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## Disaggregative policy Delphi Using cluster analysis as a tool for systematic scenario formation

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### Abstract

A critical phase of scenario making is the choosing of scenarios. In the worst case, a futures researcher creates scenarios according to his/her subjective views and cannot see the real quality of the study material. Oversimplification is a typical example of this kind of bias. In this study, an attempt towards a more data sensitive method was made using Finnish transport policy as an example. A disaggregative Delphi method as opposed to traditional consensual Delphi was applied. The article summarises eight Delphi pitfalls and gives an example how to avoid them. A two-rounded disaggregative Delphi was conducted, the panelists being representatives of interest groups in the traffic sector. Panelists were shown the past development of three correlating key variables in Finland in 1970–1996: GDP, road traffic volume and the carbon dioxide emissions from road traffic. The panelists were invited to give estimates of their organisation to the probable and the preferable futures of the key variables for 1997–2025. They were also asked to give qualitative and quantitative arguments of *why* and the policy instruments of *how* their image of the future would occur. The first round data were collected by a fairly open questionnaire and the second round data by a fairly structured interview. The responses of the quantitative three key variables were grouped in a disaggregative way by cluster analysis. The clusters were complemented with respective qualitative arguments in order to form wider scenarios. This offers a relevance to decision-making not afforded by a nonsystematic approach. Of course, there are some problems of cluster analysis

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used in this way: The interviews revealed that quantitatively similar future images produced by the panelists occasionally had different kind of qualitative background theory. Also, cluster analysis cannot ultimately decide the number of scenarios, being a choice of the researcher. Cluster analysis makes the choice well argued, however.

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## 1. Need for systematic scenario formation

One critical question concerning scenario formation is how to form scenarios relevant to decision-makers? How to make sure that the scenarios are not only futurist's prejudices or his/her own subjective ideas of the policy options? What are the relevant ranges of the values of the variables between scenarios?

The aim of this paper is to illustrate that one way to tackle this problem is to use the Delphi method applied in a disaggregative way. 'Disaggregative' here means that the goal of consensus is not adopted but the responses are grouped to several clusters by using cluster analysis as a systematic tool for grouping the core quantitative variables. The rather bare-boned clusters are then complemented with the respondent's qualitative arguments in order to construct more holistic scenarios. In this study, Delphi panelists are representatives of interest groups instead of individual professionals because the approach is considered an intermediate between expert poll and committee work in policy formation. The approach also raises some new problems, which are further discussed. The methodology is illustrated by the Delphi data gathered of the transport policy of Finland for 2025.

### 1.1. Case: Finnish transport policy

The disaggregative Delphi application of this study focuses on the future of the volume of economic output, traffic and environment. The problematique was reduced to three key variables:

- the gross domestic product measured in market exchange rates ( $GDP_{mer}$ ) in real terms
- the road traffic volume measured in vehicle kilometers
- the carbon dioxide ( $CO_2$ ) emissions of road traffic measured in metric tonnes

A decoupling of GDP and road traffic volume would imply immaterialisation or non-material economic growth in more traditional vocabulary. The decoupling of road traffic volume and the  $CO_2$  emissions of road traffic would imply dematerialisation, or more simply, technical development of vehicles. In spite of all the writing about technical development, dematerialisation, decarbonisation and a qualitative change in the economy, the three key variables correlated strongly in 1970–1996 in Finland, especially from 1978 to 1996 [1–3] (Fig. 1).

The purpose of the application was to produce alternative scenarios focusing on these key variables for 1997–2025, which would be relevant from the point of view of the interest

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