<td>Third parties</td>
<td>Traffic accidents</td>
<td>Accidents with personal injury and material damage</td>
<td>Monetised</td>
</tr>
<tr>
<td></td>
<td>Noise and air pollution</td>
<td>Indoor noise. Local, regional and global air pollution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Residual value</td>
<td>Benefit of initiative beyond the appraisal period, calculated as the residual value of the investments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost of government funds</td>
<td>Loss of efficiency due to tax financing, 20% of governmental costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landscape or cityscape</td>
<td>Visual effects in uninhabited areas, rural areas, cities and urban areas</td>
<td>Non-monetised</td>
</tr>
<tr>
<td></td>
<td>Community life and outdoor life</td>
<td>Altered quality of residential areas, identity features with which the area is identified, outdoor areas, recreational areas, service, roads and tracks for pedestrians and cyclists</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Natural environment</td>
<td>Interference with larger natural areas and ecosystems, regional vegetation, important single areas, natural areas, special deposits of geo-historical significance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cultural heritage</td>
<td>Interference with pre-historic deposits, sami cultural monuments, cultural heritage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Natural resources</td>
<td>Interference with areas of agriculture, forestry, reindeer management, fishing and sea farming, rocks and ors, water</td>
<td></td>
</tr>
</tbody>
</table>
Monetised impacts

The monetised impacts are based on changes measured in monetary terms. Costs and benefits are estimated for four main groups of stakeholders:

- transport users
- operators
- government
- third parties

The last group includes those affected by accidents, noise and air pollution, residual value of capital and cost of government funds.

The monetised impacts are estimated as gross costs (market price incl. taxes and duties) in order to study the distributional effects between the various stakeholders.

Important concepts in socioeconomic welfare theory

The monetised impacts are evaluated in a benefit-cost analysis. In a benefit-cost analysis the welfare of society is defined as the sum of the welfare of each individual. The individual’s welfare is measured by their willingness to pay for a benefit.

Benefit and costs, or a change in welfare, is estimated as a change in consumer surplus. The consumer surplus represents the difference in the individual’s willingness to pay for a benefit and the actual cost of the benefit.

The changes in the consumer surplus are estimated for each travel market, hence it is irrelevant whether the traffic has been generated or transferred.

Software for calculation of monetised impacts

The Norwegian Public Roads Administration has developed a software package to calculate monetised effects. The simplest project, which does not influence choice of routes or means of transport, only requires EFFEKT. Projects that do influence the travel demand require a TRANSPORT MODEL. A “basic transport model” is established based on data concerning pattern of localization, transport systems and travel habits. The traffic is then calculated both for the reference alternative and for the project alternatives. The results are then used in a TRANSPORT USER BENEFIT MODULE which estimates the transport user benefit caused by the planned changes in the transport system. The cost for the public transportation operator can be calculated with a separate PUBLIC TRANSPORTATION MODULE. The results from the TRANSPORT MODEL, the TRANSPORT USER BENEFIT MODULE and the PUBLIC TRANSPORTATION MODULE, are transferred to EFFEKT where the rest of the monetised impacts are calculated and compared.

In projects where only EFFEKT is used, refer above, the benefits can be calculated as absolute results for each separate alternative, including Alternative 0. The TRANSPORT USER BENEFIT MODULE only takes deviations in relation to Alternative 0 into account.
Appraisal period and price level
Infrastructure projects have a long lifetime, and the impacts of the different alternatives therefore need to be evaluated in a long term perspective. The benefits and costs will occur at various times.

Typically, an impact analysis is based on a 25 year appraisal period (calculated from commissioning of the project). Interest during construction is calculated up to the completion date.

Projects in the road network and some minor investments may have shorter life time. In such cases, a shorter appraisal period can be chosen.

All prices are fixed at the price level of the year of estimation.

Discount rate and calculations of present value
A project’s benefit and cost occur through-out the 25 year appraisal period. In a benefit-cost analysis, impacts occurring at different times are weighted differently.

The annual benefit and cost, which occur each year, are discounted by a set discount rate back to the year of comparison.

The discount rate is pr. 2006 set to 4.5% by The Ministry of Transport and Communications for all projects within the transport sector.

A project’s net present value is the difference between the discounted benefits and the discounted cost, calculated over the appraisal period.

Economic assessment
The Net Present Value (NPV) represents the total present value of a project’s benefit components, minus the present value of all investment and operating costs. The NPV represents the net contribution to the society. If the NPV is negative, the project is not profitable to the society, because the interest on the investment is lower than the discount rate, currently 4.5%.

The government’s budget is limited and hence does not allow for all projects with a positive NPV to be realised. The net benefit-cost ratio, where only costs financed through government budget is included in the denominator, is used for project priorities. This is a measure of the relative profitability and reflects, in a simplified manner, the contribution to the society per NOK (Norwegian krone; currency) financed through government budget.

The internal rate of return (IRR) is defined as the interest which causes a zero net benefit and expresses a project’s profitability. If the NPV is less than zero, the IRR is less than the discount rate. In impact assessments, the IRR is used only as a supplement to the net benefit-cost ratio.

Two important equations:
Net present value = $-I_0 + \sum_{t=1}^{n} \frac{b_t - k_t}{(1 + r)^t}$

Where $I_0$ subscript are all costs during the construction period discounted to the year of comparison, $b_t$ subscript is the annual benefit, $k_t$ subscript is the annual costs, $r$ is the discount rate, $n$ is the appraisal period, typically 25 years and $t$ is year number. All benefits and costs are reported as fixed prices.

Net benefit cost ratio = $\frac{(B + P - F + E)}{F}$

Where $B$ is transport user benefits, $P$ is operator benefits, $F$ is the effect on the government’s budget and $E$ is benefits for third parties.
Transport user benefits
Transport users are defined as both travellers and buyers of freight transportation services. The transport users are divided into five travel groups and three different travel purposes. The five travel groups are driver, passenger, public transport user, cyclist and pedestrian. The three travel purposes are business travel, commuting and leisure travel. This makes a total of 15 different groups. Freight transportation often needs to be considered separately.

The methodology calculates changes in:
• time dependent costs
• distance-related vehicle costs
• other transport user costs
• inconvenience costs in ferry connections
• health effects for pedestrians and cyclists
• unsafe conditions for pedestrians and cyclists

Operator benefits
In this case, operators are defined as companies that provides public transportation or companies that administer transport infrastructure. The relevant operator companies are divided in four groups as follows:
• public transport companies
• parking companies
• toll-road companies
• other private stakeholders

Cost, revenues and transfers for each company can be specified.

Government budget effect
Government budget effect is the sum of disbursements and payments over all public authority budgets. Normally, these will contain state appropriations required by the project and the tax income it generates.

For single road projects this represents the investment costs and changes in the management and maintenance cost over the NPRA’s budget as well as changes in the revenue from transport fees.

For packages of project initiatives which include rail and public transport systems, the budget effects also include the infrastructure owner’s budget and the state and the county purchase of the transport services.

Third parties
The individual operator, the infrastructure manager and the transport user are not held financially responsible for inconvenience and environmental costs for third parties. The neighbours are not compensated for e.g. the resultant increase in noise and air pollution (reductions result in a corresponding positive effect). These costs are included in the “third parties” group analysis.

Accidents
The cost of accidents includes the real cost for society (medical treatment expenses, loss of work, material damages, administrative costs) and loss in quality of life for the injured, family and friends.

No gross cost methodology for accidents has been developed to show how the different groups are affected. The net socioeconomic cost is calculated and assigned to the “third parties” group.

Noise and air pollution
Indoor noise and local, regional and global air pollution are monetised.

Noise is one of the biggest road-related environmental problems. Noise has an adverse effect on health and well-being and may lead to changes in the use of areas.
Local air pollution (NO₂ and dust particles) due to road traffic can be a problem in cities and urban areas. Air pollution is a contributory source of morbidity and increased mortality. In addition, people can experience a decrease in their well-being.

The emission of nitric oxides (NOₓ) has an adverse effect on nature. Road traffic contributes very little to sulphur emissions, and this impact is therefore not taken into account.

The emission of carbon dioxide caused by fuel combustion contributes to greenhouse gas emissions and is monetised.

**Residual value**
The lifetime of an infrastructure is defined as the period the infrastructure is expected to be in operation, typically 40 years. Because the appraisal period consists of the first 25 years of the project's lifetime, there will a period of 15 years where the benefits and costs are not accounted for. To correct for this, the project is given a residual value which is accounted for in the net benefit with a positive value.

At the end of a 25 year assessment period, the remaining value is set to 15/40 (37.5 %) of the investment cost. This value is discounted to the year of comparison.

**Cost of government funds**
The tax funding of public initiatives implies a cost to society which needs to be included in the socioeconomic analysis. The tax represents a wedge between operator's prices and the price of the demand. Taxes therefore contribute to a distortion in use of resources which results in a loss of efficiency.

All governmental payments and disbursements must therefore have imposed an extra tax cost (20 %).
Non-monetised impacts

The non-monetised impacts are divided into five themes which represent the different aspects of the environment and they all supplement each other. Ideally, there should be no overlap between the themes so as to prevent double counting. All non-monetised impacts must be covered by one of these five themes.

The time of occurrence of benefit and cost is considered in the benefit-cost analysis of monetised impacts. A krone (NOK) today is given higher value than a krone in ten years. When dealing with non-monetised values, which might permanently be lost, one cannot assume a reduced value for future generations. The methodology takes this into account.

There are three main terms when dealing with evaluations and analysis of non-monetised impacts; value, magnitude and significance.

- **Value**: Evaluate how valuable an area is to its environment
- **Magnitude**: Evaluate the extent of future changes in these areas and the degree of change caused by the project
- **Significance**: This means a balanced evaluation of the advantages and disadvantages of the project compared to Alternative 0

Criteria for determining the value and magnitude for each theme are developed.

Valuations of the areas influenced by the project, with respect to each theme, must be decided. The value is assigned on a scale of three from small via medium to large value.

Thematic maps, showing the valuations regarding each theme, are produced.

The value criteria for the various themes are coordinated such that a large value in one theme is comparable to a large value in another theme.

The magnitude is presented on a scale divided into five, ranging from a large negative to a large positive magnitude.

The evaluation of the magnitude is based on an assessment of the project’s physical layout, expected amount of traffic plus the project’s influence on e.g. land use, community life, severance, changes in terrain, barrier effect, noise and air pollution. Quantifiable effects, e.g. no. of houses and land take, should be quantified.

The significance of the various impacts is to be assessed by combining the value and the magnitude of impact as shown in the figure below. As seen in the figure, impacts are presented on a scale divided into nine segments ranging from a very large positive to a very large negative significance.
Landscape, cityscape
A landscape is defined as an area formed by natural and human interaction. The city is by this definition a type of landscape.

The terms landscape and cityscape mean the visual surroundings, and the theme deals with how these changes as a result of the project. This theme deals with both how the project is adapted into the landscape as seen from its surroundings and also how the landscape is seen when travelling along the road (travel experience).

Community life and outdoor recreation
The community life is defined as the environment in which people live from day to day. Outdoor recreation is defined as physical activity and staying outdoors with the aim to experience a change of environment and nature.

The terms community life and outdoor recreation are connected to staying outdoors and physical activity in residential areas, cities, parks and other outdoor recreational areas. Outdoor activities which are a part of daily life in the local environment are important arenas for physical activity. The two terms community life and outdoor recreation therefore overlap and are to be dealt with together.

Impacts on residents and users of affected areas must be assessed. The assessment of community life evaluates how the initiative weakens or strengthens the physical conditions for enjoyment, group activities and physical activities in the outdoor areas. This indirectly affects our health. Impacts on pedestrian and bicycle traffic are normally assessed under this theme.

Natural environment
The theme deals with types of nature, biotope, habitat and species which affect the life of animals and plants, as well as geological elements. The term natural environment includes all terrestrial, limnological and marine bodies and the biological diversity related to these.

Cultural heritage
Cultural heritage is defined as all traces of human activities in our physical environment, including locations related to historical events, faith or tradition. The term cultural heritage is defined as any area where a monument or site forms part of a larger entity or context.

Cultural heritage sites protected by law include archaeological and cultural heritage sites from before 1537 and structures originating prior to 1650.

Natural resources
Natural resources are resources that come from agricultural, forestry and other rural areas, fish stocks, wild animals, water resources, rocks and minerals. Impacts on agriculture, fishing, use of water, use of marine resources, reindeer, rock, gravel, sand and clay as resources are assessed under this theme.

A resource base is the resources which constitute the basis for employment within the primary production and secondary processing industry. The evaluation of the resource base includes both quantity and quality. The evaluation does not include the utilization of the resource, meaning commercial affairs.

Renewable resources mean water and biological resources. Non renewable resources are topsoils and geological resources (rock, gravel, sand and clay).

Example of a value map
The result of the socioeconomic analysis

Summarising is the final step in the socioeconomic assessment, and is not to be mistaken as final recommendations for the project. Summarising is a systematic comparison and evaluation of benefits and costs caused by the project. The summary needs to be transparent in order to show what themes that are emphasized.

Table 1 illustrates an example of how the net present value for each monetised impact theme and main results from the EFFEKT calculations are presented. Table 2 illustrates the same for the impact assessment and ranking of the non-monetised themes. Additional text is given explaining the results – where the biggest conflicts or improvements are located, and what they consist of.

A road project typically involves negative impacts for the non-monetised themes. When evaluating the non-monetised themes, one needs to make a total evaluation of all non-monetised impacts in order to assess whether the alternatives are negative or positive compared to Alternative 0.

Table 1: Collocation of monetised impacts, current value in mill. NOK

<table>
<thead>
<tr>
<th>Components</th>
<th>Alt. A</th>
<th>Alt. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation users</td>
<td>210</td>
<td>380</td>
</tr>
<tr>
<td>Operator benefit</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Budget effect</td>
<td>-160</td>
<td>-560</td>
</tr>
<tr>
<td>Accidents</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>Noise and air pollution</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Remaining value</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Cost of government funds</td>
<td>-30</td>
<td>-115</td>
</tr>
<tr>
<td>Net present value</td>
<td>90</td>
<td>-100</td>
</tr>
<tr>
<td>Net benefit-cost ratio</td>
<td>0.6</td>
<td>-0.2</td>
</tr>
<tr>
<td>Internal rate of return (%)</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>First year rate of return (%)</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

Example: New highway through Smalltown

The project

The project is a new highway through Smalltown. The highway has a traffic of 15,000 vehicles per day. Alternative A is based on upgrading of the existing road. Alternative B passes the outskirts of the town in two long tunnels, connected with a bridge over the River and a new connection to the town centre.

Monetised impacts

Alternative A has a positive net benefit. Alternative B has a negative net benefit, mainly due to high investment costs. The net benefit cost ratio shows that the society earns 0.60 NOK for each NOK invested in Alternative A and looses 0.20 NOK pr. NOK invested in Alternative B.

Non-monetised impacts

Both alternatives show a negative total evaluation for non-monetised impacts. This means that the reference alternative is best, and should be ranked first. Alternative A has less conflict with natural resources than Alternative B, but is inferior in respect of community life and recreation, and is therefore ranked lower than Alternative B.
Socioeconomic assessment and ranking

Alternative A has an uncertain socioeconomic evaluation, hence the monetised effects are positive and the non-monetised effects are negative. The levels of conflict of the non-monetised themes are moderate. The conflicts consist mainly of visual effects for the cityscape in Smalltown and need for movement of two houses from the 1850-ies. The question is whether these losses are worth more than 90 million NOK (compared to the reference alternative which is ranked second). As total the pros are assessed to be greater than cons, and the alternative can be recommended.

Alternative B is considered negative both for monetised and non-monetised impacts. The society looses 100 million NOK in addition to the negative non-monetised impacts.

Alternative A is the only alternative with a positive total socioeconomic evaluation, and is ranked first.

Alternative B has a negative total socioeconomic evaluation, and is ranked last and after Alternative 0 (do-nothing).

Table 2: Collocation of non-monetised themes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Alt. 0</th>
<th>Alt. A</th>
<th>Alt. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape/ cityscape</td>
<td>– –</td>
<td>– –</td>
<td>– –</td>
</tr>
<tr>
<td>Community life and outdoor recreation</td>
<td>0 +</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Natural environment</td>
<td>– –</td>
<td>– –</td>
<td>– –</td>
</tr>
<tr>
<td>Cultural heritage</td>
<td>– –</td>
<td>– –</td>
<td>– –</td>
</tr>
<tr>
<td>Natural resources</td>
<td>0 –</td>
<td>– –</td>
<td>– –</td>
</tr>
<tr>
<td>Total evaluation</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Ranking</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 3: Ranking

<table>
<thead>
<tr>
<th>Impact</th>
<th>Alternative</th>
<th>Alt. 0</th>
<th>Alt. A</th>
<th>Alt. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetised:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net present value</td>
<td>0</td>
<td>90</td>
<td>-100</td>
<td></td>
</tr>
<tr>
<td>Non-monetised:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparison summary and ranking</td>
<td>None 1</td>
<td>Negative 3</td>
<td>Negative 2</td>
<td></td>
</tr>
<tr>
<td>Socioeconomic evaluation</td>
<td>0</td>
<td>Uncertain Positive</td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td>Ranking</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Summary of monetised and non-monetised impacts

A project is profitable to society when the total evaluation of the non-monetised impacts and the calculated net benefit is positive. The goal of the socioeconomic analysis is to find the most advantageous alternatives to society.

The summary is a joint assessment of the monetised and non-monetised impacts where the alternative’s advantages are weighted against the disadvantages of the same alternative.

The comparison of alternatives with different monetised and non-monetised impacts can illustrate the cost to society to maintain a non-monetised value, e.g. to preserve a cultural heritage object.

The summary is a qualitative evaluation and is based on professional judgement and therefore will not yield precise answers.

The comparison summary is divided into two steps:
- first, the monetised and non-monetised impacts are evaluated together for each alternative
- then, the alternatives are ranked.

The results can be summarised as in table 3. The additional explanation that accompanies the table is very important.

Socioeconomic assessment and ranking

Alternative A has an uncertain socioeconomic evaluation, hence the monetised effects are positive and the non-monetised effects are negative. The levels of conflict of the non-monetised themes are moderate. The conflicts consist mainly of visual effects for the cityscape in Smalltown and need for movement of two houses from the 1850-ies. The question is whether these losses are worth more than 90 million NOK (compared to the reference alternative which is ranked second). As total the pros are assessed to be greater than cons, and the alternative can be recommended.

Alternative B is considered negative both for monetised and non-monetised impacts. The society looses 100 million NOK in addition to the negative non-monetised impacts.

Alternative A is the only alternative with a positive total socioeconomic evaluation, and is ranked first.

Alternative B has a negative total socioeconomic evaluation, and is ranked last and after Alternative 0 (do-nothing).
Spatial and social development

For some projects, the decision-makers are interested in making the impacts visible for certain groups of the population, local communities, municipalities, or larger regions. Assessments of spatial and social development deal with specific goals or problems, which often (either partially or completely) are included in the socioeconomic assessment. These can be illustrated specifically by other methods. This is particularly relevant for projects and plans which result in large changes in the transportation services or affect special areas or groups of people.

Spatial and social effects must not be presented as an additional benefit if these overlap the socioeconomic analysis. There is a significant risk of double counting when presenting a scenario as a benefit for one group without mentioning the corresponding disadvantage for other groups (redistribution effects).

It is not a requirement to conduct spatial and social development analyses. Whether this is to be done and how comprehensive the analysis should be, has to be determined for each case.

The following list illustrates which general themes need to be accounted for when dealing with regional effects:
- land use
- labour market (recruitment and employment possibilities)
- management of private and public business (access to new markets, new operation concepts, mergers or collaboration between units, new enterprises)
- recreational activities
- shopping habits
- transport system interchanges
- nodal development
- creation of regions (to split or to combine functional regions)
- secondary and tertiary effects of non-monetised themes as a result of altered pattern of urbanisation

Goal evaluation

The need analysis, done as a basis in the preparation of the project, focused on the following goals:

<table>
<thead>
<tr>
<th>Goals for the project:</th>
<th>Alt. A</th>
<th>Alt. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce the number of people seriously injured or killed</td>
<td>Reduced by 32 % - good</td>
<td>Reduced by 43 % - best</td>
</tr>
<tr>
<td>Travel time by bus compared to private car</td>
<td>2 min. relative gain for bus</td>
<td>2 min. relative loss for bus</td>
</tr>
<tr>
<td>Shopping in Smalltown</td>
<td>A little increase</td>
<td>A little increase</td>
</tr>
<tr>
<td>Land use compared to the municipalities goal for reducing the need for transport</td>
<td>None</td>
<td>Good</td>
</tr>
<tr>
<td>Easier commuting</td>
<td>Insignificant</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Total evaluation / ranking</td>
<td>Partly / 1</td>
<td>Partly / 1</td>
</tr>
</tbody>
</table>

The most significant choice is between improvements for public bus transport in Alt. A, or preparation for new housing areas near the city centre in Alt. B. The alternatives meet different goals in national politics. If the population growth in the municipality becomes higher than expected, new housing near the city centre will be more important than better public transport for existing areas.
Recommendation of alternatives

Typically, the Public Road Administration will recommend one or a few alternatives to the municipalities.

Recommendations are made as a separate evaluation after the results of the analysis have been determined.

The normal procedure is to start with the summary of the socioeconomic analysis, choose the alternative ranked highest and then recommend this.

The recommendation is usually based on numerous considerations, and the final result can differ from the result of the socioeconomic analysis.

The methodology therefore has created a clear distinction between the results of the socioeconomic analysis and the other assessments, goals and considerations.

In any cases it should be made clear whether the NPRA intends to object to local authorities’ choice of any one of the alternatives.

Example on recommendation

The Public Road Authority recommends Alternative A.

According to the Public Road Authority's assessment, Alternative A is best for society. The difference in net present value between Alternative A and B is 190 million NOK. Alternative B is a little better for non-monetary themes, but the difference is small, hence it is difficult to argue for a choice of Alternative B. The uncertainties are not of a magnitude that they can alter this.

None of the alternatives fulfil all the project goals. If the population growth in the municipality become higher than expected, new housing near the city centre will be more important than better public transport for existing areas.

Choice of Alternative A does not rule out the building of Alternative B at a later date.

The reference alternative does not solve any problems. The most significant choice is between improvements for public bus transport in Alt. A, or preparation for new housing areas near the city centre in Alt. B. Both goals are according to recommendations from the government.

<table>
<thead>
<tr>
<th>Evaluation of goals</th>
<th>Alt. 0</th>
<th>Alt. A</th>
<th>Alt. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetised net present value (mill. NOK)</td>
<td>90</td>
<td>-100</td>
<td></td>
</tr>
<tr>
<td>Non-monetised comparison summary and ranking</td>
<td>Negative</td>
<td>Negative 3</td>
<td>Negative 2</td>
</tr>
<tr>
<td>Socioeconomical evaluation</td>
<td>Uncertain evaluation</td>
<td>Positive</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Ranking

None
Partly
Partly

The reference alternative does not solve any problems. The most significant choice is between improvements for public bus transport in Alt. A, or preparation for new housing areas near the city centre in Alt. B. Both goals are according to recommendations from the government.