Sustainable Food Logistic Scenarios

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Introduction
This is the first discussion note on the FoodPort scenarios. It sets off with a short concentrated introduction to scenarios and possible futures of the transport sector. Most of this text is adopted from Rehfeld 2000. The introduction is followed by the first discussion outlay for the FoodPort scenarios.

Scenarios
The term scenario can be defined in many ways but in this context the following definitions are used:

- "the challenge is to determine, preferably through scenarios, how such trends will affect us and how new technologies...will influence the future environment... The farther away the time horizon of our predictions, the lesser the accuracy of our forecasts, since many things can happen to change established patterns and relationships. The purpose of forecasting in such cases is to build scenarios that provide general directions to where the world ... is heading." Makridakis, et al. (1998, p.558)

- A scenario as defined by Ayres (1969) is "...a logical and plausible (but not necessarily probable) set of events, both serial and simultaneous, with careful attention to timing and correlation’s wherever the latter are salient".

Planning time horizons
When doing planning and in particular transport planning the time horizon of the planning period is of relevance. Normally the following time horizons are considered:

- Short Term
- Medium Term
- Long Term

<table>
<thead>
<tr>
<th>Time horizon</th>
<th>Period</th>
<th>Description</th>
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<tbody>
<tr>
<td>Short term</td>
<td>Up to 5 years</td>
<td>On a short-term basis an analysis will in most cases be a prediction or prognosis, which offer tactical solutions to a planning problem. Predictions of this kind are relevant to minor road infrastructure investments such as bypass roads in rural areas.</td>
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<tr>
<td>Medium term</td>
<td>From 5 to 20 years</td>
<td>A medium-term time scale basis is a sufficiently long period of time for the full effect of a strategic decision to materialise. Equally, the variables may well develop over time. This opens for the possible use of scenarios. However, prognoses have and probably will continue to be used for this time span. Prognoses of this type should include quite substantial sensitivity testing of key variables</td>
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Long term – short term interaction
Schofer & Stopher (1979) identified some important points concerning the interaction between long range planning and short-term actions (adapted from Schofer, J.L. & Stopher, P.R., 1979):

- **Short-term actions have long-term impacts.** The failure to assess the long-term impacts of short-term actions may well lead to the adaptation of short-term strategies that in the present context seem appropriate, but which may generate new and more serious problems in the future.

- **Short-term actions are rarely isolated and independent events.** Short-term actions contribute to the development of the transport system, and may foreclose other future actions. Hence short-term actions may be associated with an important opportunity cost.

- **Long range planning allows the exploration of major policy or facility options.** Long range planning permits the planner or decision-maker to identify potential future problems and prepare for them in advance. Short-term planning tends to be reactive whereas long range planning provides the opportunity for normative actions (proactive).

- **Avoid the clear association between the size of investment and the planning horizon.** Traditionally low capital investments are analysed through an optimising planning approach whereas only methodologies wider in scope have been applied to large-scale capital investments. For the reasons outlined above this approach should be avoided and instead the implications for future choices should be reviewed and assessed.

Scenario types
Scenarios can be categorised into a number of different types:

- **Normative scenario.** Fulfils a given set of objectives at the end of the time horizon of the scenario. The planning objectives may in many cases be attained by different means. As a consequence these scenarios offer the possibility of making an analysis of the efficiency of a strategy.

- **Extreme case scenario.** Extreme case scenarios involving force majeure such as war, significant economic recession, revolution or other very improbable occurrences should not be considered. Such abnormalities in society are avoided due to their extremity and their low probability.

- **Project specific scenarios.** The scenarios are written with a view to reflecting the consequences for a given project in order to assess whether these will be good, bad or
neutral. This type of scenario equally well includes the maximum cases developed to test project efficiency, such as e.g. a significant land-use development scenario.

- **Probability of occurrence.** By assessing the probabilities of the different scenarios it becomes possible to apply probability theory to the planning problem. It should be noted that probabilities have a tendency of giving unwarranted security. The future is by definition unpredictable and consequently probabilities have little meaning.

- **Inductive scenario.** Emphasis is put on one key variable, such as the economic development, the development of the European Union etc.

- **Deductive or thematic scenario.** Thematic or deductive scenarios are also sometimes known as scenario writing and are normally based on a societal logic found in the present society and given a qualitative description defining a possible and probable future. The description may include quantitative measures.

**Scenario construction**

It is difficult give an exact “cooking book” for scenario construction but there are however a number “rules” that can help the scenario building process.

- More than 4 to 5 scenarios should be avoided as a larger number makes it difficult to distinguish the scenarios qualitatively from each other (Allport et al., 1986; Schnaars, 1987).

- If the scenarios are too alike there is a risk of only covering a share of the possible future space and hence a risk of the scenarios being to narrow in scope.

- With respect to applying scenarios to transport planning, each scenario should “reflect one consistent set of possible conditions, including land-use patterns, economic characteristics, population size, lifestyle (family size, labour force participation rates) and travel behaviour characteristics to which the future transportation system must respond appropriately” (Schofer, J.L. & Stopher, P.R., 1979).

- **Construct a set of measures, and agree on corresponding acceptance levels.** The measures used in transport infrastructure appraisal are often concerned with the economic feasibility of the decision, measured as the net present value or other more informal measures. The acceptance level will relate to the whether these measures jointly meets decision-maker requirements.

- **Identify a representative range of alternative futures.** The futures should be relevant, possible or likely states of the environment of the system being planned for. The selected futures must be comparatively few in number (for tractability), each representative for a range of futures differing in parameter values and selected to be meaningfully different from each other.

- **Identify a set of possible decision sequences.** The identification of possible decision sequences will involve some sort of scanning or screening process eliminating unfeasible strategies.

- **Model the consequences of different decision sequences for each identified future.** For each of the decision strategies the relevant impacts are modelled as a forecast of
system performance for each possible future. The result forms the foundation for the appraisal of each planning strategy.

- Select initial decision or decision-sets, which are components of a wide range of acceptable decision sequences, under most or all of the identified futures. The robustness analysis may relate either to components across strategies or to entire strategies. Based on the measures and the acceptance levels the appraisal will contain an analysis of the degree of goals achievement for each identified future.

**Scenarios and models**

When using scenarios in infrastructure and transport planning it is important to understand that the scenario not only influence development variables but also can have an impact on all levels of the planning process. This is illustrated in Figure 1.

**FIGURE 1 SCENARIO PAINTING**
The future of the transport sector

In 1995 the Danish Ministry of Transport and the Transport Council commissioned a scenario study from the Institute of Future Research in Copenhagen (Palludan et al., 1996).

- **Deregulation in the transport sector.** Due to EC directive 91/440 the transport sector is becoming deregulated. The former national railroad companies must be divided into an infrastructure provider and a transport supplier, making room for competition between private rail transport operators. The same applies to air transport, where national companies have had some sort of monopoly on certain destinations. In order to survive alliances are emerging between airline companies. This may also happen in the railroad sector in the future.

- **The increasing environmental awareness.** The environmental awareness is increasing at all levels of society. Ecology and sustainability are key concerns in agriculture as well as in transport. The local values and self-regulation are seen as measures against the international deterioration of the environment. The sensitivity towards air pollution is increasing even though the level of emissions has been relatively stable for many years (Danmarks Statistik, 1995b). The global heating is a concern for many.

- **Continuing European integration.** Many Eastern European countries are on the brink of entering the European Union. The common currency seems to be a reality within a foreseeable future, and an increasing amount of decisions are being taken at an international level. The United Nations are attempting to play a central role in attaining international agreement on global heating as well as in peace keeping missions.

- **The technological development.** The engine efficiency of passenger cars has been increasing over the last 20-30 years and may well continue to do so. The decision of the State of California in The United States to require that a fixed percentage of all cars sold must be low emission vehicles by a given year, has increased the research into battery technology and alternative combustion. This may well lead to a technology jump in a foreseeable future. Also, the home computer is becoming so widespread that working at home is becoming an option.

<table>
<thead>
<tr>
<th>Base year 1996</th>
<th>Trend</th>
<th>Theme</th>
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<tbody>
<tr>
<td>Scenario year 2015</td>
<td></td>
<td></td>
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<tr>
<td>Economic growth and European integration</td>
<td>Liberal economic thinking</td>
<td>The market oriented society (MKT)</td>
</tr>
<tr>
<td>Emphasis on local society and soft values</td>
<td>Social soft values</td>
<td>The intimate society (INT)</td>
</tr>
<tr>
<td>European integration and international environmental agreements</td>
<td>Global Environmental problems</td>
<td>The supra-national society (SUP)</td>
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<td>---------------------------------------------------------------</td>
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<tr>
<td>Technological revolution</td>
<td>Technological development</td>
<td>The technological society (TEC)</td>
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The market oriented society (MKT)  
"Denmark and Europe experience an economic growth, which remains the main objective. The open market is developed with deregulation in a number of sectors such as telecommunication, transport and postal services. The common European currency is a reality. The common agricultural policy is abandoned. The opening towards Eastern Europe is primarily of an economic nature. The stabilisation of the relationship with Eastern Europe is obtained through free trade and economic support, which contributes to the economic growth and democracy in the region."

The intimate society (INT)  
"An ethical wave washes across Denmark. An attempt is made to stop the polarisation of the social classes and the social alienation through a reorganisation of society. The working hours are cut substantially in order to increase employment and ‘citizen wage’ is implemented. The family and home play a more central role in everyday life, and the extra spare time is used in spiritual activities such as religion, yoga and education. The career is substituted by ‘mental equilibrium’ as a status symbol. Politically, the society should also be in equilibrium, which influences both the economic, European and environmental policy."

The supra-national society (SUP)  
"The political and economic integration in Europe continues. At the same time a number of binding international agreements concerning human rights, economic co-operation (interest rates and budget co-ordinating) and the environment concerning CO₂ are ratified. The UN is appointed to monitor that the agreements are observed and is given authority to intervene. The countries on the Northern Hemisphere have to a larger extent opened their markets to the countries in the Southern Hemisphere, and different types of development aid are offered to the countries in need hereof. Both on the conditions that certain criteria concerning the environment, workers rights’ and democracy are observed."
The technological society (TEC) "A technology jump occurs around the turn of the millennium. A string of new technologies reach maturity more or less simultaneously which radically changes society. Especially the combination of previously disparate technologies such as video and computer technology creates a decisive qualitative change. The development is aided by the new generations that have grown up during this significant technological change, and now are entering the labour market. These generations are capable of responding in an active way to the changes. In the same way that machines automated the industry, large parts of the service sector is now being automated."

The FoodPort scenarios
In the initial face 3 potential FoodPort scenarios have been suggested:

- The regulated/supra national scenario
- The environmental scenario
- The split-growth scenario

Each of the scenarios is further elaborated in the following.

The regulated/supra national scenario
The regulated/supra national scenario is initial based on the The supra-national society (SUP) in the section "The future of the transport sector".

The verbal description of the scenario is:

"Strong political and economic integration in the continues within the European Union. At the same time a number of binding international agreements concerning, economic co-operation (budget co-ordinating) and the environment concerning CO₂, NOₓ, SO₂ etc. are ratified. The EU is appointed to monitor that the agreements are observed and is given authority to intervene. The transport sector is heavy regulated by use of road pricing making transport more expensive but less congested. Energy efficiency are central and rail and sea transport capacity are increased"

The environmental scenario
The environmental scenario is initial based on partly on a combination of both The intimate society (INT) and The supra-national society (SUP) in the section "The future of the transport sector".

The verbal description of the scenario is:

"The family and home play a more central role in everyday life, and originality of e.g. food plays a predominate role in everyday life. Sustainability is very much in focus and each mode of transport
“pays” for its own externality (full internalization). Politically, the society should also be in equilibrium, which influences both the economic, European and environmental policy.”

The split-growth scenario

The split-growth scenario is initial based on the The market oriented society (MKT) in the section “The future of the transport sector”.

The verbal description of the scenario is:

“Europe experiences an uneven economic growth. The open market is developed with deregulation in a number of sectors such as transport and agriculture. A common agricultural policy is abandoned. The opening towards Eastern and southern Europe is primarily of an economic nature. The stabilisation of the relationship with Eastern and southern Europe is obtained through free trade and economic support, which contributes to the economic growth in the region. Transport only pays direct costs and all externalities are ignored”.

Initial parameters in the scenarios

If the typology from Figure 1 is used the parameters that changes in each scenario can be organised into the 4 classes:

- **Development variables**
  - Economic
  - Political
  - Social
  - Technological
  - Environmental

- **Traffic flows**
  - Demand
  - Supply

- **Impact assessment**
  - Core
    - Investment cost
    - System operation and maintenance cost
    - Vehicle operating cost
    - Travel time benefit
    - Safety
    - Local environment
  - Non Core, Non-Strategic
    - Driver convenience
    - Urban quality and landscape
  - Strategic, Territorial
    - Strategic mobility
    - Strategic environment
    - Strategic economic development
  - Strategic, Non-Territorial
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- Private financial attractiveness
- Other strategic policy and planning impacts

- **Evaluation methodology**
  - Shadow Prices
  - Unit Prices
  - Estimation Technique

However not all the parameters above are relevant for the FoodPort project. It is therefore suggested to limit the scenarios to the following parameters:

- Development variables
  - Economic
  - Technological
  - Environmental

- Traffic flows
  - Demand
  - Supply

- Impact assessment
  - Core
    - Vehicle operating cost
    - Safety
    - Local environment
  - Strategic, Territorial
    - Strategic mobility
    - Strategic environment
    - Strategic economic development

- Evaluation methodology
  - Unit Prices

At this point values and developments for each of the parameters in each of the scenarios has to be decided upon.
Literature