A survey of the potential user-requirements for global change scenarios in Finland

Summary report

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Contents:

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1. Introduction

The FINSKEN project, which is part of the Finnish Global Change Research Programme FIGARE, aims to construct scenarios of changes in environmental and related factors in Finland during the 21st century. It is believed that global change scenarios are of interest to a wide audience including policy makers, researchers, private industry, public utilities, the media, educational establishments and the general public. In January 2001 a questionnaire was sent to 588 persons representing the above-mentioned target groups of whom 175 persons (30 %) returned a completed form. The objective was to investigate the interest in obtaining global change scenarios for Finland and to gather information on the specific needs of potential future scenario users concerning socio-economic conditions, atmospheric composition, acidification and eutrophication, climate and sea-level. Knowledge of potential user requirements will be of valuable guidance in developing a set of scenarios that best meets the needs of the user community. The results may also be of wider interest to other researchers involved in scenario development.

2. Questions

The questions posed first addressed the different global changes covered by the scenarios (Question 1), and then investigated issues concerning the desired time horizon, spatial and temporal resolution, type of scenario, reasons for scenario use and likelihood and timing of scenario use (Questions 2-8, Table 1). Additionally, the name of the respondent was asked for as well as the organisation represented by the respondent and his or her role in the organisation.

Table 1. Contents of the FINSKEN questionnaire in summary form.

Q1-A: socio-economic conditions	demographic changes, GDP, types of economic activities, trade, transport infrastructure and technology, energy technologies and diet
Q1-B: atmospheric composition	CO_2 concentration, S compounds, N compounds, tropospheric ozone, stratospheric ozone/UV radiation
Q1-C: acidification and eutrophication	S deposition, N deposition, eutrophication of lakes, eutrophication of rivers, eutrophication of coastal waters
Q1-D: climate	temperature, precipitation, wind speed, wind direction, humidity, radiation/cloudiness
Q1-E: sea-level	mean sea-level, land uplift, maximum high water level
Q2: time horizon	upto 2010, 2025, 2050, 2075, 2100, beyond 2100
Q3: spatial resolution	regional average, national average, province, commune, river catchment, ecosystem type, regular grid, individual sites
Q4: temporal resolution	sub-daily, daily, weekly, monthly, seasonal, annual
Q5: type of scenario	single best estimate, several scenarios showing range of uncertainty, probabilistic scenarios, quantitative scenarios, qualitative scenarios
Q6: reason for scenario use	policy making, strategic planning, impacts research, other research, political lobbying, education, general interest
Q7: potential use of FINSKEN scenarios	
Q8: date by which scenarios required	2001, 2002, later than 2002

Users were requested to express their need for each scenario attribute by selecting either *yes*, *no* or *don't know*. In addition, the need for other scenario types or attributes not listed could be entered on the questionnaire as supplementary text. In addition to *yes*, *no* and *don't know* responses, many questions were left unanswered (blank). This was interpreted to mean that this particular question did not concern the person answering and was recorded as *empty*.

3. Response and grouping

The questionnaire was sent to 588 persons representing different types of institutions (Table 2). The size of each group in absolute numbers is shown in grey in Figure 1a and in proportion of all in Figure 1b. The largest share was sent to private companies (29 %), universities (21 %) and research institutes (17 %). Responses by groups are shown as black bars in Figures 1a and 1b. The response rate to the questionnaire as a whole was 30 %, i.e. 175 persons.

Table 2. Grouping by type of institution.

BAN	banking
GOV	ministries and other state institutions
INS	insurance companies
NON	non-profit-making associations
POL	political organisations
PRI	private companies
REG	regional agencies
RIN	research institutes
SOC	societies, interest groups
UNI	universities

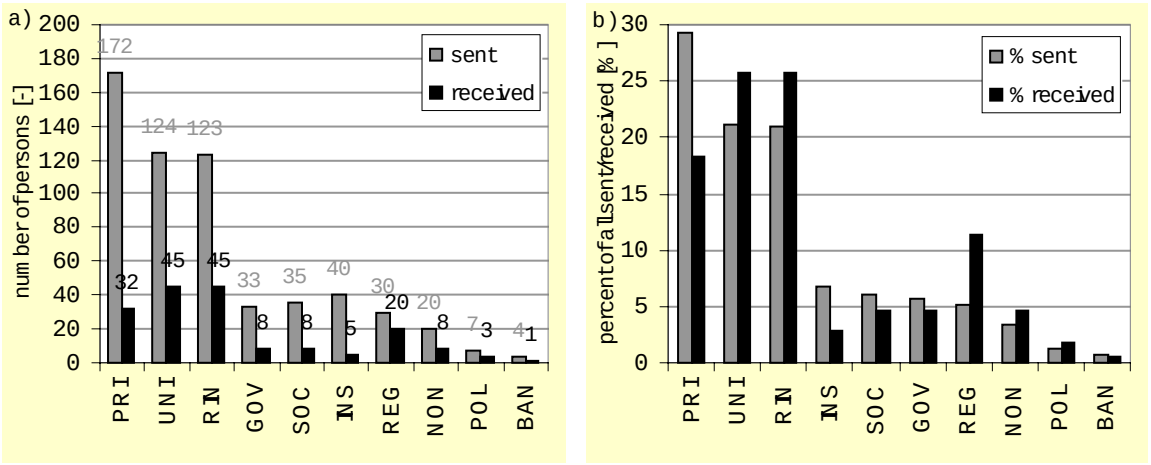

Figure 1. Questionnaires sent and received by group: as absolute numbers **(a)**, and as a percentage of the total sent/received **(b)**.

The highest response rates, relative to the individual group size, were from regional agencies, political organisations, non-profit-making associations, research institutes and universities (Figure 2).

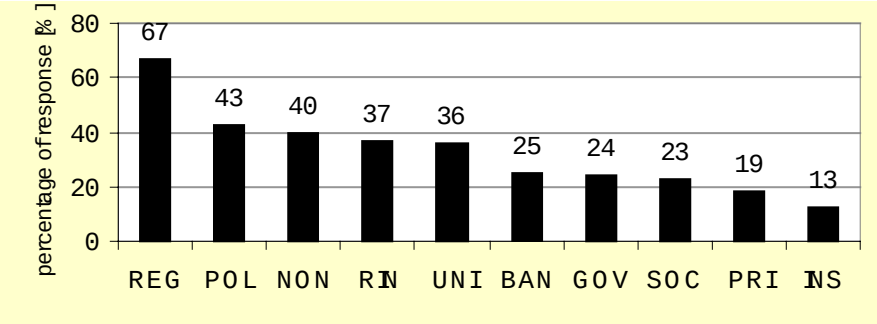

Figure 2. Response rate by group.

This first grouping led, however, to a very biased group size distribution (Figure 1) which was found out not to be suitable for further analysis of the results. Therefore two other types of groupings, broader but also more subjective, were introduced: grouping by "field of activity" and by "sector of interest". The field of activity grouping emerged directly from the first grouping by merging the institutional groups into two larger units, distinguishing between researchers and non-researchers (Table 3).

Table 3. Grouping by field of activity.

1st grouping	2nd grouping	Abbreviation	No. of persons
PRI	non-research	NONRES	87
BAN			
GOV			
INS			
NON			
POL			
REG			
SOC			
RIN	research	RESEAR	88
UNI			

The third grouping by sector of interest is independent of the two others (Table 4). It is based on the assumed prior natural or social science field of each respondent.

Table 4. Grouping by sector of interest.

3rd grouping	Abbreviation	No. of persons
agriculture	AGR	8
atmosphere	ATM	19
ecology and biology	ECOBIO	20
economy and social science	ECOSOC	21
environment	ENV	54
forest	FOR	39
water	WAT	14

When these groupings are combined it can be seen that the some sector of interest groups include only few non-researchers (Table 5). Only the economy & social sciences and forest groups contain equal number of persons from both activity fields.

Table 5. Grouping by sector of interest and field of activity.

Sector of interest	Field of activity	No. of persons
AGR	NONRES	0
	RESEAR	8
ATM	NONRES	12
	RESEAR	7
ECOBIO	NONRES	1
	RESEAR	19
ECOSOC	NONRES	10
	RESEAR	11
ENV	NONRES	42
	RESEAR	12
FOR	NONRES	20
	RESEAR	19
WAT	NONRES	2
	RESEAR	12

4. Results

The results can be divided into three categories: scenario types, scenario attributes and comments and additions to the questionnaire. Here an overview of the results is presented.

4.1 Types of global change scenarios (Question 1 A-E)

In order to give an overview of the results the answers for each scenario type were weighted according to the group size (either field of activity or sector of interest) and the number of sub-questions to each scenario type. This allows a comparison between the respondent groups and the scenario types.

When grouped according to field of activity (Figure 3) there is a distinct pattern for all scenario types, except the sea-level scenarios (Figure 3e): most scenario types are interesting to both groups. The weighted percentage of *don't know* plus *empty* answers is quite small and varies little between the questions. Therefore, it was regarded as justifiable to focus on positive answers alone since a high positive response rate can be interpreted as a low negative response rate, and *vice versa*.

Three of the five scenarios were regarded as similarly important by both activity groups: atmospheric composition (Figure 3b), acidification and eutrophication (Figure 3c), and climate (Figure 3d). The socio-economic scenarios (Figure 3a) seemed to be of less interest to the research group whereas the non-research group showed a higher interest towards sea-level scenarios (Figure 3e).

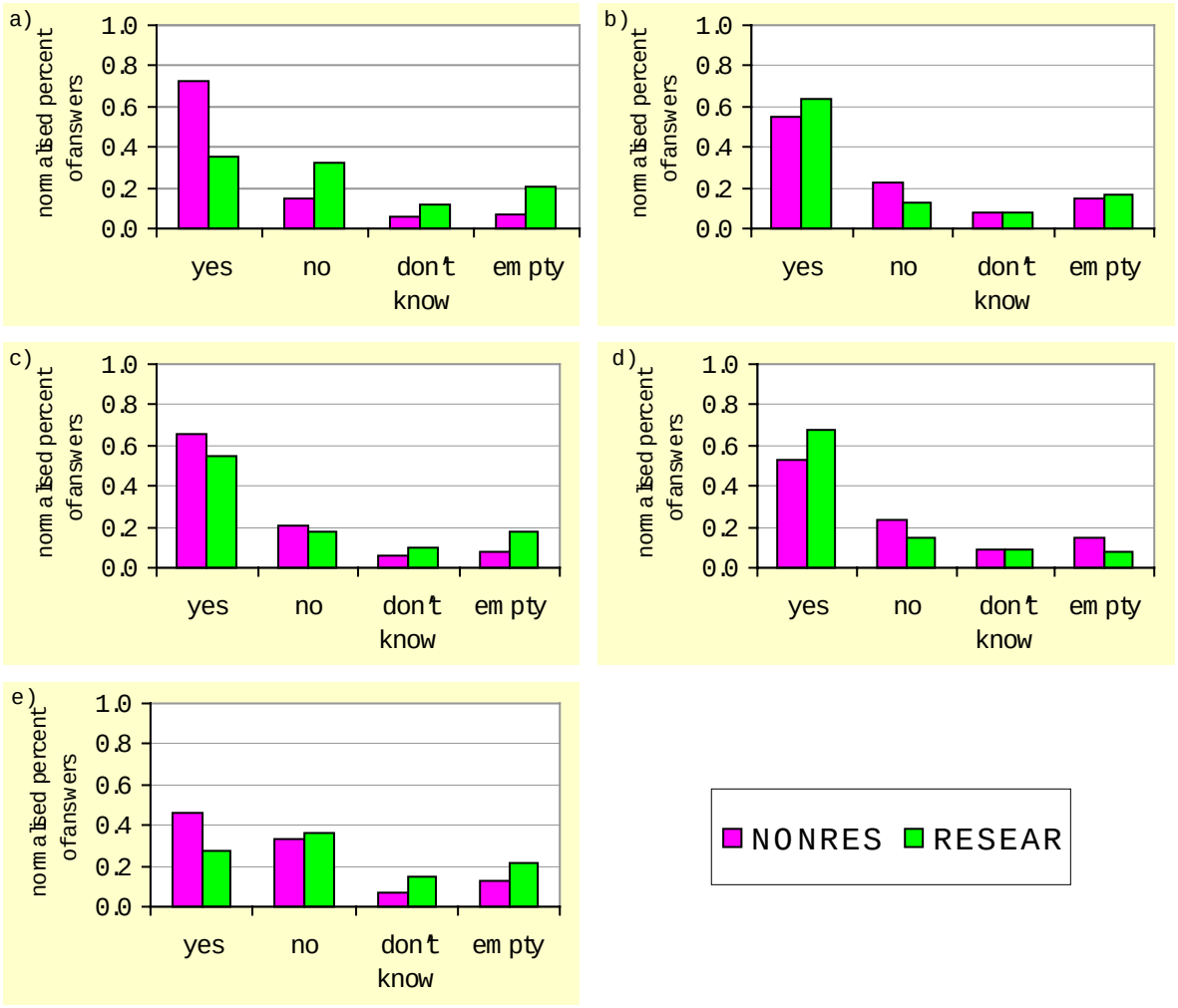

Figure 3. Weighted responses of the activity groups regarding the five different scenario types: socio-economic conditions **(a)**, atmospheric composition **(b)**, acidification and eutrophication **(c)**, climate **(d)** and sea-level **(e)**.

Using the grouping according to the sector of interest (Figure 4) the picture is more varied. Even though the research group seemed to be less interested in socio-economic conditions there is a difference between the agriculture and forest groups, which appear to be interested and the atmosphere, ecology & biology and water groups, which seem to be less interested. Only the economy & sociology and water groups show a lower need for atmospheric composition scenarios and the acidification and eutrophication scenarios seem to be of average interest to all groups. Only the economy & sociology group indicates a low need for climate scenarios and the environment group an above-average interest towards the sea-level scenarios.

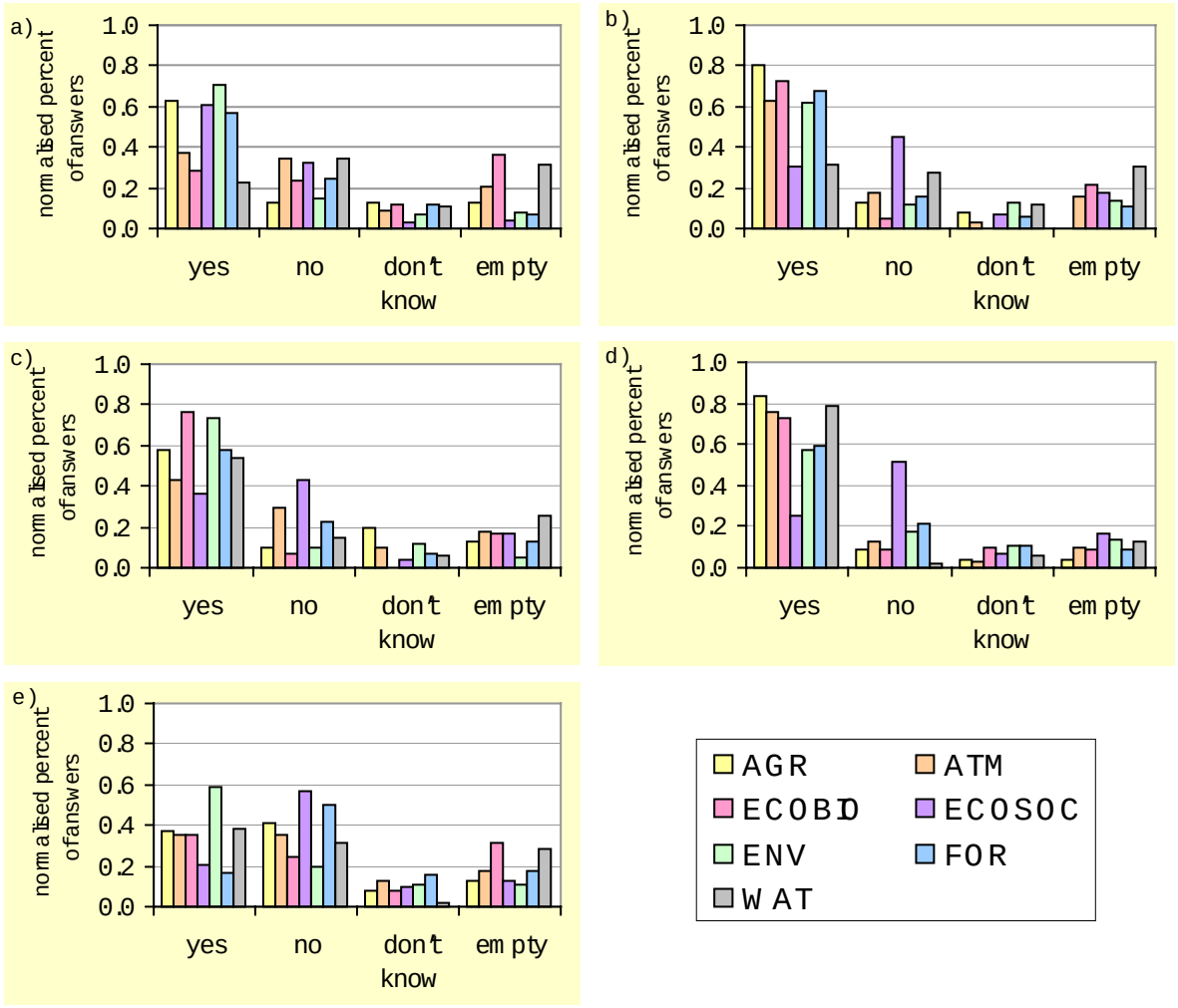

Figure 4. Weighted responses of the sectoral interest groups regarding the five different scenario types: socio-economic conditions **(a)**, atmospheric composition **(b)**, acidification and eutrophication **(c)**, climate **(d)** and sea-level **(e)**.

4.2 Scenario attributes (Questions 2-6,8)

The second part of the questionnaire, **Q2-Q6 & Q8** dealt with scenario attributes: time horizon, spatial resolution, temporal resolution, type of scenario, reasons for scenario use and scenario provision (Table 1). These results were only weighted according to the group size of either field of activity or sector of interest groups. Certain general trends could be distinguished for each of the scenario attributes.

Certain general trends from the answers for the activity groups:

- The shorter the **time horizon** the greater the interest, with time horizons of up to 10 and 25 years the most popular, except among the research group, where there is also strong interest in longer time horizons (Figure 5).

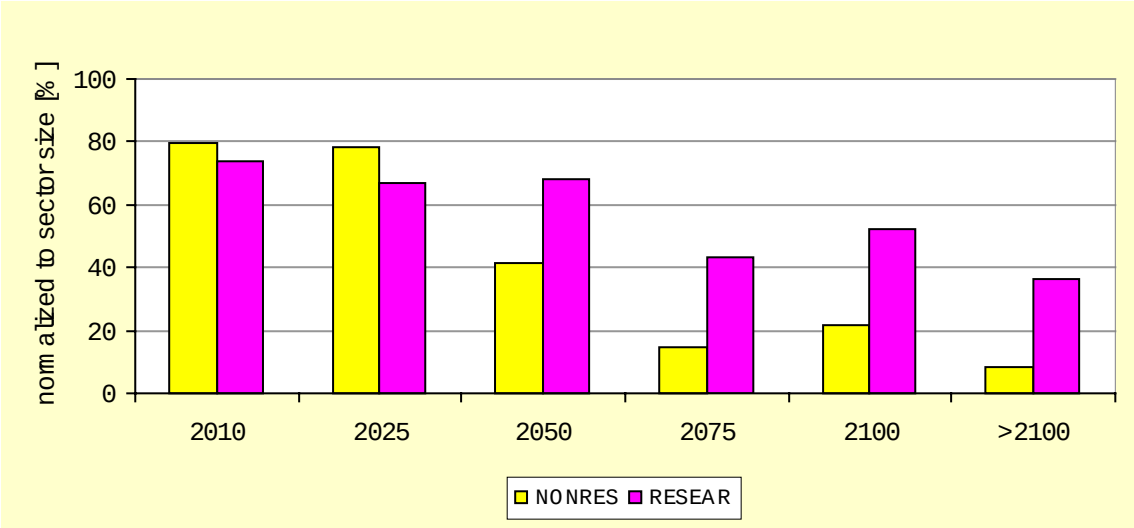

Figure 5: Weighted positive responses of the activity groups regarding time horizon of projection – by time horizon.

- Interest in scenarios with a supra-national or national **spatial resolution** was high among both groups, whilst information at smaller scales was of more interest to the research group (Figure 6).

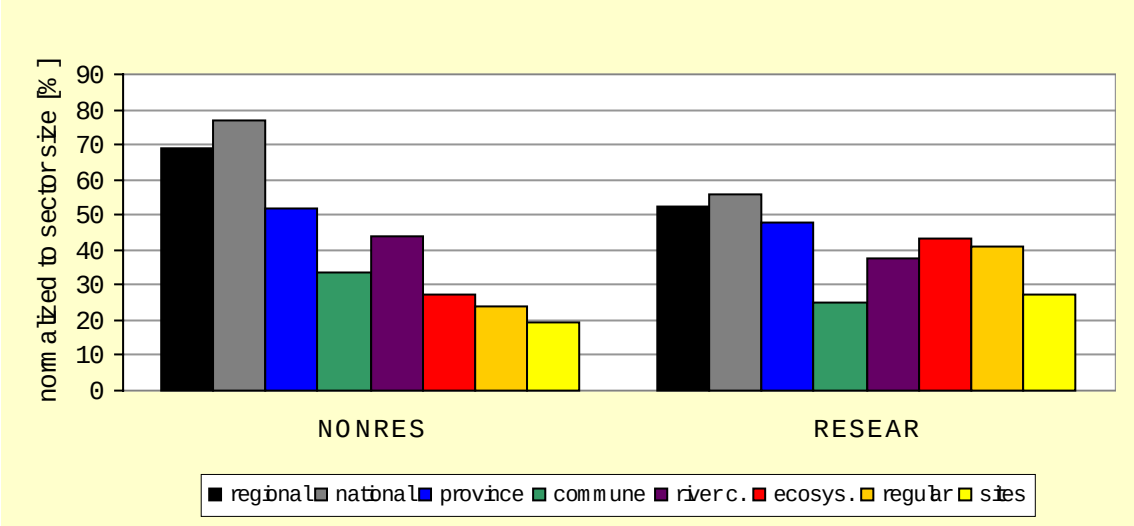

Figure 6: Weighted positive responses of the activity groups regarding types of spatial resolution – by group.

- The lower the **temporal resolution** of scenario information the greater the interest, with preference shown for an annual or seasonal resolution. The exception was for researchers where there is also a higher interest in scenarios at a daily resolution (Figure 7).

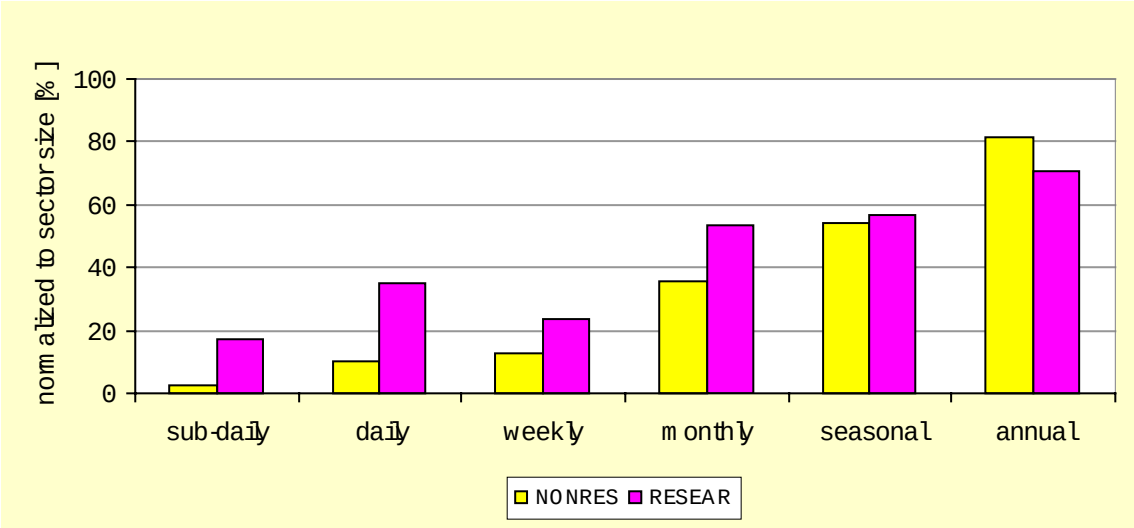

Figure 7: Weighted positive responses of the activity groups regarding types of temporal resolution – by resolution.

- Of the different **scenario types**, both groups clearly favour quantitative over qualitative scenarios and appear to favour having a variety of scenarios. Many also opt for a single best estimate. Though these were intended to be exclusive options, there may be a perception that a variety of scenarios is needed, but with a clearly identified best estimate among these (Figure 8).

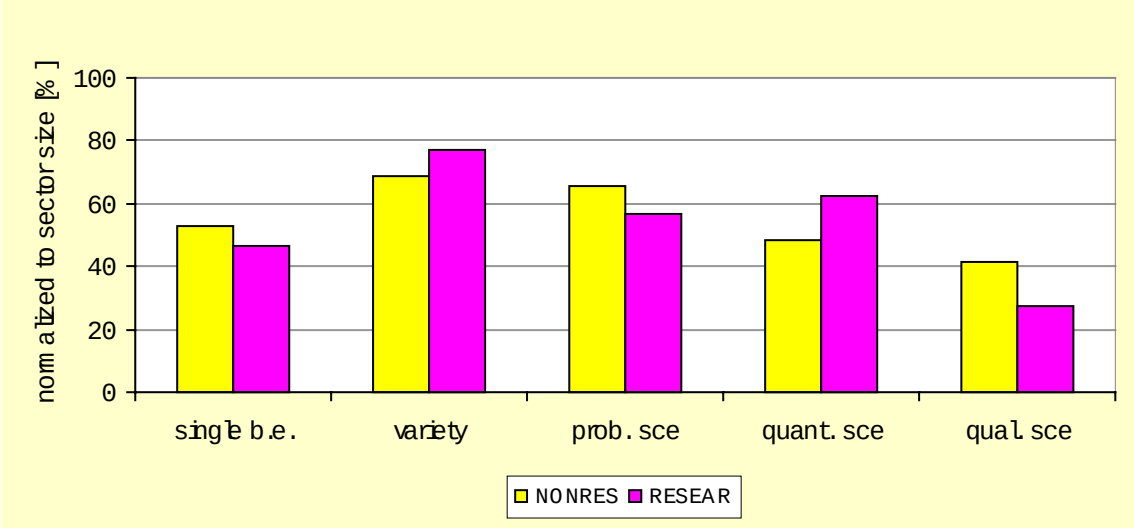

Figure 8: Weighted positive responses of the activity groups regarding scenario types – by scenario type.

- **Reasons for obtaining scenarios** are closely tied to the composition of the activity groups, with the research group indicating a strong impact and other research application and less interest in strategic planning, policy making or politics. In contrast, the latter three applications are accorded a much higher priority by the non-researcher group (Figure 9).

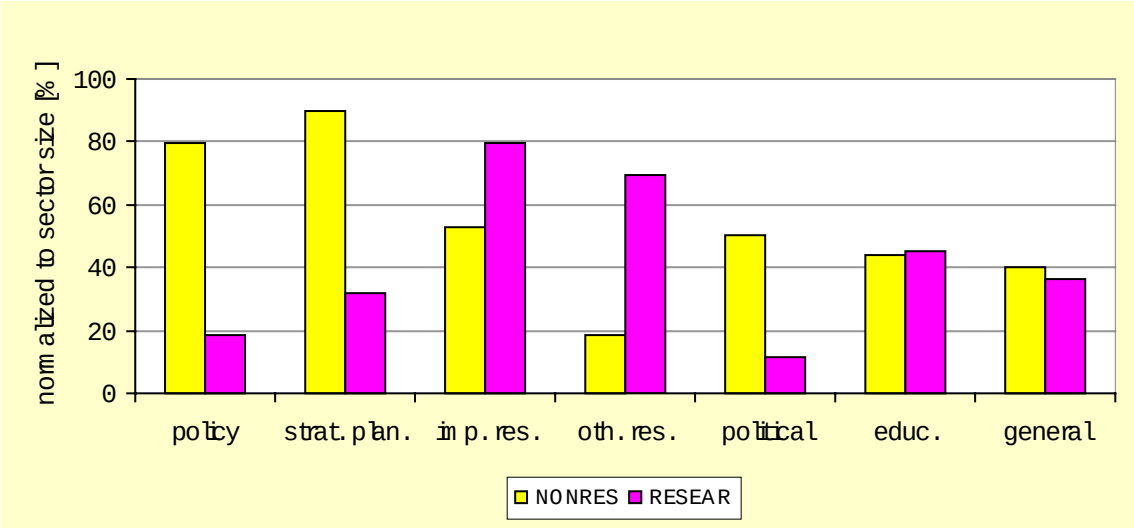

Figure 9: Weighted positive responses of the activity groups regarding reasons for obtaining scenarios – by reason.

Certain general trends could also be distinguished from the answers for the sectoral interest groups:

- The **time horizons** up to 2010 and 2025 are favoured by all groups. The longer time horizons, i.e. 2050 and beyond, are clearly more interesting only to the water group and to some extent to the ecology & biology group (Figure 10).

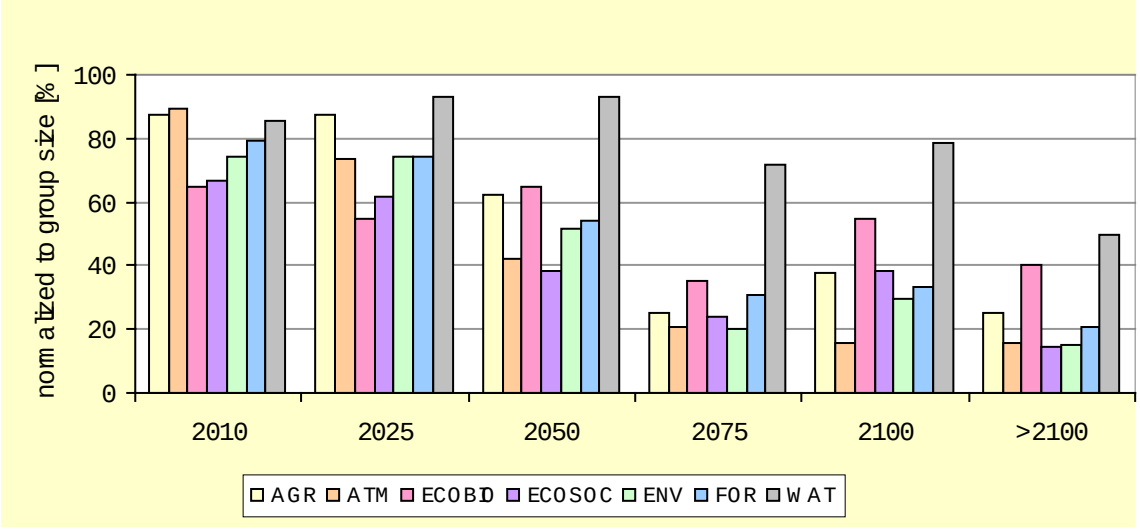

Figure 10: Weighted positive responses of the sectoral interest groups regarding time horizon of projection – by time horizon.

- There are a few **spatial resolutions** which seem to be of special interest to a certain group such as the province (*lääni*) to the agriculture group, the river catchment to the water group and the ecosystem type to the ecology & biology group. The regular grid resolution is of above average interest only to the water group (Figure 11).

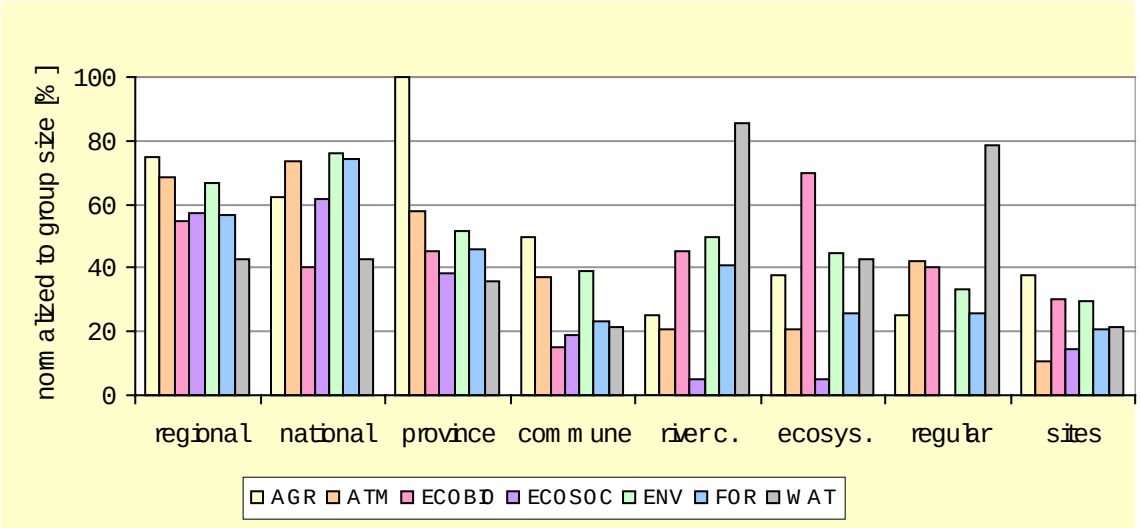

Figure 11: Weighted positive responses of the sectoral interest groups regarding types of spatial resolution – by resolution.

- Generally the lower the **temporal resolution** of scenario information the greater the interest. There is however some special interest also for the more precise resolutions, i.e. daily resolution for the agricultural group, monthly resolution for the water group and seasonal resolution for the ecology & biology group (Figure 12).

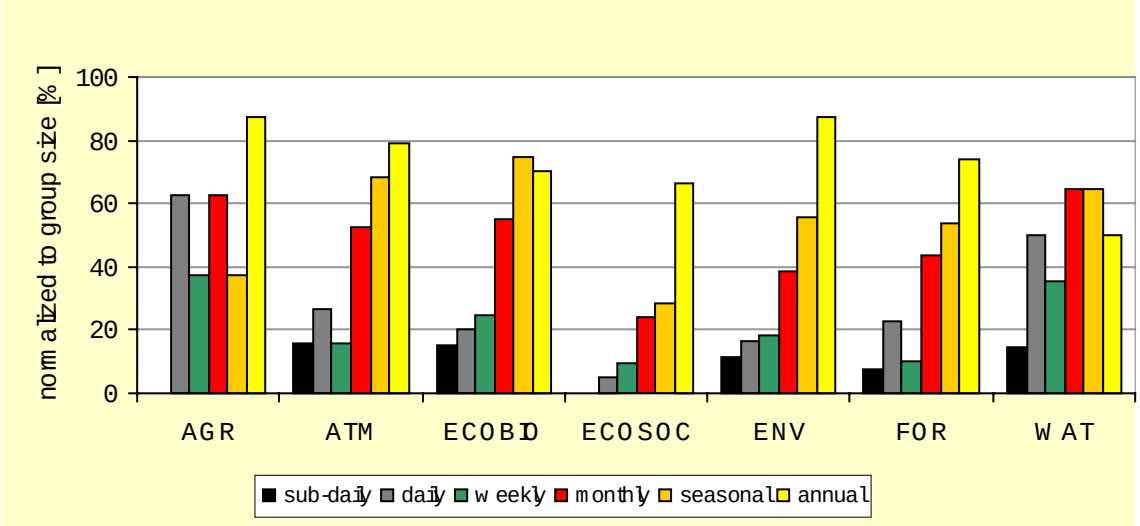

Figure 12: Weighted positive responses of the sectoral interest groups regarding types of temporal resolution – by group

- Of the different **scenario types** there is no clear favourite for any of the groups, except a variety of scenarios for the agriculture group. The single best estimate is of interest for the atmosphere, forest and water groups and the qualitative scenarios of less interest to the atmosphere and forest groups (Figure 13).

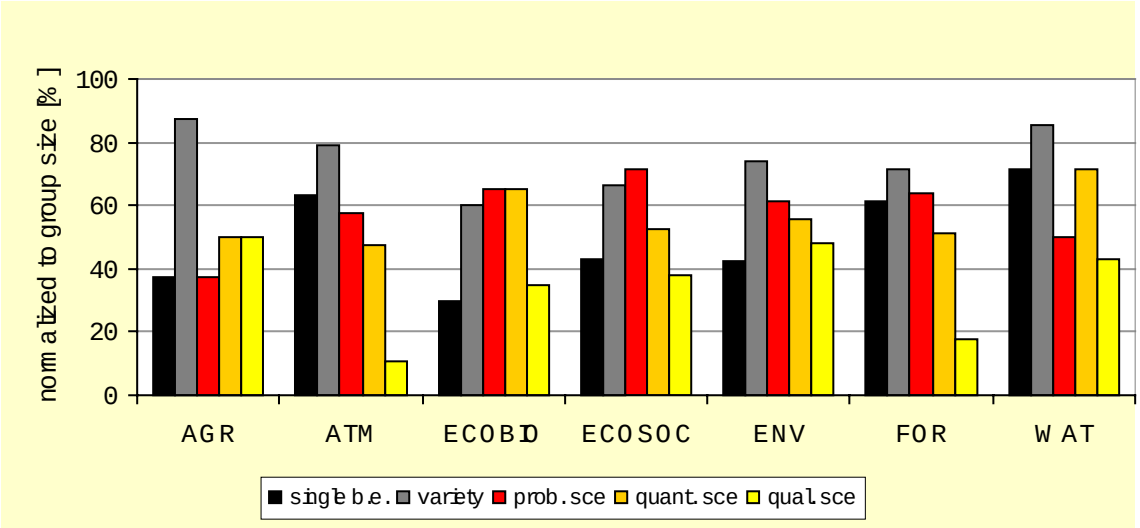

Figure 13: Weighted positive responses of the sectoral interest groups regarding scenario types – by group.

- **Reasons for obtaining scenarios** are closely tied to the composition of the interest groups: e.g. a strong representation of researchers is indicated by an emphasis on impact and other research for the agriculture and water groups. On the other hand the strong representation of researchers in the ecology & biology group raises also the educational reason for obtaining scenarios. This is due to the agricultural and water researchers working mainly at research institutes and the ecology & biology researchers mainly at universities (Figure 14).

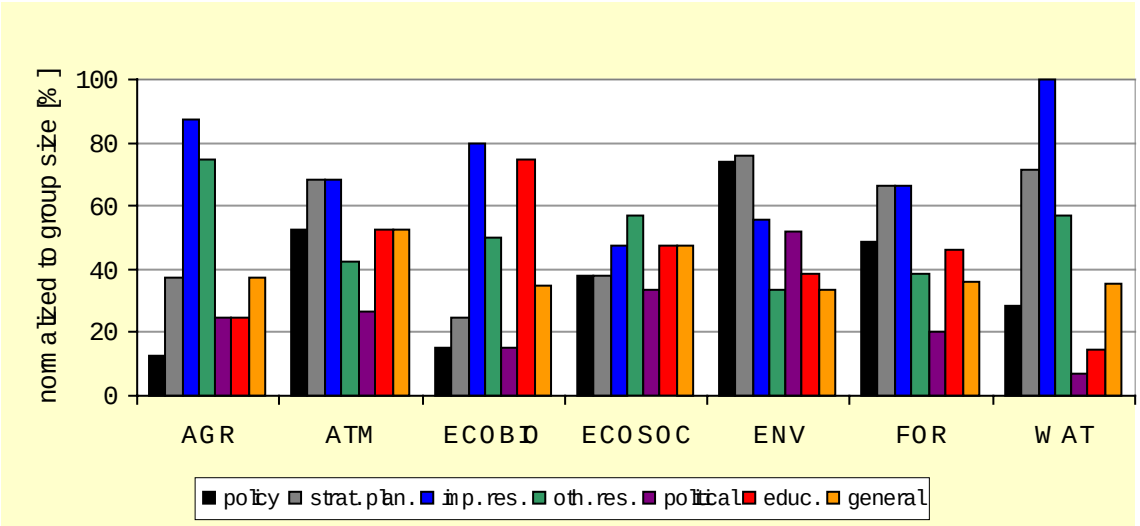

Figure 14: Weighted positive responses of the sectoral interest groups regarding the reasons for obtaining scenarios – by group.

With respect to **scenario provision** (**Q8**), 64 % of the respondents are prepared to wait until 2002 (the end of the FINSKEN project) for scenarios. Only 17 % require scenarios during 2001.

4.3 Scenarios of other environmental factors (Question 1F)

Respondents also identified scenarios of many other factors that were not listed in the questionnaire. These can be summarised according to the following categories:

- climate — e.g. climatic zones
- ecology — e.g. biodiversity, biotopes
- flora and fauna — e.g. vegetation, indirect climatic indicators
- forestry and agriculture — e.g. development of forests, increase in noxious animals
- human activities — e.g. environmental technology, consumer habits
- hydrology — e.g. runoff, snow cover
- land use — e.g. urban environment, forest areas
- soil — e.g. C & N balances of soils, other soil contamination

Some of these represent additional variables from a scenario type already identified (e.g. climate variables). Others represent scenarios that might be derived from other scenarios that can be provided (e.g. climatic zones, vegetation, runoff). A third class of scenarios includes types not covered in FINSKEN (e.g. soils, land use).

5. Conclusions

Overall, the questionnaire responses indicated that there is substantial interest in scenarios of global change for Finland across a wide cross-section of activity groups. In response to question 7 (Table 1), 61 % of the respondents thought that they or their organisation could make use of the FINSKEN scenarios and 32 % thought that perhaps they could use them. Many of the responses follow a predictable course; for example, the focus on research needs among university and research institutes, in contrast to planning and policy needs in the government and private sectors. Other responses are less easy to explain. For instance, there is a very low importance attached to long-term scenarios by representatives of the private sector, in spite of a strong representation from the forestry, energy and water resource sectors, all of which are presumably investing in enterprises with long lead-times (e.g. forest management, dam construction and power generation). In contrast, researchers in these sectors were interested in a century-scale perspective.

Issues touched upon in the questionnaire have been presented in a seminar of potential scenario users on 28 May 2001 in Helsinki [abstracts available at: http://www.vyh.fi/eng/research/projects/finsken/events.htm] and in the CLIC conference 6-8 June 2001 in Turku [http://figare.utu.fi/events/CLIC].