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Conseil de recherches en sciences naturelles et en génie du Canada
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# Final Report of the Evaluation of the Discovery Grants Reallocations Exercise

**Natural Sciences and Engineering Research Council**
Policy and International Relations Division
Research Grants and Scholarships Division

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# Executive Summary

This report presents the findings of the evaluation of NSERC's Reallocations Exercise. An evaluation of the Exercise was recommended by the Committee on Research Grants and by Council in 2002. Three such exercises have taken place; when fully implemented these three exercises will have covered a period of 13 years (1994-2007). It is therefore important for NSERC to look back and think about the Exercise in order to assess whether its purposes and goals are still valid and to look at how it could be improved in the future.

The Reallocations Exercise was created by Council in 1991 to ensure that the Discovery Grants Program, NSERC's largest, remains dynamic and responsive to changes in the various disciplines and in the research environment. The main objective stated for the Reallocations Exercise is to redistribute a portion of the Discovery Grants budget among the various NSERC Grant Selection Committees (GSCs), shifting some resources to initiatives and needs identified, through broad community input and peer review, as the most important to Canada. A second objective of the Reallocations Exercise is to provide a mechanism for strategic planning of Canadian university basic research in the natural sciences and engineering, involving the research community on a national basis.

## Methodology

The Evaluation of the Reallocations Exercise was conducted internally by NSERC Program Evaluation and Research Grants staff. An Evaluation Steering Committee was responsible for overseeing the process and commenting on report drafts.

### *Evaluation Framework Development*

The evaluation issues and the more specific questions that have resulted from their analysis were based on consultations carried out with key stakeholders of the Reallocations Exercise, including NSERC staff and management, the Committee on Research Grants, Council, members of Grant Selection Committees, and members of Reallocations Steering Committees. These consultations resulted in a final list of 12 questions.

### *Data Collection*

Multiple lines of evidence were used in this study in an effort to obtain complete information and to triangulate findings. The data collection methods selected for the study included a document review consisting both of feedback from the research

community and NSERC's own records and reports, a survey of the research community and key informant interviews (with members of GSCs, Reallocations Steering Committees, Reallocations Committees and NSERC management). The survey component of the study focused on gaining a better sense of the awareness and knowledge of the research community about the Exercise, and the key informant interviews and document review probed the rationale, process, and outcomes of the Exercise in more detail.

**Findings**

The findings of the study are presented in the following paragraphs and have been organized according to evaluation question.

***Question 1: What was the rationale behind the Reallocations Exercise? Is this rationale still relevant?***

The Reallocations Exercise was first created by NSERC in an effort to deal with some perceived unfairness in its existing allocations process, which was deemed to be too static and driven mostly by historical awards and university hiring practices. The objective of the Exercise was to make the Discovery Grants program more flexible by redistributing a portion of its budget according to changing needs and priorities. This rationale is still supported by members of the NSERC community, and there is widespread support for a mechanism through which the allocations made in the GSC budgets can be reviewed in a systematic manner. However, considerable resources are required to conduct the Reallocations Exercise, which casts doubt on its value to NSERC and the scientific community. Furthermore, changes in the Canadian research landscape over the past 10 years have cast a shadow on the potential of the Reallocations Exercise. Therefore, although the original rationale for the Exercise is still relevant, the mechanism used must be reconsidered to take recent developments into account.

***Question 2: Should increases in the number of individuals applying to and receiving grants from the various GSCs be addressed separately from the Reallocations Exercise?***

The growth in the number of individuals applying to and receiving grants within the Discovery Grants program is typically referred to as "discipline dynamics" and takes into account the number of new applicants to the program as well as the attrition or retirement rate within each Grant Selection Committee. Discipline dynamics were an inherent part of the review process for the first Exercise, but not for the second and third exercises. Based on correlational analyses conducted on discipline dynamics and the results of the three exercises, it is recommended that discipline dynamics be considered separately from the strategic planning efforts undertaken as part of the Exercise.

***Question 3: What are the benefits of the Exercise? What are its costs?***

The Reallocations Exercise offers certain benefits for those who participated as Steering Committee members. For instance, interview respondents reported gaining a better understanding of their discipline, as well as enjoying the social and creative aspects of the submission development process. Some benefits were also identified at a disciplinary level, such as funding increases and the positive feedback received from international referees. The Exercise also resulted in some broader benefits for specific disciplines, who were able to turn a poor result in one exercise into a powerful incentive for their members to engage in strategic planning and coordinated efforts in subsequent exercises.

The most important cost of the Exercise is without a doubt the time commitment required of its participants, especially Steering Committee members responsible for the development of the submissions. The Exercise's design requires volunteers to take on the considerable task of developing each submission: Steering Committee members spent from one week to over four months working on the Exercise, with Chairs spending the most time. There was general agreement amongst interview and survey respondents that the time spent away from research as a result of participating in the Exercise was its most negative consequence and was identified as an important detractor for potential SC members. A secondary but important cost of the Exercise appears to be the frustration and personal stress experienced by SC members faced with the responsibility of a poor outcome for their discipline in the Exercise, coupled with low levels of support from their communities and little recognition of their efforts.

Finally, it should also be noted that the operational cost of the Exercise was estimated to be similar to the actual amount of funding to have changed disciplines in each of the exercises. Taken with the personal costs described above, it can be concluded that the costs of the Exercise as it is currently designed outweigh its benefits.

***Question 4: Is the current timeframe of five years appropriate/inappropriate?***

The timeframe used in the Reallocations Exercise was first selected because it was deemed most appropriate in disciplinary strategic planning and because it would follow the Discovery Grants Program cycle. For the most part, Steering Committee members and Grant Selection Committee members found that the five-year timeframe is appropriate for the Exercise. In the end, the timeframe should be based on the design of the Exercise: a focus on discipline dynamics could be associated with a shorter

timeframe, whereas a focus on strategic planning should be based on a longer time period. The recommendations presented in a later section of this summary address this issue in more detail.

***Question 5: In the last two exercises, GSCs were asked to explain why it was important for Canada that the research communities under their purview receive some of the reallocated funds. To what extent is this approach appropriate/inappropriate?***

The criteria used by the Reallocations Committee in the assessment of submissions have changed over the years, from a set of four specific, weighted criteria to one broader criterion of "importance to Canada". Although there is general agreement in the community over the appropriateness of such a criterion for accountability purposes, former Reallocations Committee members have claimed that it has been of little practical use in ranking submissions in the second and third exercises. In fact, these informants have stated that they used a mix of the criteria formulated for the first Exercise to determine which disciplines would receive reallocated funding. However, because there were no clear guidelines on the use of other criteria, these have been applied inconsistently across submissions and exercises, and thus no clear trend can be observed in the Reallocations Committee reports for each Exercise. The use of such a broad criterion also resulted in confusion among some Steering Committee members who stated that they were unable to identify on what grounds their submissions would be assessed.

Several criteria have been suggested for future consideration. Discipline dynamics was mentioned most often; others include the quality of research, interdisciplinary research, and need for funds. The importance to Canada criterion was retained among these suggestions, but only as one of a set of criteria. Finally, an important comment raised in interviews and in the survey raises the need to have clearly defined criteria, whatever these may be.

***Question 6: Is the process of asking GSC-based Steering Committees to put forward specific funding proposals appropriate/inappropriate?***

The use of specific proposals is directly linked to the design of the Exercise. In some cases, they were found to be useful by the Reallocations Committee as an additional source of information in the decision making process. In most cases, however, the use of specific proposals hindered the submission development process. For instance, many Steering Committee members found the specific proposals difficult to develop given the lack of clear guidance on what they should include and how they should be presented.

A widely-shared perception in the scientific community is that the reallocations decisions were mainly based on the quality of the writing used in the submissions, regardless of the contents of the specific proposals. The evaluation findings also reveal that the specific funding proposals had the effect of creating smaller competitions within GSCs for targeted funding.

***Question 7: Based on the three exercises to date, is it effective to use Steering Committees to develop the documents on which the Exercise is based, and which go to the Reallocations Committee?***

The continued use of Steering Committees will likely depend on the specific changes made to the reallocations process. Although several respondents recognized the need for a group of champions to undertake the submission development process, the major problems raised by almost all respondents about the use of Steering Committees were difficulties associated to obtaining feedback from the community and the workload required of SC members. Respondents provided several suggestions to change or improve the use of Steering Committees in the Exercise, such as using GSC members who have just completed their three-year term to write the submission, putting the Exercise in the hands of Council rather than a separate Reallocations Committee and basing the decisions of Council on data provided by NSERC staff, dealing with discipline dynamics outside of the reallocations process, or hiring consultants to develop the submissions in conjunction with Steering Committees.

***Question 8: Is there a bias in the Reallocations process against GSCs that are more heterogeneous (i.e., those GSCs where constituents are from a variety of fields)?***

The degree to which a discipline is homogeneous generally appears to have an impact on the results of the Reallocations Exercise. The analysis conducted by NSERC staff on homogeneity supports this claim, especially when considering the results of the third Exercise, where GSCs identified as having a high degree of homogeneity had a mean ranking of 5.1, compared to 12.3 for those with medium homogeneity and 15.3 for those with low homogeneity. This conclusion is further substantiated by the interview and survey findings, which indicate that researchers believe that homogeneous GSCs have an advantage over heterogeneous GSCs in the Exercise. In the opinion of respondents, this was mainly due to the fact that disciplines that regroup fewer or more cohesive areas of research are more likely to be organized, have an established network and communications protocol, and can more easily express a common voice in their submissions.

***Question 9: Should the Reallocations Committee base its recommendations mostly on the quality of the specific submissions, or should they be based on an overall assessment of the relative importance of the areas represented by the individual GSCs? If the latter, how should "relative importance" be determined?***

The current process requires the Reallocations Committee to distribute funds based mainly on the submissions provided by the Steering Committees. However, an overall assessment based equally on the submission as well as on other sources of information may prove to be useful in future Exercises, given some of the more problematic aspects of the submissions, such as the influence of the text's quality. Most of the suggestions made on the reallocations process are based on the use of submissions as well as other evidence, such as NSERC-collected data on various indicators. Other mechanisms in use internationally focus on the identification of national priorities for research rather than the reallocation of funding within one budget envelope, and so offer no single methodology for the process.

***Question 10: Does the Reallocations process work against engineering and the applied sciences? If so, how can NSERC ensure that appropriate measures are applied to these areas?***

The evaluation study found no evidence that engineering GSCs were at a disadvantage compared to other disciplines in the reallocations process. The range of results in terms of rankings of the engineering committees across all three exercises shows considerable variability between these committees, which points to the fact that no systematic discrimination against these committees was present in the review process. Furthermore, the written comments provided by the Reallocations Committee to each GSC highlight different strengths and weaknesses for each of the engineering committees, which suggests that the Reallocations Committee did not use criteria more favourable to the sciences than to engineering.

***Question 11: Is the Reallocations Exercise achieving its stated objectives?***

Overall, the evaluation findings reveal that the Reallocations Exercise is not achieving its stated objectives. An analysis of the results of the three exercises suggests that 16 of the 19 Grant Selection Committee budgets stayed within 4% of their original budget in each of the three Exercises. In addition to this, the lack of consistent results across all three exercises has yielded little by way of clear trends and strategic priorities. Therefore, it seems as though the Exercise has had little overall impact on the disciplines and on individual researchers, aside from those involved in the reallocations process. After three exercises, the more relevant question may be whether the reallocations mechanism has had a real impact on the Canadian research landscape. The evidence obtained on this matter as part of the evaluation study suggests that there has been little impact so far. The unintended outcomes of the Reallocations Exercise on the GSCs who are responsible for the implementation of its results include alterations to the historical grant levels in each GSC due to the supplements provided in certain areas by the Exercise, the difficulty for GSCs in differentiating between high quality researchers not

working in strategic areas and less experienced researchers working in strategic areas funded by the Exercise, as well as shifts in policies in terms of awarding reallocated funding to new researchers and the imbalances that this creates upon renewal.

***Question 12: Communications is an unstated objective of the Reallocations Exercise. Should it be made explicit? Should the submissions be used to communicate the successes of Canadian research to decision makers and the public?***

Interview and survey results confirm that the results of the Reallocations Exercise have been disseminated to the broader research community fairly well through the usual channels. Other than site visits, however, most of the dissemination is done through one-way communication, in various broadcasts to the community (such as the NSERC website and newsletter). The low degree of awareness of the Exercise in the general research community indicates that these dissemination mechanisms are not entirely successful, especially compared to more interactive mechanisms such as meetings or site visits to the universities. An important issue highlighted in both the interviews and the survey was the lack of awareness of further use of the submissions, beyond their use in the Exercise. This may be due to a lack of use of the submissions, or to a lack of awareness about their use. Given the comments of those closest to these submissions, the SC members, it is safe to conclude that the submissions have been used very little beyond the intent for which they were developed.

**Discussion**

The evaluation results suggest that NSERC continues to require a mechanism through which its budgetary allocations between disciplines can be systematically reviewed. However, the results also identify several problematic issues related to the mechanism through which the Exercise is conducted; these have led the evaluation team to recommend that the Reallocations Exercise in its current form be terminated.

The factors which have lead the evaluation team to make this recommendation are summarized below:

- The amount of funding available to be reallocated is insufficient to meet the ambitious objectives of the Exercise.
- There has been little change in GSC budgets over the past three Exercises, which suggests a lack of impact.
- The submissions have not been used for purposes other than the reallocation of funds.
- The costs associated with the Exercise outweigh its benefits.

- Steering Committees have been unsuccessful in bringing forward submissions that represent the views of their community, due to lack of participation and interest of the general research community.

- More homogeneous GSCs have an advantage over those that are more diverse.

The evaluation results reveal that a number of individuals within the research community consider discipline dynamics as an important variable in the reallocation of funds between disciplines. Discipline dynamics could be assessed on an annual basis by using available NSERC data and thus would not require significant input from the research community. Discipline dynamics could be defined not only as the population of researchers in a given area, but also as the number of highly qualified people that obtain degrees in this area, or as the demand for its HQP in the marketplace.

A reallocations process based at least partly on discipline dynamics would also have to consider to some extent the strategic planning undertaken by universities, since this has a direct impact on the number of new applicants to the Discovery Grants program each year. Therefore, the evaluation team recognizes the merit of considering discipline dynamics as one criterion in the reallocation of DGP funding, although it should not be the only criterion considered. The recommendations made in the following section provide additional details regarding discipline dynamics and strategic planning.

**Recommendations**

The recommendations proposed in this section were developed with the primary intent of reducing the effort required from the research community, while meeting the Exercise's joint objectives of accountability and priority-setting. Two options for a revised reallocations process are described below, and are followed by more specific recommendations to the current process, should it be retained by Council.

Before a decision can be made concerning the next iteration of the Exercise, it is recommended that NSERC carefully review the two objectives currently guiding the Exercise and select one as a main, intended objective, while the other one becomes secondary. In other words, the joint objectives of accountability and priority-setting are sometimes at odds with one another, and so only one of the two should prevail as the main objective of the Exercise. This will guide the changes made to the current Exercise and will make the Exercise and NSERC's goals more transparent to the research community.

*Option 1 – Corporate Approach to Strategic Planning*

This option focuses on strategic planning at a corporate level rather than at an individual program level and is endorsed by the evaluation team. First, it is recommended that a reallocation of funds be made annually within the Discovery Grants program on the basis of discipline dynamics, as proposed in the previous section. This would address the strategic planning undertaken by universities, since this is reflected in hiring practices and enrolment. It would also provide NSERC with a straightforward mechanism through which to review the allocations made to the GSCs on a regular basis.

In addition to this, the strategic planning and decision making required to establish funding priorities for NSERC would be made through some of its other programs, such as the Special Research Opportunities (SRO) program or the NSERC Innovation Platforms (NIP) program. In this approach, the Reallocations Committee, composed of senior university, government and private sector administrators, would become an advisory committee to Council and would provide recommendations on specific priority areas for investment based on the expertise and knowledge of its members. A detailed analysis of university strategic plans submitted in the context of the CFI and CRC programs would also be conducted by NSERC staff to complement the work of the Reallocations Committee.

*Option 2 – Priority Setting Within the Discovery Grants Program*

This option is similar to Option 1, except that it involves the Discovery Grants program only. The new Reallocations Committee would make specific recommendations to Council on priorities for basic research funding, as described above. Discipline dynamics would remain a factor, but the GSCs linked to the priority areas identified by the Reallocations Committee would receive additional funding. Specific weighing would be given to both discipline dynamics and degree of relevance to priority areas.

Alternately, once Council has approved the new priority areas, a call for proposals could be issued to the research community and funding would be allocated by the Reallocations Committee to the GSCs that make the best case for relevance to these priority areas. This option implies that Steering Committees would have to be formed and that a "competition" would be launched among GSCs. The evaluation team does not recommend such an approach because of the problematic issues linked to the use of Steering Committees presented in the findings section of this report.

*Option 3 – Status Quo*

The following recommendations are made to improve the existing mechanism:

- Specific criteria similar to those used in the first Exercise should be used and clearly communicated to the research community.

- The Reallocations Committee should be asked to comment on draft submissions and Steering Committees should have the opportunity to modify these drafts before submitting them formally for assessment.

- NSERC should provide data to Steering Committees and the Reallocations Committee as needed to reduce the workload of committee members.

- The Exercise should focus on disciplinary vision, without requiring specific proposals.

- The membership of the Reallocations Committee should be expanded to include economists and policy makers.

**Conclusion**

By reallocating funds between disciplines in a systematic manner, NSERC ensures that it remains relevant and accountable to the Canadian public. However, the mechanism through which this has been done has been met with resistance from the scientific community, in part because of the workload that it represents, but also because of the lack of impact that these efforts have had in the past. The evaluation findings presented in this report cover issues of relevance, cost-effectiveness, and success. It is hoped that they will be useful in providing clear information on the strengths and weaknesses of the current process, and that the recommendations made as a result of the evaluation will be carefully considered in the design of the next iteration of the Exercise.

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# 1.0 Introduction

## 1.1 Background

This report presents the findings of the evaluation of NSERC's Reallocations Exercise. An evaluation of the Exercise was recommended by the Committee on Research Grants and by Council in 2002. Three such exercises have taken place; when fully implemented these three exercises will cover a period of 13 years (1994-2007). It is important for NSERC to look back and think about the Exercise in order to assess whether its purposes and goals are still valid and to look at how the Exercise could be improved in the future.

The evaluation report is divided into four major sections. The first section provides an introduction to the Reallocations Exercise and a definition of terms, Section 2 discusses the methodology employed during the evaluation, Section 3 outlines the findings of the study, and Section 4 discusses the results of the evaluation and provides recommendations for the future.

## 1.2 Description of the Reallocations Exercise

The Reallocations Exercise was created by Council in 1991 to ensure that the Research Grants program (now called Discovery Grants), NSERC's largest, remains dynamic and responsive to changes in the various disciplines and in the research environment. The main objective stated for the Reallocations Exercise is to redistribute a portion of the Discovery Grants budget among the various NSERC Grant Selection Committees (GSCs). This redistributed funding goes to initiatives and needs identified, through broad community input and peer review, as the most important to Canada. A second objective of the Reallocations Exercise is to provide a mechanism for strategic planning of Canadian university basic research in the natural sciences and engineering (NSE), involving the research community on a national basis.

Before the implementation of the Reallocations Exercise, changes in the level of funding allocated by the Discovery Grants program for the various GSCs had been mainly influenced by the number of new applicants and by the attrition of grantees. Occasionally, GSCs made a case for special adjustments and these were considered on an ad hoc basis by NSERC staff. For a number of years just prior to the first Reallocations Exercise, the budget had been stable and had not allowed for adjustments based on growth in the research population of each discipline.

The Reallocations Exercise has allowed NSERC to periodically take stock and plan for the future, based on the input of the people closest to Canadian research. The goals of

the Reallocations Exercise are responsiveness, accountability, and foresight. Each Reallocations Exercise results in specific outputs such as submissions made by GSC-based Steering Committees that are reviewed by an interdisciplinary Reallocations Committee. This committee presents recommendations to Council, which in turn determines how funding will be redistributed between GSCs based on these recommendations.

## 1.3 Definition of Terms

In order to ensure consistency in the understanding and interpretation of the evaluation findings, brief definitions are offered for commonly used terms and expressions throughout the report:

- **Reallocations Committee (RC)**: Interdisciplinary Committee responsible for the assessment of submissions prepared by GSC-based Steering Committees and for making recommendations to Council on the reallocation of funds;
- **Steering Committees (SC)**: Disciplinary or GSC-based committees responsible for the development of submissions;
- **Grant Selection Committees (GSC)**: Disciplinary committees responsible for the allocation of Discovery Grants to individual researchers;
- **Submission**: Document developed by each Steering Committee which addresses the criteria for the Exercise. The first Exercise was based on four criteria (quality, discipline dynamics, highly qualified personnel and cost of research). The second and third Exercises were based on one broad criterion, the discipline's importance to Canada and specific funding proposals were highlighted;
- **Specific proposals**: Precise articulation of how reallocated funds will be spent by GSCs, included in the submissions developed by Steering Committees.

Finally, the following should be noted about the use of the "Reallocations Exercise" term:

- "Reallocations Exercise" or "Exercise" refers to the reallocations mechanism in general;
- The "first Exercise" refers to the 1994 process;
- The "second Exercise" refers to the 1998 process;
- The "third Exercise" refers to the 2002 process;
- The "three exercises" refers to all three processes combined.

# 2.0 Evaluation Methodology

## 2.1 Overview of Study

The evaluation issues and the more specific questions that have resulted from their analysis were based on consultations carried out with the major stakeholders of the Reallocations Exercise, including NSERC staff and management, the Committee on Research Grants, Council, members of GSCs and Reallocations Steering Committees and members of the community at large. These consultations resulted in a final list of 12 questions, presented in Section 3. The data collection methods selected for the study included a document review, a survey of the research community and key informant interviews. These are described in the following sections.

An internal evaluation was conducted because of the complexity of the Exercise itself and the limited budget available for the study. A participatory approach was used throughout the study, and required program managers and staff to work closely with internal evaluators to design the evaluation plan, complete the evaluation activities, analyze the data collected and write the evaluation report. A specialized firm was hired to conduct the web survey.

The approach chosen for this study has some advantages and some limitations. The study team was more knowledgeable about the Exercise than a consultant would have been, and so less time was required at the start of the project for familiarization and information-gathering. The study team members also had contacts with key target groups; this made planning and conducting the survey and the interviews easier for them than it would have been for consultants without those contacts. Also, the fact that NSERC employees were working on the project clearly demonstrates the Council's level of commitment to improving the Reallocations Exercise, which, in turn, may have prompted better participation from community members. However, some may criticize the lack of involvement of an objective third party in data collection and analysis. Hopefully this report will address this concern by clearly linking the evaluation findings to the multiple lines of evidence presented in the next section.

## 2.2 Document Review

Various documents were reviewed in order to provide background to the information collected using other methods. These documents included letters written to NSERC by community members, meeting notes, reports on previous Exercises, GSC annual reports, websites of other similar organizations, *NSERC Contact* publications, statistical analyses conducted on the results of the Exercise, and other documents deemed relevant to the

evaluation questions. A full list of the documents reviewed for the evaluation is available in **Appendix A.**

## 2.3 Survey of Research Community

A web-based survey of a sample of current recipients of NSERC Discovery Grants was used to collect general information on community members' knowledge of, and attitude towards, the Reallocations Exercise. The web-based survey questionnaire was developed by NSERC staff and administered by an external contractor in March 2004. The survey contained 18 items and took approximately 10-15 minutes to complete, depending on the open-ended comments provided by each respondent. The questionnaire is presented in **Appendix B**.

### 2.3.1 Design and Pre-Test

The survey questions were based on six of the twelve evaluation questions retained for the study. The survey was designed by NSERC program evaluation staff and modified according to suggestions from the Reallocations Exercise Evaluation Steering Committee and the Program Evaluation Committee. A pre-test involving both NSERC program staff and community members provided useful information on the clarity and logic of the questions, as well as on the web-based interface. Twenty (20) individuals participated in the pre-test. Minor modifications were made to the questionnaire following the pre-test to refine some of the wording used. The completed questionnaires from community members were retained in the final analysis, whereas the completed questionnaires from NSERC staff were removed from the response data file.

### 2.3.2 Sampling

The target population for the survey was composed of the 7855 Discovery Grants holders (at the time of the survey administration). First-time applicants in 2002 or 2003 were excluded from the sample since their grants became effective after the end of the last Reallocations Exercise.

Based on the number of individuals included in the target population (7855), it was determined that 366 completed questionnaires were required for statistical significance based on a 95% confidence interval and a 5% margin of error. In other words, the survey results can be generalized to the population within 5 percentage points 19 times out of 20. The distribution of GSCs in the survey sample is proportional to the distribution of GSCs in the target population.

### 2.3.3 Survey Respondent Characteristics

A few survey questions focused on basic information about the respondents. The primary institutional affiliation, GSC, years of NSERC funding, prior awareness of the Reallocations Exercise, and specific involvement in the Exercise are reported below for the entire sample. These data were also used in the analysis of other survey questions, as a means to group types of respondents (see section 3 for more details).

Primary Institutional Affiliation

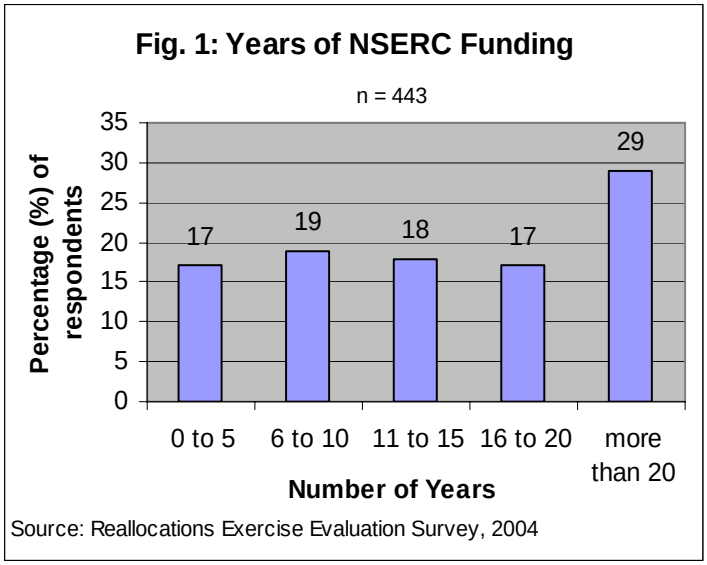
Survey respondents were from 49 different institutions across Canada. The highest proportions of respondents were from the University of Toronto (9.5%), the University of British Columbia (7.0%), the University of Alberta (5.2%), Université Laval (4.7%), and Dalhousie University (4.3%). The remaining institutions had proportions of less than 4% (n = 443).

Grant Selection Committee

The proportion of respondents in each GSC was similar to the proportion included in the population. The biggest gaps between proportion in population and proportion of respondents were found in Evolution and Ecology (GSC 18) and Integrative Animal Biology (GSC 1011), both of which were overrepresented in the respondent distribution, and Chemical and Metallurgical Engineering (GSC 04) and Computing and Information Science – B (GSC 331), both of which were underrepresented.

Years of NSERC Funding

Respondents were generally long-time recipients of NSERC funding and so can be considered familiar with its programs and processes, including the Reallocations Exercise. Figure 1 provides the breakdown of respondents per five-year period.



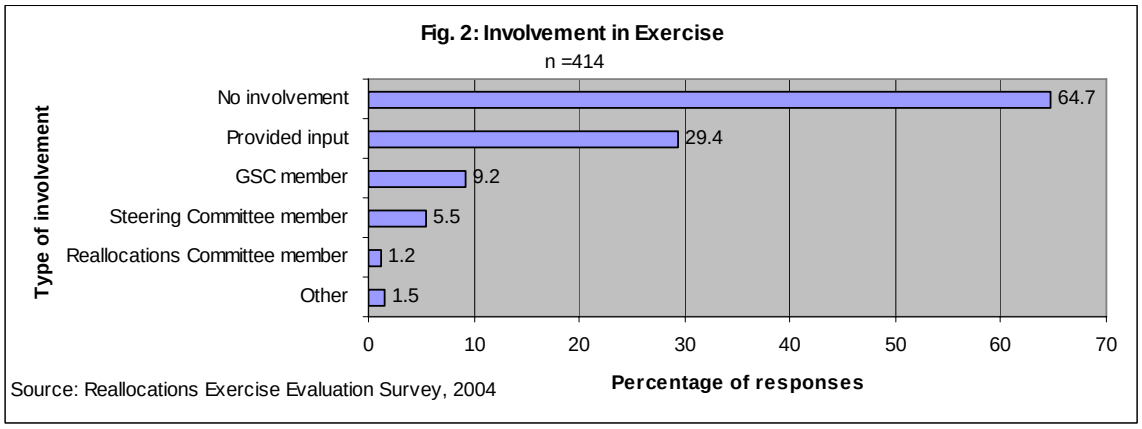

Prior Awareness of Reallocations Exercise

Most respondents reported some prior exposure to the Reallocations Exercise. Respondents indicated that they were either highly knowledgeable about the Exercise (16.8%), somewhat knowledgeable about the Exercise (36.1%), or simply aware of the Exercise (37.2%). However, 9.8 percent of respondents did indicate having no prior awareness of the Exercise before they received the invitation email. When this response was selected, the survey software was programmed to automatically end the survey with a message thanking the respondent for their participation. It was determined that individuals with no prior knowledge of the Exercise should not complete the remainder of the questionnaire, since all of the subsequent questions required some level of awareness of the Exercise and its results (n=502; respondents could select more than one response).

As can be expected, a significant difference was found between the level of awareness or knowledge about the Exercise and the number of years funded. Respondents who have been receiving funding for 11 years or more are more likely to be somewhat or highly knowledgeable about the Exercise than those who have been receiving funding for a smaller number of years ($\chi^2 = 59.889$, df = 12, $\alpha = 0.01$).

Involvement in Reallocations Exercise

Finally, respondents were asked about their specific involvement in the Exercise. Figure 2 summarizes the responses to this question.




The survey findings on involvement are reported in Section 3, along with the findings from the other lines of evidence.

## 2.4 Key Informant Interviews

Key informant interviews were conducted to obtain more detailed information from the individuals involved in various aspects of the Reallocations Exercise. In-person or telephone interviews were conducted with GSC members, Steering Committee members, Reallocations Committee members, and NSERC staff and management.

Interview protocols were developed for each of these groups and addressed issues such as the rationale for the Exercise, its processes, and its outcomes. The Reallocations Exercise Evaluation Steering Committee approved the interview protocols and the first two interviews for each sub-group were used as a pre-test of the instruments. No major modifications were necessary based on the pre-test, and so all findings were included in the final analysis. The interview protocols used in the study are available in **Appendix C**.

### 2.4.1 Interview Participant Selection

The potential interview participants were selected in various ways: Reallocations Committee members from all three exercises were identified by NSERC staff (12 total), Steering Committee members were identified by the Evaluation Steering Committee and selected randomly within pre-determined discipline groupings (20 total), and Grant Selection Committee members were randomly selected from NSERC current membership listings (20 total). Each GSC member name identified was checked against a list of past Steering Committee members, in order to remove those individuals who had participated as SC members in the past. In addition to this, new GSC members were also removed from the list in an effort to select only those GSC members who had had

experience in implementing the results of the last exercise. The final list of names for all three groups was distributed to the Evaluation Steering Committee for validation, and a few changes were made based on their suggestions (for example, a few potential participants had retired since with no forwarding contact information). Five NSERC employees were selected by the evaluation team for their experience and familiarity with the exercise.

### 2.4.2 Interview Data Collection Process

Potential respondents were first contacted through an email sent by NSERC's Vice-President, Research Grants and Scholarships. The email explained the purpose of the evaluation and requested the participation of the individual. Potential respondents were then contacted by telephone to conduct the interview or to set up an appointment at a later time. The interview period lasted three months, in order to maximize the number of responses. Interview times varied based on the respondent group, with an average of 45 minutes for RC and SC members, 25 minutes for GSC members, and one hour for NSERC staff and managers. Table 1 presents the response information for the interviews:

*Table 1: Interview Response Information*

| | RC members | SC members | GSC members | NSERC |
|---|---|---|---|---|
| **Potential participants** | 12 | 20 | 20 | 5 |
| **Completed interviews** | 10 | 20 | 14 | 5 |
| **Refused to participate** | 1 | 0 | 1 | 0 |
| **Could not be reached** | 1 | 0 | 5 | 0 |

A qualitative content analysis methodology was used to detect trends in the interview data and to summarize the interview findings. The interview results are presented in Section 3, along with the findings from the other sources of evidence.

# 3.0 Findings

The evaluation findings are presented in this section for each of the three main evaluation issues: rationale, design and outcomes. The findings are organized by evaluation question.

## 3.1 Rationale

### 3.1.1 Rationale/relevance

***What was the rationale behind the Reallocations Exercise? Is this rationale still relevant?***

The lines of evidence used to answer this question include the document review, the web-based survey, and key informant interviews of GSC members, Steering Committee members, Reallocations Committee members, and NSERC staff and management.

Rationale for Reallocations Exercise

Following a major policy review in 1991, Council struck an Ad Hoc Committee on Allocation Criteria and mandated it to recommend improvements to the allocation process for the Discovery Grants and Strategic Grants programs. The analysis and recommendations for a new process were received and accepted by Council at its June 1992 meeting.

The analysis revealed that the former allocation process had been largely driven by historical awards and university hiring practices. Council decided that this process needed more flexibility to fund disciplines according to changing needs. NSERC therefore decided to periodically examine the entire spectrum of research areas that the then-named Operating Grants program supported, and make adjustments to the funding allotted to the various disciplines. Council determined that 10% of the budget of each discipline would be reallocated – this amount was judged to be appropriate to the maintenance of the base while investing in new initiatives or areas of priority.

It was anticipated that the Reallocations Exercise would permit increased input from GSCs and provide a longer planning horizon for their operations. It was also anticipated that it would eliminate some of the major disadvantages of the old system: the "personalization" of grants, the loss of funds to the committee when grantees moved or retired, and the stigma attached to previously unsuccessful applicants who bring no new money to a GSC.[1]

[1] *Report of the Allocations Committee* (1994), Introduction, p.1.

Feedback received from GSC members after each of the exercises supports to some extent the rationale behind the implementation of the Reallocations Exercise. Letters sent to NSERC by members of the scientific community highlight the fact that some form of reallocation protocol is required within the context of the Discovery Grants program in order to adapt to the changing context within which scientific research is conducted.[2] This opinion was also expressed by community members in the survey: The vast majority of respondents (95.5%) agreed with the statement that NSERC should periodically review the distribution of funds for the support of basic research among the various disciplines of the natural sciences and engineering (n = 356). This is also echoed in many of the key informant interviews: most respondents support the exercise's objective of reallocating funding according to the changing needs of the disciplines. However, the interview findings also show little support for the current reallocations mechanism. These findings will be discussed in further detail in other sections of the report.

Changes to Research Environment Since 1994

Since the first Reallocations Exercise, many changes have occurred in the Canadian research environment. The following paragraphs outline those changes which may have had an influence on NSERC and its Reallocations Exercise.

*a) Program Review*

The program review undertaken across the federal government in 1995 resulted in significant cuts to NSERC's budget, which in turn hindered the ability of NSERC to ensure the availability of adequate funding to its Discovery Grants program. The cuts to NSERC that were announced in the 1995 federal budget were much deeper than expected, and were made over three years.[3] It is within this context that Council reviewed the first Reallocations Exercise and developed the guidelines for the second Reallocations Exercise. The submission made by each discipline would have to answer the question: "Why is it important for Canada that this discipline receive some of the funds available for reallocation?"[4] After three years of fiscal restraint, NSERC's budget rose in 1998 from $434 million to $494 million.[5] The planned cuts for the year were cancelled, and the cuts made since 1994-95 were reversed. New resources were spent to

[2] *Letter to NSERC from Member of the Community*
[3] *NSERC Contact, vol. 15* n 1, (1995)
[4] *NSERC Contact, vol. 21*, n.1, (1996)
[5] *NSERC Contact, vol. 23*, n.1, (1998)

increase the support to Highly Qualified Personnel and to enhance university-industry partnerships.[6]

*b) New Initiatives and Programs*

A study conducted as part of the Evaluation of the Research Grants program in 2001 outlined the changes that occurred in the Canadian research environment[7] over the past ten years. These changes are organized according to four themes: increased funding available to institutions and to researchers, the evolution of how research is conducted, changes within universities themselves, and trends and projections for the future. Among these changes, the creation of the Canada Foundation for Innovation (CFI) and the Canada Research Chairs have had some impact on NSERC and, indirectly, on the Reallocations Exercise.

***Canada Foundation for Innovation (CFI):***
The Canada Foundation for Innovation (CFI) was created as an independent, non-profit organization by the federal government in 1997. The goal of the CFI is to strengthen the capacity of Canadian universities, colleges, research hospitals, and other not-for-profit institutions to carry out world-class research and technology development.[8] The CFI requires institutions to submit a Strategic Research Plan that sets priorities based on their strategic vision for the future. Institutions are especially encouraged to set priorities in areas that integrate ideas and knowledge from many disciplines and sectors, and that build on their distinct advantages.[9]

***Canada Research Chairs:***
The Canada Research Chairs program was implemented to address the nation's need for excellent researchers, given the pressures faced by universities to replace retiring faculty members. The key objective of the Chairs program is to enable Canadian universities, affiliated research institutes and hospitals to become world-class centres of research. The program also seeks to make the best possible use of research resources through institutions' strategic planning, and through collaboration among institutions and between sectors. In order to achieve this, the program provides substantial incremental support in the form of salaries and research support for world-class researchers, or potential world-class researchers, across Canada.[10]

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[6] *NSERC Contact, vol. 23*, n.2, (1998)
[7] Brochu, M., & Williams, D. (2001). *Final Report – Environment Scan for NSERC Evaluation of the Research Grants Program.*
[8] http://www.innovation.ca
[9] *CFI Policy and Program Guide*, 2004
[10] http://www.chairs.gc.ca/web/home_e.asp

***Other Important Changes:***
Aside from the CFI and Canada Research Chairs, other new programs implemented by various levels of government to fund university-based research and cited by interview respondents include Genome Canada, the Networks of Centres of Excellence, the Indirect Costs of Research program, as well as provincial programs such as Ontario's Centres of Excellence program. The creation of the Canadian Institutes of Health Research and the increase in available health research funding were also cited by some respondents as an important change in their area of research.

Interview respondents also identified other changes occurring in their own disciplines as particularly important in influencing trends and developments in their work. Several participants indicated a movement towards interdisciplinarity, integration and collaborative research. Others identified significant changes in the demographics of their communities and increased costs of research due to new technology as adding to existing budget pressures. The involvement of industrial partners in research was identified as both a positive change by some respondents and a negative change by others; to some, increased industrial involvement has resulted in financial contributions to the research conducted in the university as well as more technology transfer; to others, it has resulted in more difficulty in obtaining funds for basic research activities.

Finally, a small number of respondents identified some of the changes that have occurred within NSERC as having an important impact on their work. For instance, respondents highlighted decreases in Strategic Project Grants, changes in the Industrial Research Chairs, and the addition of programs such as the University Faculty Awards. Others stated that the large number of NSERC programs has resulted in a bigger workload for researchers due to the application process.

Impact of Recent Changes

The majority of interview respondents from all three researcher groups felt that the Canada Research Chairs and CFI had been instrumental in attracting or repatriating Canadian researchers to their universities and in providing much needed infrastructure. However, most respondents also stated that these investments have not included operating funds for recipients, and so funds from the Discovery Grants program are now required more than ever to complement the other two programs. As one respondent explained, "What really leads to good science is the availability of funds year after year to do the work".

Respondents made few comments on the potential impact of the Chairs and CFI programs on the Reallocations Exercise. The most significant comments made on this topic focused on the size of the investments made through these programs and the

strategic planning effort that they have imposed on universities. In the opinion of respondents, these have considerably reduced the impact that the Reallocations Exercise could have on the direction of Canadian university basic research.

NSERC staff and managers acknowledged that the CFI and Chairs have been instrumental in encouraging universities to develop strategic plans, yet they felt that these two new initiatives respond to needs that are fundamentally different than those met by the Discovery Grants program. Therefore, their impact on the Reallocations Exercise is minimal.

Need for Continued Reallocations Exercise

The opinions of interview respondents were mixed on the subject of whether or not there is still a need for the Reallocations Exercise, given all of the changes described previously. Most respondents felt that the Exercise is still needed, and explained that NSERC needs some mechanism through which the amounts allocated to different areas of research can change over time; others felt that the Exercise was useful, both through the reports produced and also because it forced members of each community to come together to discuss their priorities and identify a common vision for the future. Others still stated that the Exercise was needed to respond to changes not only between fields but also within them in the form of the specific proposals brought forward in each submission. The political ramifications of the Exercise were also identified by NSERC staff and managers, who stated that the image of NSERC is enhanced by the Exercise. However, some of these respondents also indicated that in order for the Exercise to have a real impact on Canadian research, a greater amount of funds should be reallocated. Other NSERC respondents also mentioned that although there is a need for NSERC to identify strategic priorities, this should be done across all of its programs and not just within the Discovery Grants program.

The participants who felt that the Exercise was no longer needed cited the lack of consistency in the results of the three exercises conducted to date, and stated that the objectives of the Exercise have not been met. They explained that the process used in the Exercise needs to change in order to reduce workload on the community and to ensure consistency in the results. Others felt that the Exercise created competition between disciplines, which could also have a negative impact on interdisciplinary research in the future. Finally, several respondents thought that the Exercise should only be conducted if new funds were available, rather than taking funds from each GSC.

Survey respondents were asked to rate their agreement with a number of statements based on the rationale of the Reallocations Exercise. Table 2 presents a summary of the percentage of responses on a rating scale ranging from 1 for Strongly Disagree to 7 for

Strongly Agree for four statements as well as the mean rating and the standard deviation obtained for each. The average ranking for all four statements was 5 out of 7.

*Table 2: Level of Agreement with Rationale Statements*

| Rationale Statement | Strongly Disagree 1 – 2 (%) | Neither 3 – 5 (%) | Strongly Agree 6 - 7 (%) | Mean | Std. Deviation |
|---|---|---|---|---|---|
| The Reallocations Exercise provides a useful framework for directing research funds towards emerging research priorities. (n=393) | 13.4 | 49 | 30.7 | 4.9/7 | 1.9 |
| The Exercise fosters interaction and communication within disciplines or sub-disciplines.(n=370) | 23.2 | 48.3 | 15.8 | 4.5/7 | 2.3 |
| The submissions prepared by Steering Committees are useful tools in promoting Canadian science and engineering in specific areas. (n=327) | 10.4 | 43.1 | 23.5 | 5.6/7 | 2.3 |
| The Reallocations Exercise is a useful tool to assist planning within universities or other organizations. (n=361) | 25.1 | 46.3 | 13.4 | 4.5/7 | 2.5 |

A significant difference was observed between GSCs on the first statement "The Reallocations Exercise provides a useful framework for directing funds towards emerging research priorities." GSCs 17, 21, 28, 330, 334, and 335 were more likely to strongly agree with the statement than the other GSCs ($\chi^2 = 79.334$, df = 52, $\alpha = 0.01$).

A significant difference was also found between the number of years of NSERC funding on the fourth statement "The Reallocations Exercise is a useful tool to assist planning within universities or other organizations". As can be expected, respondents with the highest number of years of funding strongly agreed with the statement in a higher proportion than respondents with fewer years of funding ($\chi^2 = 14.522$, df = 8, $\alpha = 0.1$).

Summary of Findings (Section 3.1.1)

The Reallocations Exercise was first created by NSERC in an effort to deal with some perceived unfairness in its existing GSC budget allocation process. This process was, deemed to be too static not sufficiently strategic. The objective of the Exercise was to make the Research Grants program more flexible by redistributing a portion of its budget according to changing needs and priorities. In general, members of the NSERC community support this rationale, and agree that some mechanism is required to revisit the allocations made in the GSC budgets in a systematic manner. However, considerable resources are required to conduct the Reallocations Exercise, which casts doubt on its value to NSERC and the scientific community. Furthermore, changes in the Canadian research landscape over the past 10 years have cast a shadow on the potential of the Reallocations Exercise: New initiatives, such as CFI and the Chairs, for instance, provide

substantial funding linked to strategic planning by universities. This has considerably reduced the impact that the Exercise could have on the scientific direction of Canadian basic research. Such changes need to be addressed in future allocations mechanisms.

### 3.1.2 Discipline Growth

***Should increases in the number of individuals applying to and receiving grants from the various GSCs be addressed separately from the Reallocations Exercise?***

The document review and interviews of GSC members and NSERC staff and managers were used to collect data on this question.

Use of Discipline Dynamics in the Exercise

The growth in the number of individuals applying to and receiving grants within the Discovery Grants program is typically referred to as "discipline dynamics" and takes into account the number of new applicants to the program as well as the attrition or retirement rate within each Grant Selection Committee. The first Reallocations Exercise defined discipline dynamics as "fluctuations in the relative size and national importance of some disciplines over others."[11] As shown in section 3.1.3, discipline dynamics were used as an explicit criterion in the 1994 Reallocations Exercise, but not in the second and third exercises. Therefore, data produced by NSERC staff on discipline dynamics were not used in the same way in each of the three exercises.

Correlation Between Discipline Dynamics and Reallocations Results

A cursory analysis of the correlation between discipline dynamics and reallocations results within and across all three exercises was conducted by NSERC for the purposes of this evaluation. In this analysis, discipline dynamics were defined on the basis of the number of new applicants to the Discovery Grants program over the years, with the assumption of a constant attrition rate of 10% across all disciplines.[12]

a) *First Exercise (1994)*

The results of the first Reallocations Exercise are strongly correlated to the discipline dynamics rankings established between all Grant Selection Committees (r = 0.8).[13] In

[11] *Report of the Allocations Committee* (1994)
[12] *Research Grants Discipline Dynamics Report* (2001)
[13] r statistic is based on the Pearson product-moment correlation and ranges between -1 and 1, with values closest to zero expressing low correlation.

other words, the disciplines that ranked highest according to discipline dynamics did well in the Exercise. This is not surprising, considering that the discipline dynamics criterion was worth 25 percent of the rating made by the Reallocations Committee. However, given that the definition of discipline dynamics used in the first Exercise also included "national importance", it is not possible to determine what specific aspects of this criterion were considered as particularly critical to the Reallocations Committee. This may explain the moderate correlation found between the results of the first Exercise and the ranking of the disciplines in terms of the number of new applicants in the four years preceding the Exercise (r = 0.4).

*b) Second Exercise (1998)*

Discipline dynamics was not considered an official criterion in the second Reallocations Exercise. Information provided in the submissions focused on growth and attrition, and was used mainly as historical data on the Discovery Grants program. It did not provide information on the relative importance to Canada of the disciplines. Seven Steering Committees made a case for new applicants in the specific proposals that they outlined in their submissions, and six received some funding for this purpose. The only one of the seven committees that did not receive funding for new applicants was Earth Sciences, despite the fact that they were ranked fourth among all disciplines in terms of the number of new applicants to their discipline in the four years preceding the Exercise.[14]

Although the Reallocations Committee decided to award funds for new applicants to six of seven committees requesting such funding, no correlation was found between discipline dynamics of these fields and the results of the Exercise in terms of dollars (r = 0.14). Further, those disciplines that received funding for new applicants did not rank highest in terms of the number of first-time applicants in the four-year period preceding the second Exercise. These results suggest that the actual number of first-time applicants was not an important factor in the decisions made by the Reallocations Committee. However, a review of the Reallocations Committee's comments to Steering Committees on the second Exercise indicates that the importance of the discipline was a critical factor in determining whether or not funds would be provided for specific proposals dealing with first-time applicants (FTA). Out of the seven Steering Committees that put forward these specific proposals, four mentioned growth within the discipline, while the three others focused on the importance of properly funding new applicants. The comments from the Reallocations Committee show that growth was only a factor in considering the submissions of two disciplines that experienced a large increase in the years prior to the Exercise (ECE and CIS). The five other disciplines received funding to address the importance of properly funding FTAs rather than for

[14] *Research Grants Discipline Dynamics Report* (2001)

actual disciplinary growth. This may explain the low correlation reported above between the results of the Exercise and the discipline dynamics identified in the second Exercise.

*c) Third Exercise (2002)*

The analysis results of the third Exercise are similar to those of the second. The Reallocations Committee recommended funding seven of the nine Steering Committees who requested funds for new applicants. The results of the Exercise and the discipline dynamics rankings were uncorrelated (r = -0.018). In addition to this, the results of the Exercise and the number of FTAs in the two years after completion were also uncorrelated (r= 0.005). This suggests that the Reallocations Committee's decision was not based on the true demand for new applicant funding.

Besides making specific requests for funding for new applicants, several Steering Committees also requested funds for general growth in their discipline. An analysis of the feedback provided to Steering Committees shows that the Reallocations Committee recommended funding for growth to 5 of 9 Steering Committees that requested it. The Steering Committees that received funding for general growth include the three communities that had most grown in the years preceding the Exercise.

*d) Results of Three Exercises*

An analysis of the correlation between discipline dynamics and reallocations results over the three exercises shows a weak correlation coefficient (r = 0.15). However, it should be noted that the two disciplines that were most successful across all three exercises showed the second and third largest growth in first-time applicants in the period 1991-2001.

It appears that discipline dynamics as defined in the first Exercise was considered fairly consistently across all three exercises: The three Reallocations Committees all considered both the growth in the number of new applicants and the importance of the research areas, especially those defined as "emerging." However, this practice was not made explicit at the outset of the second and third exercises, and so discipline dynamics was not considered one of the key criteria of these two exercises.

Stakeholder Opinions on Growth

Although none of the interview questions specifically dealt with this issue, several respondents commented on discipline dynamics and its place within the Reallocations Exercise. Opinions on this matter were mixed, with some respondents claiming that

discipline dynamics should be the basis for the whole Exercise, while others felt that it should be one of the criteria. Others claimed that this should be addressed by NSERC outside of the Exercise. In all cases, however, many respondents demanded that this issue be clarified before the start of the next Exercise, and emphasized the need for consistency between disciplines in requesting funds to deal with growth. These comments were echoed in letters received from community members.[15]

Summary of Findings (Section 3.1.2)

The first Reallocations Exercise explicitly used discipline dynamics as a criterion by which disciplines were assessed and ranked. At the time, the definition of discipline dynamics included the national importance of some disciplines over others. Not surprisingly, a strong correlation (r = 0.81) was observed between the discipline dynamics rankings and the results of the first Exercise. The second and third exercises showed moderate to low correlations between various measures of discipline dynamics and the results of the Exercise. This may be attributable to the fact that discipline dynamics was not used as a formal criterion in the last two exercises, even though the Reallocations Committee did award specific funding to several Steering Committees for first-time applicants or for growth of the discipline in general.

## 3.2 Design (Cost-Effectiveness)

### 3.2.1 Benefits and Costs

***What are the benefits of the Exercise? What are its costs?***

This question was addressed using data from the document review, the survey of community members, and interview data from GSC members, Steering Committee members, Reallocations Committee members, and NSERC staff and managers. The costs and benefits of the Exercise were explored both in relation to individuals and to disciplines.

Cost Estimates

The operational costs associated with the last Exercise were estimated based on NSERC financial reports and staff time spent on the Exercise. The administrative cost of the 2002 Exercise amounts to $203,319 and includes expenditures related to Steering

[15] *Letters to NSERC from Members of the Community*

Committees' administrative and teaching release budgets, expenses related to the meeting of the Reallocations Committee as well as other small expenditures from staff.[16]

The cost of the work conducted as part of the 2002 Exercise has also been estimated for illustrative purposes. The *rate per hours worked* is based on the NSERC "Policy for Remuneration of Council and Committee Members" which states that members who face a loss in personal income or whose employer faces a loss of income because of committee service should be at least partly reimbursed. Such rate is established at $67/hr ($500/day), and is considered low in terms of current consulting fees charged by some researchers when undertaking work for other organizations. The cost estimates presented in Table 3 are therefore likely to be fairly conservative.[17]

*Table 3: Cost Estimates of Time Spent on 2002 Exercise*

| | Hrs/member | # of members | Total hrs. | Cost |
|---|---|---|---|---|
| **RC** | 120 | 14 | 1,680 | $ 112,560 |
| **SCs** | 357 | 176 | 62,832 | $ 4,209,744 |
| **Referees** | 4 | 95 | 380 | $ 25,460 |
| **NSERC Staff** | | | | $300,000 |
| **Admin. budget** | --- | --- | --- | $ 203,000 |
| **Total** | --- | --- | --- | $ 4,850,764 |

The table above includes an estimate of NSERC salary dollars paid out to staff and managers involved in the Exercise. These individuals worked on the Reallocations Exercise in addition to other responsibilities, and so a precise calculation of the number of hours spent on the Exercise is not possible given currently available information. However, some details were obtained from interviews with NSERC and staff, and provide a good sense of the cost to NSERC in terms of staff time.

The Director responsible for the 2002 Exercise stated that she spent approximately 50% of her time on reallocations for over two years. One of the team leaders reporting to the Director also spent a considerable amount of time on this project, which could be estimated at 35% of his time over two years and a staff member was assigned to the project at about 20 hours per week for two years. Most of the Program Officers employed in the Research Grants Division spent some time working on the Exercise, mostly in meetings and in the preparation of feedback to the Steering Committees; this time has been estimated to a few days for each of the 20 Program Officers. Finally, other NSERC divisions were involved in the Exercise. Employees of the Policy and International Relations division were responsible for the preparation of reports used by

[16] FPAM report – Operating Budget for Reallocations Exercises (2002)
[17] The number of hours per member was estimated using interview data from RC and SC members.

the Reallocations Committee (estimated at 4-6 weeks); several employees of the Communications division were involved in translating documents, developing press releases, posting information about the Exercise on the NSERC website, and liaising with the Minister's Office about the Exercise. Altogether, these salary costs could be roughly estimated to $300,000.

Total Dollars Reallocated

In comparison to the operational costs of the Exercise outlined above, Table 4 presents the total amount of dollars that actually "changed hands" in each of the three exercises to date. It is understood that some of the dollars that were not part of the net gain or net loss were nevertheless earmarked to specific initiatives within a GSC and therefore were not necessarily available to the GSC for the usual grant allocation process.

*Table 4: Total Dollars Reallocated*

| Exercise | Dollars Reallocated | Total in Reallocations Pool | Proportion Reallocated |
|---|---|---|---|
| 1994 | $5,2M | $20,5M | 25% |
| 1998[18] | $7,1M | $30,5M | 24% |
| 2002 | $5,9M | $27,2M | 22% |

It appears, therefore, that the estimated operational cost of the Exercise is similar in scale to the actual amounts that are reallocated in each Exercise.

Costs and Benefits to Individual Researchers

A widely-held view within the scientific community is that the preparation of the submission requires extensive time and effort on the part of some of the best researchers in Canada, who then cannot spend as much time on their research as needed.[19] This comment about the cost of the Exercise for those involved (approximately 100 researchers) was made several times through open-ended responses provided to various survey questions and was confirmed through the key informant interviews, in terms of the workload required to participate in the exercise.

*a) Workload of Committee Members*

The time spent working on the Exercise by Reallocations Committee members ranged from one week to one month. This included reviewing the submissions as well as time

[18] The 1998 Exercise was a positive sum game: The Reallocations pool ($20.5M) was supplemented by $10M of new funds from the 98-99 federal budget.

[19] *Letters to NSERC from Members of the Community*

spent meeting with the other committee members. Several committee members found this to be a "huge amount of work" for which they had not been prepared, while others said that they found the submissions interesting to read.

The range of time estimates provided by Steering Committee members was broader than that of the Reallocations Committee members. Steering Committee members spent from one week to over four months working on the Exercise, depending on their role. Chairs reported spending much more time than other committee members, usually because they were the ones writing most of the submission. Several respondents stated that although they agreed that NSERC had to remain accountable to Canadian taxpayers, it had to address the workload that the Exercise represents for those involved. Concerns about workload issues were also expressed through the survey and through discussions of the Committee on Research Grants (CORG).

Grant Selection Committee members stated for the most part that the Reallocations Exercise did not result in much additional work for their committee. In fact, most respondents explained that the impact of the Exercise on the committee's workload was relatively minor, although this was not the case for all committees: some respondents claimed that their committees had to spend between 1 and 5 days to implement the results of the Exercise.

*b) Most and Least Rewarding Aspects of Participation*

Because of their significant contribution to the Exercise, Steering Committee members were asked to comment on the most rewarding and least rewarding aspects of their participation in the Reallocations Exercise. A number of respondents reported that the Exercise had allowed them to gain a better understanding of the research being conducted in their communities and their vision for the future. Others stated that they were pleased to contribute to their discipline and its scientific direction, especially in cases where the discipline received funding as a result of the Exercise. Respondents also enjoyed the social and creative aspects of the submission development process, stating that they liked interacting with other members of the Steering Committee and developing something new and exciting.

As can be expected, the least rewarding aspect of the Reallocations Exercise for Steering Committee members was the workload and time commitment required of them. In addition to this, other members found the process and rules unclear, and found it difficult to balance the diverse viewpoints of their community. Several respondents stated that their efforts had been met with little support or appreciation from their community, and that they did not enjoy feeling responsible for the results of the exercise, given the lack of input from colleagues. Finally, some respondents mentioned

problems within the committee such as a lack of leadership or conflicts between committee members, as well as difficulties encountered in developing interdisciplinary proposals.

Readiness of SC members to participate again or of GSC members to serve on committee

When asked whether they would agree to participate again in the exercise in the same capacity, most Steering Committee members said that they would not, mainly due to the workload and the responsibility that this role entails. Others stated that in order to remain relevant, the Exercise requires the participation of a number of researchers, and that they wouldn't participate again to make room for others. Some respondents felt that they hadn't received enough support from NSERC or from their university, and that the results obtained in the end were disappointing and had not warranted the effort that they had put into their tasks.

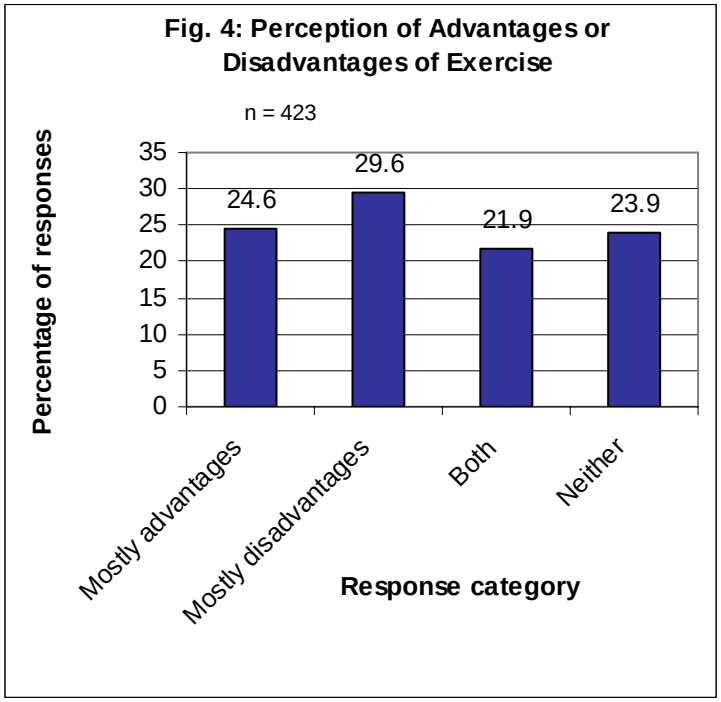
Among those who would sit on a Steering Committee again, some respondents said that they would do so out of a feeling of responsibility towards the system that provided them with funds for research, because they felt that it was important to help the granting agencies make strategic investments, and because they had enjoyed interacting with other committee members. Others indicated that they would participate again, but only if major changes were made to the reallocations process.

Grant Selection Committee members were asked if they would agree to sit on a Steering Committee. Again, more members said that they probably would not, because of the workload involved and the perceived lack of impact of the results. Others felt that they did not have the required knowledge or skills to participate, or that they had other priorities. The GSC members who were willing to sit on a Steering Committee said that they would do so if asked because they saw value in contributing on a personal level, because they felt that it was their duty to participate, and because they wanted to see more mid-career researchers involved in the process. Other respondents said that they might participate, depending on the committee's composition and the workload involved.

The perceived costs and benefits of participation were also reflected in a hypothetical question posed to survey respondents about whether or not they would be willing to participate in a future Reallocations Exercise as a Steering Committee member responsible for putting together their discipline's submission. Most of the respondents indicated either a yes or a maybe, with 39.3 percent of responses each, and 21.4 percent of the respondents indicated their unwillingness to participate if asked. These results are comparable to the percentage of community members who decline NSERC invitations to

sit on the GSCs for the Discovery Grants Program.[20] No significant differences were found between universities, GSCs, discipline groupings, years of NSERC funding, prior knowledge of the Exercise, or awareness of the results of the Exercise (n = 423).

When asked to elaborate on why they would be willing to participate or not, respondents explained that they do want to contribute to the Exercise in order to ensure that their discipline remains relevant and adapts to change in the national scientific landscape. However, the respondents also raised concerns over the workload associated with the Exercise as well as their personal ability to contribute to the Exercise effectively given their personal circumstances (i.e., new faculty member, close to retirement, etc).




Costs and Benefits to Disciplines

Survey respondents were asked whether there have been significant advantages or disadvantages to their discipline because of the Reallocations Exercise. Figure 4 summarizes the distribution of responses to this question.

[20] *Final Report on the Evaluation of the Research Grants Program* (2003) http://www.nserc.gc.ca/pubs/rg_table_e.htm

These findings demonstrate that respondents had mixed opinions about whether or not the Reallocations Exercise had resulted in significant advantages or disadvantages to their discipline. An interesting finding is that a significant difference was found in this assessment when respondents were grouped according to general disciplines ($\chi^2 = 57.750$, df = 12, $\alpha = 0.01$). Life Sciences respondents indicated that the Exercise mostly had disadvantages for their discipline (39.5%), Physical Sciences respondents indicated that their discipline had mostly advantages and mostly disadvantages in equal numbers (30.6% each), respondents in Mathematics and Computational Sciences indicated that the Exercise had been mostly advantageous to their discipline (48.6%), and Engineering respondents were divided fairly evenly across all four response categories, with a slightly higher percentage for "Neither" (30%). Not surprisingly, these findings are in line with the results of the Exercise over the years in terms of net dollars gained or loss by each discipline. Because so few respondents identified themselves as belonging to the Interdisciplinary Committee (n = 3), their responses are not reported here.

Another interesting aspect raised in some of the interviews with NSERC employees is the supportive nature of the comments received from external referees in the second and third Exercises. These comments pointed to the fact that Canadian research is well-regarded internationally, and the Steering Committees received very encouraging feedback from their international colleagues. However, this benefit was overshadowed by the controversial results of the exercises and the limited dissemination that occurred as a result.

Summary of Findings (Section 3.2.1)

The Reallocations Exercise offers certain benefits for those who participated as Steering Committee members. For instance, interview respondents reported gaining a better understanding of their discipline, as well as enjoying the social and creative aspects of the submission development process. Some benefits were also identified at a disciplinary level, such as funding increases and the positive feedback received from international referees. The Exercise also resulted in some broader benefits for specific disciplines, who were able to turn a poor result in one exercise into a powerful incentive for their members to engage in strategic planning and coordinated efforts in subsequent exercises.

The most important cost of the Exercise is undoubtedly the time commitment required of its participants, especially Steering Committee members responsible for the development of the submissions. The Exercise's design requires volunteers to take on

the considerable task of developing each submission: Steering Committee members spent from one week to over four months working on the Exercise, with Chairs spending the most time. There was general agreement amongst respondents that the time spent away from research was the most negative consequence of their participation in the Exercise and was identified as an important detractor for potential Steering Committee members. A secondary but important cost of the Exercise appears to be the frustration and personal stress experienced by SC members faced with the responsibility of a poor outcome for their discipline in the Exercise, coupled with low levels of support from their communities and little recognition of their efforts.

Finally, it should also be noted that the operational cost of the Exercise was estimated to be similar to the actual amount of funding to have changed disciplines in each of the exercises. Taken with the personal costs described above, it can be concluded that the costs of the Exercise as it is currently designed outweigh its benefits.

### 3.2.2 Timeframe

***Is the current timeframe of five years appropriate/inappropriate?***

The lines of evidence used to answer this question include the document review as well as interviews with GSC members, Steering Committee members, and NSERC staff and management.

The initial timeframe of four years was based on advice received from NSERC Council prior to the first Exercise. Council felt that it was realistic to ask each discipline to present a vision of what it hoped to achieve in the next four years, whereas a longer timeframe would have been less practical. Furthermore, the four-year period tied in well with the four-year grant cycle used in the Discovery Grants Program, and so it was expected that the Exercise would be easier to manage and fairer to applicants who would then apply once in each reallocations period.[21] The timeframe was recently changed to five years, in order to follow the change in grant cycle made in the Discovery Grants program.

For the most part, Steering Committee members and Grant Selection Committee members found that the five-year timeframe is appropriate for the Exercise. The

[21] *Questions and Answers on the Reallocations Exercise* (1998) http://www.nserc.gc.ca/programs/qasen.htm

opinions on whether to make the Discovery Grants and the Reallocations Exercise follow the same cycle were mixed: some thought that they should have the same cycle to be fair to all researchers, while others felt that this was not needed.

As for those who felt that five years were not appropriate, only a minority of respondents felt that the timeframe should be shorter. Among respondents who were supportive of a longer timeframe, most felt that disciplines do not evolve quickly enough to warrant a five-year planning horizon, and that more time was necessary to properly evaluate the impact of the last Reallocations Exercise on the disciplines themselves. Some of the interviews with NSERC staff indicated that a shorter but different process may be useful in future Exercises. They felt that the Exercise could be conducted in a more incremental manner, adjusting for specific factors on a smaller scale. For instance, discipline growth could be reviewed annually without the input of the community, while other issues could be reviewed on a longer timeframe.

A review of exercises similar to Reallocations was undertaken in order to identify the timelines used in other countries. The closest approximation to NSERC's Reallocations Exercise is the Balance of Portfolio exercise undertaken by the U.K.'s Engineering and Physical Sciences Research Council (EPSRC). The Balance of Portfolio exercise is conducted over two years, the Strategy Year and the Assurance Year.[22] Because this process is somewhat different than the NSERC process, the two year timeframe does not allow for further comparison with the Reallocations Exercise.

Summary of Findings (Section 3.2.2)

The timeframe used in the Reallocations Exercise was first selected because it was deemed most appropriate for disciplinary strategic planning and because it would follow the Discovery Grants Program cycle. For the most part, Steering Committee members and Grant Selection Committee members found that the five-year timeframe is now appropriate for the Exercise. However, opinions on whether to make the Discovery Grants and the Reallocations Exercise follow the same cycle were mixed: some thought that they should have the same cycle to be fair to all researchers (who normally apply once in each reallocations period), while others felt that this was not needed. Some of the interviews with NSERC staff indicated that a shorter but different process may be preferable in future Exercises. This type of model has been used to some extent in other countries, although none of the reallocations processes in place internationally offered a complete model that could be emulated by NSERC.

[22] EPSRC, E-mailed documents.

### 3.2.3 Importance to Canada

***In the last two exercises, GSCs were asked to explain why it was important for Canada that the research communities under their purview receive some of the reallocated funds. To what extent is this approach appropriate/inappropriate?***

The lines of evidence used to answer this question include the document review as well as interviews with GSC members, Steering Committee members, Reallocations Committee members, and NSERC staff and management.

History of the Criteria Used by the Reallocations Committee)

The first Reallocations Exercise focused on four criteria in the assessment of the submissions. These criteria echoed those used in the review of individual applications by Grant Selection Committees, and were outlined as follows:

- Overall quality of the research in a discipline according to international standards (40%);
- The relative cost of research (15%);
- The training of Highly Qualified Personnel in relation to the supply/demand situations (20%); and,
- Discipline dynamics, which takes into account a discipline's growth, emerging areas of research, and national interest in such research (25%).

It should be noted that the 1994 Allocations Committee, despite having it as a criterion at the start of the Exercise, did not use the "relative cost of research" criterion in its assessment because it did not feel comfortable discriminating among disciplines on this a basis.

After the first exercise, it was determined that the best course of action would be to ask the GSCs to submit proposals that focused on the importance of their discipline to Canada. It was felt that the former criteria resulted in an exercise that ranked the disciplines, and that a ranking of specific funding proposals would represent a better approach and would at least partly avoid putting the emphasis on the quality of disciplines themselves. The criterion of "importance to Canada" was meant to be interpreted broadly, taking the following factors into consideration:

- Vision for the discipline in Canada, specific emerging areas, the strength of the discipline and priorities for the future, the international context of the research, interactions with other research communities and the users of the research, and the benefits to Canada of training in the discipline;
- Strategy for future development of the discipline, including major research questions to be addressed, and the benefits to Canada of pursuing them (e.g., advancement of knowledge, training, social, environmental or economic impacts);
- The degrees to which each proposal supported the vision for the discipline, the feasibility of implementing the proposal, the likelihood it would help achieve the vision, and the importance to Canada of funding that specific proposal.[23]

The original criteria are no longer part of the official assessment process of the Reallocations Committee. The Reallocations Exercise reports published for the last two exercises do not specify why such a change was made, although it is widely believed that the main reason for this change was the discomfort felt by NSERC in the disciplinary rankings that occurred as a result of the process.

In the third Exercise, the main criterion was again the importance to Canada of the discipline and this iteration of the exercise also allowed Steering Committees to submit joint "interdisciplinary" submissions.

The Reallocations Committee did not include members with expertise in all areas and thus felt strongly that its evaluation should focus on the information and arguments presented in the submissions and joint proposals. Although members were free to bring their own knowledge and perceptions about the importance and contributions of different research areas to the table, it was the submissions and joint proposals themselves that were judged.[24]

A review of all of the Reallocations Committee reports for the last two exercises reveals, however, that the four original criteria were very much a part of the assessment process. The specific proposals included in each submission often focus on the cost of research, the training of HQP, or discipline dynamics. In the reports produced by both the second and third Reallocations Committees, comments almost invariably focus on the quality of the research conducted by members of a given discipline, and considerable use is made of the external referee comments in the assessment of the quality, productivity, and overall health of the discipline. The importance of the discipline to Canada appears to be one of the primary considerations behind the Committee's overall assessment, although

[23] *NSERC Report on the 1998 Reallocations Exercise* (1998), Process, p. 4-5.
[24] *NSERC Report on the 2002 Reallocations Exercise* (2002), Process, p. 6-7.

it is rarely discussed in the Committee's justification for supporting or not supporting specific proposals.

It should be noted that a cursory comparison of the funds reallocated to each discipline and the use of the four original criteria as a basis for specific proposals did not yield any significant results. In other words, disciplines who presented specific proposals focusing on the increasing cost of research, the need for HQP training or changing discipline dynamics did no better or no worse than the disciplines whose specific proposals focused on the development of target areas deemed important to Canada.

The review of the 1998 and 2002 Reallocations Committees comments on each submission made it clear that each Committee used its own set of criteria to evaluate the submissions – it was, however, less clear whether these criteria were applied systematically to each submission and whether the interpretation was consistent from one submission to the next. Some of the criteria most cited in the Reallocations Committee reports include (in no particular order):

- accomplishments of outstanding researchers;
- links between overall vision for the discipline and the specific proposals;
- academic reputation and productivity of researchers in the discipline;
- costs of research;
- strong, focused vision;
- growth of the discipline;
- interdisciplinarity;
- international standing of the discipline;
- success in implementation of the results of the last exercise; and,
- referee comments.

In addition to these, both the 1998 and 2002 Reallocations Committees commented extensively on the relationship between the researchers and the user community as proof of relevance and quality of research and on the emerging areas identified in the submissions. The Reallocations Committee also commented on the quality of the submission itself and provided feedback on aspects of the submission that did not meet its standards.

Usefulness of Current Criterion

The most important benefit of the approach used in the last two exercises, raised by RC, SC, and GSC members, was that the criterion of "importance to Canada" might be of interest to policymakers, and so might help NSERC garner more support from Parliament. Several interview respondents found that this criterion was reasonable and useful, and some stated that it had helped the Steering Committees articulate the benefits of their research to the country. Interestingly, most of the respondents who found that the criterion was reasonable and appropriate were either Steering Committee members or Grant Selection Committee members, although the opinions were somewhat mixed in those two groups. Reallocations Committee members did not, for the most part, believe that the criterion had been helpful to them in reallocating funds because it was so broad. Several members of the Reallocations Committee stated, in fact, that the Committee had not used this criterion in its analysis of the submissions. The opinions of NSERC staff and managers were mixed on this issue, with some respondents indicating a clear preference for the original criteria because of their perceived objectivity and ease of quantification, while others felt that the broader criterion used in the last two exercises provided the disciplines with the necessary freedom to make the best possible case for funding, and did not give certain disciplines more advantage in the process than others.

Suggested Criteria

Several suggestions were made on potential criteria for the assessment of the submissions. Reallocations Committee members emphasized that the excellence of the discipline or the quality of the research should be considered, as well as a focus on interdisciplinary research and government priorities in specific fields of research. They also suggested that the assessment process should be based on scientific indicators, with data provided by NSERC. In addition to these, other criteria suggested by Steering Committee and Grant Selection Committee members include disciplinary growth and need for funds, the application of the research to broad societal problems, and international impact. They also suggested that whatever criteria are used be clearly defined by NSERC, and that the Exercise should take into account the differences between science and engineering quality indicators.

Several letters were sent to NSERC following the last exercise to share the concerns of community members on the criteria used to evaluate the submissions. Some community members closely involved with the Exercise suggest that at least part of each reallocation be based on discipline growth or contraction as well as research excellence. The number of new applicants in a given field was recommended as one useful and simple measure

of importance to Canada.[25] Other criteria also suggested in feedback sent to NSERC include the relative cost of research in the discipline, and the availability of other sources of funding.[26]

Survey respondents were also asked what criteria should be considered in a reallocation of funds. The following eight factors were identified as particularly important (n=442):

- Discipline dynamics (24.4%);
- Impact on Canada (18.6%);
- Scientific excellence of the discipline and its researchers (17.2%);
- Emerging research areas (12.7%);
- Need for funds (7.2%);
- Costs of research (6.3%); and,
- Maintaining a balance between basic and applied research (3.4%).

Some of the criteria identified through the interviews and survey have been put into question by NSERC respondents. In particular, the criteria of research excellence and cost of research have proven to be difficult to quantify in the past, and lend themselves to different interpretations. For instance, research excellence can be either encouraged or rewarded, while the cost of research is difficult to measure objectively. Others commented on discipline dynamics, indicating that although this should be a factor in the reallocation of funds, it should not only be defined in terms of student enrolment in certain disciplines. Other definitions of discipline dynamics could be used, such as the demand for graduates in certain areas of the job market, and the type of research environment for the future in Canada that NSERC wants to support. Finally, one NSERC respondent suggested that international benchmarking should be included in future exercises in order to add a quantitative component to the process and to reduce the influence of "human elements" on the final reallocation decisions.

Summary of Findings (Section 3.2.3)

The criteria used by the Reallocations Committee in the assessment of submissions have changed over the years, from a set of four specific, weighted criteria to one broader criterion of "importance to Canada." Although there is some agreement over the appropriateness of such a criterion for political purposes, it has been of little use to the

[25] *Letters to NSERC from Members of the Community*
[26] *Letters to NSERC from Members of the Community*

last two Reallocations Committees, who have instead used other criteria similar to those used in the first exercise. However, because there were no clear guidelines on the use of other criteria, these have been applied inconsistently across submissions and exercises, and thus no clear trend can be observed in the Reallocations Committee report. The use of such a broad criterion also resulted in confusion among some Steering Committee members who stated that they were unable to identify on what grounds their submissions would be assessed.

Several criteria have been suggested for future consideration. Discipline dynamics was mentioned most often; others include the quality of research, interdisciplinary research, and need for funds. The importance to Canada criterion was retained among these suggestions, but only as one of a set of criteria. Finally, an important comment made in interviews and in the survey raises the need to have clearly defined criteria, whatever these may be.

### 3.2.4 Use of Specific Proposals

***Is the process of asking GSC-based Steering Committees to put forward specific funding proposals appropriate/inappropriate?***

The document review and key informant interviews of GSC members, Steering Committee members, and Reallocations Committee members were used as lines of evidence for this question.

Specific Proposals

The opinions of Reallocations Committee members on the usefulness of specific proposals were mixed. Several respondents felt that specific proposals had been used extensively by the committee in its decision-making process, and that they had allowed the committee to learn more about each discipline. Others felt that the specific proposals were inconsistent and varied widely between disciplines, and so were not useful to the committee. Furthermore, some committee members felt that the specific proposals were sometimes at odds with the general submission. With respect to the general principle of using specific proposals in Reallocations Exercises, RC committee members felt that the specific proposals put too much focus on "trendy" areas of research, and that they "tie the hands" of the GSCs, which can lead to further imbalances between disciplines.

Many community members identified the use of specific proposals as a hindrance to the equitable reallocation of funds between disciplines in their letters to NSERC. Some letters explained that with suitable funding, GSCs are best placed to respond to changing pressures within their discipline and to direct funds as needed. The perception

of most writers is that funding targeted areas within a discovery-based program does little to encourage research in these areas and is probably better suited to applied programs such as NSERC's Strategic Project Grants program.[27]

Other letters sent by community members focused on the format of the submissions themselves, and the way in which they were developed. Some of these researchers believe that success in the Reallocations Exercise depends primarily on the ability of the specific individuals on the Steering Committee to argue for the funding of the proposals that they have developed.[28]

A review of the implementation of the results of the third Exercise suggests that the majority of GSCs allocated their "reallocations dollars" in supplements of $5,000 or less. The dollars earmarked for new applicants were allocated in the same manner - those GSCs that received funding for first-time applicants incorporated these funds in their usual budget for new applicants. These GSCs awarded average supplements of $4,000 to new applicants.

In summary, the evaluation findings suggest that the specific funding proposal process does little to steer Canadian research in certain directions. The reallocations dollars are usually distributed in small, incremental amounts and this limits the impact that they might have. The findings from the key informant interviews and document review also suggest that the community typically perceives the specific proposals as a mechanism to create further competition within each GSC, based on certain strategic directions – in the view of the community, this is counter to the nature of the Discovery Grants program which supports long-term, basic research programs.

Overall Reallocations Process

When asked about the overall Reallocations process, RC members felt that the considerable variation in the quality of the submissions and the fact that small amounts of money were actually reallocated in the end were most important in calling for a significant change in how the Exercise is conducted. They also stated that the methodology used to assess and score the specific proposals was inefficient and that strong opinions and personalities within the Reallocations Committee had a significant impact on the results. Suggestions for improvement made by RC members included: giving time to the Reallocations Committee before the review to meet and establish clear evaluation criteria, which could then be communicated to the Steering Committees as

[27] *Letters to NSERC from Members of the Community*
[28] *Letters to NSERC from Members of the Community*

they develop their submissions; using the strategic plans developed by each university; and having NSERC staff collect data on each discipline prior to the exercise.
Steering Committee members shared much of the same opinions on the reallocations process as RC members. They were slightly more positive about the general principles of the Exercise, stating that a proposal-based approach focused the Exercise and made it easier to reallocate funds. However, Steering Committee and Grant Selection Committee members also felt that the methodology used to assess and score proposals was flawed, and that there had been considerable variation in the quality of the submissions. They attributed this to the fact that some Steering Committees had hired science writers to develop their submissions. SC members also stated that the pressure and workload of individual authors had been overwhelming. In terms of the general process used in the Exercise, SC and GSC members felt that the specific proposals requirement is at odds with the fundamental principle on which the Discovery Grants program is based, that of funding a research program rather than projects, and that a project-based approach made follow-up and implementation by the GSCs difficult.

Steering Committee and GSC members suggested that clear criteria should be provided to the committees and that the procedure used by the RC in its decision-making should be communicated and transparent. They also suggested that aspects common to all committees, such as HQP training, should not be eligible as specific proposals, and that NSERC should provide background data on each discipline. Finally, one respondent suggested that reallocations should be done between NSERC programs rather than within the Discovery Grants program.

Summary of Findings (Section 3.2.4)

The use of specific proposals is an integral part of the design of the Exercise. In some cases, they were found to be useful by the Reallocations Committee as an additional source of information in the decision making process. Many Steering Committee members, however, found them difficult to develop given the lack of clear guidance on what they should include and how they should be presented. A widely-shared perception in the scientific community is that the reallocations decisions were mainly based on the quality of the writing used in the submissions, regardless of what had been proposed. The evaluation findings also reveal that the specific funding proposals had the effect of creating smaller competitions within GSCs for the proposed funds. However, these had a limited impact because of the small amounts of funding allocated through this process. In addition to this, the findings from the key informant interviews suggest that the specific proposal mechanism runs counter to the philosophy of the DG program, which is to support long term programs of basic research.

### 3.2.5 Use of Steering Committees

***Based on the three exercises to date, is it effective to use Steering Committees to develop the documents on which the Exercise is based, and which go to the Reallocations Committee?***

The document review and interview findings were used to formulate an answer to this question. This question is closely related to the issue of the criteria used in the Exercise, discussed in section 3.2.3.

Although several respondents recognized the need for a group of champions to undertake the submission development process, the major problems raised by almost all respondents about the use of Steering Committees were difficulties associated to obtaining feedback from the community and on the workload required of SC members. Beside those two main problems, other difficulties raised included: finding members to sit on the Steering Committee, representing diverse communities, reaching consensus on priorities, and getting all of the SC members together at the same time. More specific problems brought up by individual respondents include problems with interpretation of NSERC rules and procedures, time spent away from research, and the stress of potential backlash from the community if the submission is not successful.

Respondents provided several suggestions to change or improve the use of Steering Committees in the Exercise, such as using GSC members who have just completed their three-year term to write the submission, putting the Exercise in the hands of Council rather than a separate Reallocations Committee and basing the decisions of Council on data provided by NSERC staff, dealing with discipline dynamics outside of the reallocations process, and hiring consultants to develop the submissions in conjunction with Steering Committees. Finally, some respondents suggested the development of group or individual proposals for specific target areas identified by NSERC rather than the discipline-based process used in past exercises.

In the end, the continued use of Steering Committees will likely depend on the specific changes made to the reallocations process. Although the use of Steering Committees can be problematic in some instances, this aspect of the Exercise cannot change given the current process. An earlier discussion of the costs and benefits of the Exercise (see section 3.2.1) has already raised the tremendous cost to individuals sitting on Steering Committees, and should be taken into consideration in future iterations of the Exercise.

Another related set of comments made by NSERC employees pertains to the use of a Reallocations Committee as a core component of the Exercise. It was suggested that the RC membership could be expanded to include economists who would be in a position to

comment on the submissions in terms of socio-economic benefits to Canada and offer a critical perspective on the areas of research identified by the Steering Committees. It was also suggested that NSERC staff could be part of the decision-making process and determine in part how reallocations will be made.

Summary of Findings (Section 3.2.5)

The continued use of Steering Committees will likely depend on the specific changes made to the reallocations process. Although several respondents recognized the need for a group of champions to undertake the submission development process, the major problems raised by almost all respondents about the use of Steering Committees were difficulties associated to obtaining feedback from the community and the workload required of SC members. Respondents provided several suggestions to change or improve the use of Steering Committees in the Exercise, such as using GSC members who have just completed their three-year term to write the submission, putting the Exercise in the hands of Council rather than a separate Reallocations Committee and basing the decisions of Council on data provided by NSERC staff, dealing with discipline dynamics outside of the reallocations process, and hiring consultants to develop the submissions in conjunction with Steering Committees.

### 3.2.6 Heterogeneity of GSC

***Is there a bias in the Reallocations process against GSCs that are more heterogeneous (i.e., those GSCs where constituents are from a variety of fields)?***

The document review, the survey of research community members and interviews with GSC members, Steering Committee members and NSERC staff and managers were used as lines of evidence for this question.

Identification of Homogeneous GSCs

An analysis of the degree to which each GSC is homogeneous for the purposes of this evaluation was first undertaken by identifying the home departments of their constituents, using data from the 2003 Discovery Grants competition. The GSCs with a high number of applicants stemming from a single type of department were deemed to have a high degree of homogeneity. Alternately, GSCs whose constituents were located in a wide variety of departments were deemed to have a low degree of homogeneity. It was determined by NSERC staff that the data from one competition would provide a

reasonable sample for this matching exercise, although it is understood that the validity and reliability of such a measure may be limited by other factors. Table 6 summarizes the findings of this analysis by degree of homogeneity.

*Table 6: Degree of Homogeneity of GSCs*

| High | Medium | Low |
|---|---|---|
| Statistical Sciences | Psychology | Plant Biology & Food Science |
| Space, Astronomy & Relativity | Mechanical Engineering | Chemical & Metallurgical Eng. |
| Subatomic Physics | Civil Engineering | Earth Science |
| Chemistry | | Evolution & Ecology |
| Physics | | Industrial Engineering |
| Computer Science | | Cell Biology & Genetics |
| Electrical & Computer Eng. | | Animal Biology |
| Mathematics | | |

In order to get a better sense of whether homogeneity had an impact on the results of the Reallocations Exercise, a second analysis was conducted, this time on the mean ranking of GSCs with high, medium, and low degrees of homogeneity. Table 7 summarizes the findings of this analysis.

*Table 7: Average Rank of Disciplines By Degree of Homogeneity*

| Exercise | High Homogeneity n= 9 | Medium Homogeneity n=3 | Low Homogeneity n=7 |
|---|---|---|---|
| 1994 | 10,2 | 9 | 10,3 |
| 1998 | 8 | 14 | 10,9 |
| 2002 | 5,1 | 12,3 | 15,3 |
| Total | 7,1 | 11,6 | 13 |

An examination of the Spearman correlation coefficients between the Degree of Homogeneity variable and the discipline rankings in each of the exercises revealed that only the third Exercise was significantly correlated to the degree of homogeneity (Spearman coefficient = 0.85; $\alpha = 0.01$). In other words, the degree of homogeneity of the disciplines is correlated with the reallocations results in the third Exercise. This is consistent with the mean rankings observed for disciplines in each of the high, medium, and low homogeneity groups in 2002. A significant correlation was also observed between the combined discipline rankings for all three exercises and the degree of homogeneity (Spearman coefficient = 0.49; $\alpha = 0.05$); however, this is most likely due to the high correlation observed in the third Exercise and should be interpreted in this light.

Advantages of Homogeneity vs. Heterogeneity

Most interview respondents felt that homogeneous GSCs had an advantage over more heterogeneous GSCs in the Reallocations Exercise. In the opinion of respondents, this was mainly due to the fact that disciplines that regroup fewer or more cohesive areas of research are more likely to be organized, have an established network and communications protocol, and can more easily express a common voice in their submissions. Along the same lines, a majority of respondents also felt that it is more difficult for disciplines that combine several GSCs or areas of research to find a common voice and a single vision. Reallocations Committee members also added that it was more difficult for them to understand the submissions of heterogeneous areas that cover a wide range of activities.

A few survey respondents (n=15) also commented on the homogeneity of the disciplines, although this was not asked explicitly in the questionnaire. These individuals commented on the fact that their discipline may have been at an advantage or disadvantage compared to other disciplines because of their degree of homogeneity. The issues raised by respondents about the positioning of their discipline in the Canadian research community focused mainly on broad comparisons between the results of the Exercise for entire groups of disciplines, such as life sciences and engineering, rather than on the more specific differences that may exist between them.

Summary of Findings (Section 3.2.6)

The degree to which a discipline is homogeneous generally appears to have an impact on the results of the Reallocations Exercise. The analysis conducted by NSERC staff on homogeneity supports this claim, especially when considering the results of the last Exercise, where GSCs identified as having a high degree of homogeneity had a mean ranking of 5,1, compared to 12,3 for those with medium homogeneity and 15,3 for those with low homogeneity. This conclusion is further substantiated by the interview and survey findings, which indicate that researchers believe that homogeneous GSCs have an advantage over heterogeneous GSCs in the Exercise. In the opinion of respondents, this was mainly due to the fact that disciplines that regroup fewer or more cohesive areas of research are more likely to be organized, have an established network and communications protocol, and can more easily express a common voice.

### 3.2.7 Use of Submissions in Assessment

***Should the Reallocations Committee base its recommendations mostly on the quality of the specific submissions, or should they be based on an overall assessment of the relative importance of the areas represented by the individual GSCs? If the latter, how should "relative importance" be determined?***

Data from the document review and interviews with Steering Committee and Reallocations Committee members were used to answer this question.

The current process is based on the development of a submission by each discipline and so the review mainly focuses on the information and arguments presented in the submissions. In the second and third exercises, members of the Reallocations Committee were encouraged to focus their assessment on the content of the submissions themselves, although they could also use their own knowledge of the different research areas if needed. The use of the submissions as a basis for judgment was presumed to be most fair, although the evaluation findings point to certain limitations that should be considered in the development of new guidelines for the Exercise. These limitations are highlighted throughout the following paragraphs.

Opinion of Community Members

Opinions on this matter were somewhat mixed. On one hand, interview respondents advocated the use of the quality of the specific submissions as a criterion for reallocation felt that this was the fairest way to judge the submissions from the different disciplines, and that the submissions were a good way to communicate a discipline's vision and plans for the future to the Reallocations Committee. On the other hand, interview respondents who preferred an overall assessment of each discipline felt that the RC should have all available sources of information at its disposal, not just information from the Steering Committees, and other respondents stated that past Reallocations Committees had actually considered other criteria, such as discipline dynamics and research excellence, and so the submissions were actually not an important factor in the decisions made by the committee. Several respondents also argued that an emphasis on the quality of the submissions may provide an unfair advantage to the "better writers" or the more "imaginative" authors and may not properly focus on the potential research outcomes of the submissions.

Several respondents provided suggestions on alternative approaches. Reallocations Committee members suggested that NSERC should develop clear rules to help the

disciplines build good cases, that disciplines should be weighted according to size and growth, and that Steering Committee members should work with NSERC Program Officers while developing their submissions. Steering Committee members suggested that NSERC staff should present information to Council, who would then be charged with making reallocation decisions, and that NSERC should identify target research areas to which individuals and groups could submit specific proposals.

International comparison of methods used for similar exercises

In an effort to better understand what other reallocations mechanisms used in Canada and in other countries, strategies for reviewing and reallocating funds amongst disciplines or programs were examined as part of the document review.

*a) National Research Council Canada*

Although no information was found supporting the fact that NRC reallocates funds in a systematic manner between its institutes, strategic investments have been made to support specific areas of science. For instance, some funding has been reallocated to the Genomics Health Initiative, and NRC piloted a technology foresight project as part of the FINE initiative (Federal Innovation Networks of Excellence) in order to identify the most promising areas of technological development for the next two decades.[29]

*b) Engineering and Physical Sciences Research Council (UK)*

The "Balance of Portfolio" exercise undertaken by EPSRC was reviewed as part of the evaluation study. This exercise is conducted over two years, the Strategy Year and the Assurance Year.

In the Strategy Year, the focus is on EPSRC's portfolio as a whole (top-down approach) rather than on individual areas of research (which are called programs by EPSRC). To facilitate the process during the Strategy Year, two advisory panels (the Technical Opportunities Panel, made up of members of the academic sector, or TOP, and the User Panel, or UP, whose membership is drawn from the EPSRC user sectors) receive program business plans from each research area, that include new and existing program activities as well as contextual data. The contextual data provide an overview of the characteristics of EPSRC's portfolio in relation to its strategic plan objectives, the balance of expenditure between different mechanisms and also the relationship between its support and that available at a national and international level. Any significant reallocation of resources between programs takes place during the Strategy Year.

[29] http://www.nrc-cnrc.gc.ca

The purpose of the Assurance Year is to review EPSRC's portfolio from a 'bottom-up' perspective and examine the extent to which each program is achieving its targets and contributing to the organization's strategic objectives. The inputs to the Assurance Year are program targets set as a result of the previous Strategy Year exercise, contextual data and program assessments. A program assessment is conducted to analyze each program based on data and supporting information. The Assurance Year review acts as an audit of the program business plans relative to the status and requirements of each program and its ability to responsive, to manage, and to support interdisciplinary research and training. The main output of the Assurance Year is a commentary on the overall balance of the portfolio and the ability of programs to achieve their aims, targets and objectives.

In both years, the inputs provided by EPSRC program managers are reviewed and assessed by the Technical Opportunities and User Panels using the criteria outlined below. The same criteria are used for the Strategy and Assurance years, but not all the criteria are of equal importance and relevance in both exercises. Each criterion is scored from 1 to 10, where 1 is low and 10 is high. The criteria used by the review committees are as follows:

- scientific opportunity/quality
- balance between 'high-risk' and 'safe' science
- longer-term economic and/or social need
- ability of UK to exploit results
- need for trained people
- relevance to mission
- leverage of additional funding/criticality of EPSRC funding.[30]

*c) National Science Foundation (US)*

The NSF does not have a specific process entirely dedicated to the reallocation of funds from one discipline to another. The NSF makes a budget request every year to Congress, which highlights specific priority areas in which investments will be made over the year.

Some evidence that a reallocations process does occur, however, can be found in the NSF literature. For example:

- *In FY 2003, reallocations will be made within the PACI program to provide operations support for the first Terascale Computing Facilities;*

[30] (http://www.epsrc.ac.uk/website/default.aspx?CID=10478&ZoneID=6&MenuID=119) and documents provided by EPSRC via email.

- *FY 2003 increases, with some reallocation of base funds, include support of:*
    - *The Nanoscale Science and Engineering priority area, for nano-manufacturing, covering nano-features enhancement in micro/meso products and devices, nano-assembly and connectivity, nano-process control and nano-system integration;*
    - *Biocomplexity in the Environment research, to achieve an environmentally sound and economically attractive manufacturing enterprise;*
    - *The Information Technology Research priority area, for research leading to productivity gains in manufacture and service enterprise systems such as health care delivery;*
    - *The Mathematical Sciences priority area, for engineering research on modeling nonlinear systems and scalable manufacturing enterprise systems;*
    - *Engineering sensor systems research, to design and manufacture products that can protect and trigger corrective steps in advance of catastrophic failures; and*
    - *The Small Business Innovation Research (SBIR) program and the Small Business Technology Transfer (STTR) program.*[31]

*d) Deutsche Forschungsgemeinshaft (Germany)*

Another interesting initiative is the Deutsche Forschungsgemeinshaft (DFG) Priority Program. The purpose of the Priority Program is to advance currently relevant fields in science and the humanities by encouraging coordinated, interdisciplinary, national and international cooperation between outstanding researchers. The DFG's Senate is responsible for deciding on the establishment of Priority Programmes. Its decision is based on a review which compares all incoming program proposals. The DFG Senate may establish Priority Programs when the coordinated support given to the area in question promises to produce particular scientific gain. Generally, Priority Programs receive funding for a period of six years. Once the Senate has established the program, the DFG announces a call for proposals.[32] The proposals must address the following criteria:

- Novelty of the proposed project both in Germany and in an international context
- Clear short- and medium-term objectives
- Synergy: Concept and resources to facilitate collaboration

[31] (http://www.nsf.gov/pubs/2006/nsf06553/nsf06553.htm)

[32] http://www.dfg.de/en/research_funding/coordinated_programmes/priority_programmes/priority_programme_in_brief.html

- Qualifications of the coordinator
- Measures to promote young researchers
- International involvement and visibility
- Placement within the context of other funding activities.

e) FutuRIS (France)

FutuRIS is a large scale foresight exercise conducted by *l'Association nationale de la recherche scientifique*. Its main objective is to bring together the main players in the French research and innovation system and to encourage reflection on the future challenges and priorities of the system. This process takes place over three years and has three specific goals: to define the country's strengths and weaknesses as well as emerging trends in research and innovation, to identify the areas most important to the French system of research and innovation, and to suggest improvements to the system.

The exercise is carried out by working groups made up of researchers, administrators and policymakers, who meet and discuss specific issues in one of three categories. The first category focuses on challenges, and features the excellence of the system, its economic competitiveness, society's expectations towards technology and innovation, and international dynamics. The second category focuses on specific areas of the system, and includes working groups on the synergy between teaching, research, and innovation, human resource management in a research context, and innovation funding. Finally, the third category focuses on research sectors and includes working groups on nanotechnology, biotechnology, space and weaponry, software, pharmaceuticals and chemicals, and air transportation. It is expected that the process will result in an integrated vision for the future and the identification of the mechanisms through which this vision will be achieved.[33]

*f) Foresight Program (UK)*

The goal of the Foresight Program is to increase UK exploitation of science. The Foresight program either identifies potential opportunities for the economy or society from new science and technologies, or it considers how future science and technologies

[33] http://www.operation-futuris.org/

could address key future challenges for society.[34] The approach used in this program involves bringing together key individuals in a given field, who then tackle a current or future issue through a Foresight Project. Foresight Projects are funded by the UK government and obtain funding and support through a competitive process, based on a series of criteria that focus on the ability to put together a group of experts willing to contribute to the project, as well as the significance and current importance of the scientific developments occurring in the given area of the project. It is expected that each project will yield information on recent developments in science and technology, including an international perspective, and a forecast of what future developments might be. The projects should also propose recommendations for action by policy makers, research funders, and businesses, and create networks of people who recognize the importance of the issues raised by the project and who can take the recommendations forward. The overall aim of this initiative is to inform decision makers such as funding agencies and to influence their directed programs, but it is not to determine priorities among disciplines as such.

Summary of Findings (Section 3.2.7)

The current process requires the Reallocations Committee to distribute funds based mainly on the submissions provided by the Steering Committees. However, an overall assessment based equally on the submission and on other sources of information may prove to be useful in future Exercises, given some of the more problematic aspects of the submissions, such as the influence of the text's quality. Most of the suggestions made on the reallocations process are based on the use of submissions as well as other evidence, such as NSERC-collected data on various indicators. Other mechanisms in use internationally focus largely on the identification of national priorities for research rather than the reallocation of funding within one budget envelope, and so offer no single methodology for NSERC's reallocations process. However, some of these mechanisms, such as one used by the EPSRC (UK), provide some options that could be considered in future Exercises.

### 3.2.8 Impact on Engineering and Applied Sciences

***Does the Reallocations process work against engineering and the applied sciences? If so, how can NSERC ensure that appropriate measures are applied to these areas?***

The lines of evidence used to answer this question include the document review, the survey of community members and interviews with GSC members, Steering Committee

[34] http://www.foresight.gov.uk/

members, Reallocations Committee members, as well as NSERC staff and managers. It should be noted that specific data on applied science are difficult to collect because applied science is an inherent part of each discipline. Therefore, the evaluation team decided to focus this section of the report on the engineering Grant Selection Committees.

Results of Three Exercises for Engineering Committees

The reallocations results across all three exercises were identified for all engineering GSCs. Table 8 presents the rank and average results for the five GSCs.

*Table 8: Combined Results for Engineering GSCs*

| GSC | Rank | Avg Chg |
|---|---|---|
| ECE | 1/19 | 8.1 |
| CME | 8/19 | 1.7 |
| ME | 11/19 | -0.7 |
| IE | 16/19 | -1.4 |
| CE | 18/19 | -3.0 |

Overall, no specific trend can be detected across the three exercises for all of the engineering committees, with some receiving a considerable amount of reallocated dollars and some losing a substantial percentage of their budget.

Feedback from Reallocations Committees

The first Exercise was generally more beneficial to engineering committees, with all of them ranking between 1st and 12th overall. The comments obtained from the Reallocations Committee do not provide useful information about whether or not engineering research in general was deemed important to Canada and valuable in its own right.

In the second Exercise, four of the five engineering Steering Committees received feedback on their respective fields' impact on the user sector. This feedback was mostly negative, in the sense that the Reallocations Committee felt that the Steering Committees had not clearly established a link between their research activities and the impact on their user sectors. Overall, however, it appears that the Reallocations Committee carefully considered the indicators of excellence most relevant to the engineering or

applied sciences disciplines in its assessment of these fields. In addition to this, the main critiques offered by the Reallocations Committee of the engineering disciplines were similar in nature to those provided to other disciplines. They focused mainly on the quality of the submissions, and on a general lack of detail.

The feedback received from the Reallocations Committee in the third Exercise suggests that innovation was considered more carefully in 2002 than in previous exercises. In particular, several comments were made pertaining to the impact of the disciplines on the Canadian economy as well as to industry linkages and collaboration. Four of the five engineering Steering Committees received positive feedback on these issues and on their general impact on the user sector. Once again, the main critiques offered by the Reallocations Committee about the submissions echoed those provided to other disciplines, such as a lack of detail and a lack of strategic direction.

The feedback provided by the Reallocations Committees in all three Exercises therefore appears to be fairly balanced. Factors that are important to engineering and applied sciences were often mentioned both for engineering and other areas in positive or negative ways as appropriate. In the third Exercise, the feedback reveals a stronger focus on innovation for all disciplines. Therefore, it can be concluded from this analysis that the engineering or applied sciences committees were not at an advantage or disadvantage compared to other disciplines.

Perceived Advantages and Disadvantages

Interview respondents who were identified as belonging to an engineering or applied science GSC were asked if they thought that there was a difference between these disciplines and other disciplines in terms of the Reallocations process. Perhaps not surprisingly, most respondents indicated that there was a difference, although for different reasons. Some respondents felt that the quality of engineering or applied sciences submissions was inconsistent, and that the Exercise itself was biased against these areas because it rewards scientific awards and prizes more than technology transfer and job creation. Other respondents, who felt that the Exercise was not biased against engineering and applied sciences, felt that engineering and applied sciences could more easily communicate the relevance and applicability of their work in the submissions, and that the indicators for success and excellence were essentially the same across disciplines, including engineering and applied sciences.

Although no specific questions were included in the survey about the results of the Exercise for Engineering and other applied sciences, several respondents from all disciplines made two observations regarding potential advantages or disadvantages to these areas of research. Comments received in a number of open-ended questions illustrated the perception of respondents that applied sciences were better served by the Reallocations Exercise than were the more traditional areas of research. It would appear therefore, that unless some engineering and other applied disciplines combine many different sub-disciplines, they are not perceived by the community to be at a clear disadvantage compared to the other, more fundamental disciplines.

Summary of Findings (Section 3.2.8)

Two arguments have emerged from the review of the evidence gathered for this evaluation question. The first is that engineering and the applied sciences disciplines have an advantage over others in the Exercise because it is easier for them to demonstrate their relevance to Canada's economy, and so they are better able to fulfill the requirements of the "importance to Canada" criterion. The second argument, however, is that the engineering and applied sciences are at a disadvantage in the Exercise because the actual criteria used by the RC, such as quality of research, are not measured in the same way for these fields as for other disciplines. This argument was not found to be accurate based on the written comments provided by the Reallocations Committee, which often focused on elements relevant to the engineering and applied sciences (i.e. impact on the user sector and the national economy). The range of results in terms of rankings of the engineering committees across all three exercises further supports the fact that there was no systematic disadvantage to these committees, since some gained while others lost in all three exercises.

## 3.3 Outcomes (Success)

### 3.3.1 Objectives Achievement

***Is the Reallocations Exercise achieving its stated objectives?***

The lines of evidence used to answer this question include the document review, the survey of community members and interviews with GSC members, Steering Committee members, Reallocations Committee members, as well as NSERC staff and managers.

Results of the Reallocations Exercises

In order to assess whether or not the objectives of the Reallocations Exercise have been achieved, it is important to consider the overall budget changes that have resulted from each iteration of the Exercise. Table 9 summarizes the percentage of budget change for each discipline for all three exercises individually and the average change over the three exercises.[35] The committee with the greatest average gain, Electrical and Computer Engineering, received $3.67M over the 13 years of the Exercise.

*Table 9: Budget Changes Resulting from Reallocations Exercises*

| Discipline | 1994 (%) | 1998 (%) | 2002 (%) | Average (%) |
|---|---|---|---|---|
| Electrical & Computer Engineering | 8.3 | 10.9 | 5.0 | 8.1 |
| Computing & Information Sciences | 5.9 | 9.8 | 5.3 | 7.0 |
| Chemistry | 7.0 | 5.2 | 5.6 | 5.9 |
| Statistical Sciences | 3.6 | 8.2 | 1.3 | 4.4 |
| Cell Biology/Molecular & Developmental Genetics | 3.7 | 10.0 | -5.1 | 2.9 |
| Psychology | 2.3 | 8.2 | -3.2 | 2.4 |
| Condensed Matter Physics | -8,5 | 6.4 | 9.2 | 7.8 |
| Chemical & Metallurgical Engineering | 4.3 | 5.8 | -4.9 | 1.7 |
| Space, Astronomy & Relativity | 2.0 | 3.3 | -1.8 | 1.2 |
| Subatomic Physics | -8.5 | 4.2 | 3.3 | -0.3 |
| Mechanical Engineering | 2.6 | -2.6 | -2.2 | -0.7 |
| Plant Biology and Food Science | -5.8 | 4.2 | -0.8 | -0.8 |
| General Physics | -8.5 | 4.2 | 1.0 | 2.6 |
| Evolution and Ecology | -2.9 | 6.4 | -6.9 | -1.1 |
| Mathematics | -8.5 | 4.0 | 1.0 | -1.2 |
| Industrial Engineering | 2.4 | -1.8 | -4.7 | -1.4 |
| Integrative Animal Biology | -4.3 | -0.2 | -2.5 | -2.3 |
| Civil Engineering | -1.4 | -5.8 | -1.8 | -3.0 |
| Earth Sciences | -4.3 | -1.6 | -3.7 | -3.2 |

Published Objectives of the Exercise

The two published objectives of the Exercise are "to ensure that the Discovery Grants program remains dynamic and responsive to changes in the various disciplines and in the research environments" and "to provide a mechanism for national planning and priority setting for science and engineering research in Canada." The perception of the

[35] The results are presented in the table according to the Steering Committee structure used in the third Reallocations Exercise.

community-at-large on the extent to which these two objectives have been met was assessed in the survey. Table 10 presents a summary of the percentage of responses on a rating scale ranging from 1 for "not at all achieved" and 7 for "achieved to a great extent" for each objective as well as their mean ratings and standard deviations.

*Table 10: Degree to which objectives were achieved*

| Objective | Not at all achieved 1 – 2 (%) | Somewhat achieved 3 – 5 (%) | Achieved to a great extent 6 - 7 (%) | Don't Know | Mean | Std. Deviation |
|---|---|---|---|---|---|---|
| to ensure that the DG program remains dynamic and responsive to changes in the various disciplines and in the research environments (n=347) | 10.4 | 53.7 | 16.2 | 19.6 | 5.2 | 2.3 |
| to provide a mechanism for national strategic planning and priority setting for science and engineering research in Canada (n=330) | 13.9 | 47.0 | 13.5 | 25.5 | 5.3 | 2.5 |

Other ratings and comments provided by survey respondents on a series of questions indicate that, in general, they agree with the objective of ensuring that the Discovery Grants program remains dynamic and responsive to changes in the various disciplines and in the research environments. However, even though most respondents stated that the second objective of the Exercise, to provide a mechanism for national strategic planning and priority setting for science and engineering research in Canada, is also being achieved to some extent by the Reallocations Exercise, not all respondents agree with the fundamental idea that the Exercise is the best mechanism for achieving this objective, especially given other existing initiatives both at NSERC and through other government programs.

A study submitted to NSERC by Peter Abrams and Richard Palmer on behalf of one of the Steering Committees examined the correlation between the rankings of GSCs on each of the three exercises conducted to date.[36] These researchers questioned whether the reallocations process has consistently and progressively diverted funding from less promising to more promising areas of science. The authors examined the budget changes of different areas of science, defined as Grant Selection Committees in successive exercises. They hypothesized that if the relative importance or promise of different areas of science changes slowly, on the scale of five to ten years, then the reallocations made in successive exercises should exhibit a strong positive correlation. The analysis revealed that, contrary to what had been hypothesized, the rankings of

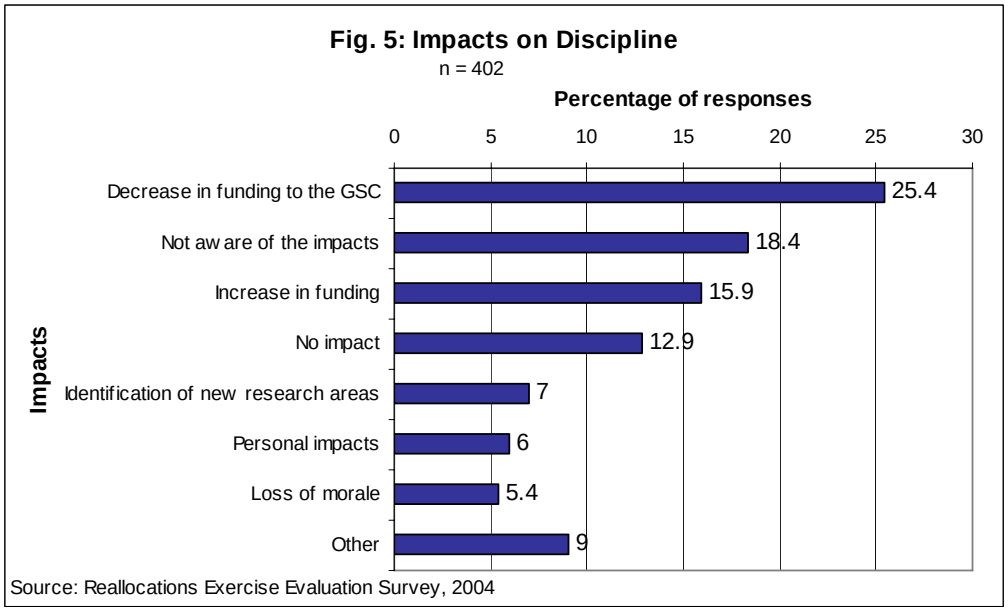
[36] *Letters to NSERC from Members of the Community*

different GSCs in successive Reallocations Exercises were not significantly correlated. Therefore, according to this study, the Exercise does not appear to adequately meet either of its two main objectives. It should be mentioned, however, that the study considered all three exercises as being equivalent. This was not the case since the second and third exercises were based on different criteria. Nevertheless, all three exercises have a common purpose (to reallocate money among various disciplines according to changing needs and priorities); whether this was done according to a set of criteria or according to specific funding proposals is therefore not critical in the analysis presented in the study.

Impact of Reallocations Exercise

The impact of the Reallocations Exercise on the disciplines was explored further in the community survey. One of the survey questions required respondents to assess what the impact of the Reallocations Exercise had been on their discipline. The question was entirely open-ended and did not focus on either costs or benefits. However, most of the impacts cited by respondents did provide a good illustration of the advantages and disadvantages of the Exercise and cover those already mentioned in previous sections.

Figure 5 summarizes the comments made by respondents to this question:



Most interview respondents felt that the Exercise had no major impact on community members, which suggests that it has not achieved its objectives. The most important impact reported was low morale in disciplines that had lost funds. As one respondent stated, "Impacts were probably more negative than positive because those who got funded probably thought that they deserved it, whereas the others were very dismayed". Other impacts identified by respondents include some difficulty in implementing the specific proposals as well as the heavy workload required of Steering Committee members.

These opinions were echoed in letters received from community members and associations; these letters questioned the Exercise's design in relation to its published objectives,[37] and criticized the results of the Exercise and the lack of correlation in the results of one Exercise to the other.

Unintended Outcomes

Perhaps the main unintended outcome of the Exercise has been that it has changed the way in which GSC budgets are managed. According to internal documents on the budget calculation process,

> In the past, a GSC's budget was determined by its share of the program budget which in turn was derived from the sum of awards in that GSC as a percentage of the program budget. Competition budgets were determined by subtracting installments from the GSC's total budget (Allotment) for that year… Now, a GSC's budget is determined every four years. The resulting envelope must be managed over the cycle to balance, as much as possible, the budget pressures in each competition and to ensure that all researchers applying during a given cycle can be affected by the results of the Reallocations Exercise.[38]

In order to identify other unintended outcomes of the Exercise, the annual reports completed by GSCs after each competition were reviewed. The unintended outcomes most commonly cited in these documents included alterations to the historical grant levels in each GSC due to the supplements provided in certain areas by the Exercise, the difficulty for GSCs in differentiating between high quality researchers not working in strategic areas and less experienced researchers working in strategic areas funded by the

[37] *Letters to NSERC from Members of the Community*
[38] *GSC Budgets – Documentation on Process and Calculations* (1999), NSERC internal document.

Exercise, as well as shifts in policies in terms of awarding reallocated funding to new researchers and the imbalances that this creates upon renewal.[39]

Summary of Findings (Section 3.3.1)

An analysis of the results of the three exercises suggests that 16 of the 19 Grant Selection Committee budgets stayed within 4% of their original budget in each of the three Exercises. In addition to this, the lack of consistent results across Exercises has yielded little by way of clear trends and strategic priorities. Therefore, it seems as though the Exercise has had little overall impact on the disciplines and on individual researchers, aside from those involved in the reallocations process. After three exercises, the more relevant question may be whether the reallocations mechanism has had a real impact on the Canadian research landscape. The evidence obtained on this matter as part of the evaluation study suggests that there has been little impact so far. The unintended outcomes of the Reallocations Exercise on the GSCs who are responsible for the implementation of its results include alterations to the historical grant levels in each GSC due to the supplements provided in certain areas by the Exercise, the difficulty for GSCs in differentiating between high quality researchers not working in strategic areas and less experienced researchers working in strategic areas funded by the Exercise, as well as shifts in policies in terms of awarding reallocated funding to new researchers and the imbalances that this creates upon renewal.

### 3.3.2 Dissemination Mechanisms Used

***Communications is an unstated objective of the Reallocations Exercise. Should it be made explicit? Should the submissions be used to communicate the successes of Canadian research to decision makers and the public?***

The lines of evidence used to answer this question include the document review, the survey of community members and interviews with GSC members, Steering Committee members, Reallocations Committee members, as well as NSERC staff and managers.

Effectiveness of dissemination mechanisms used

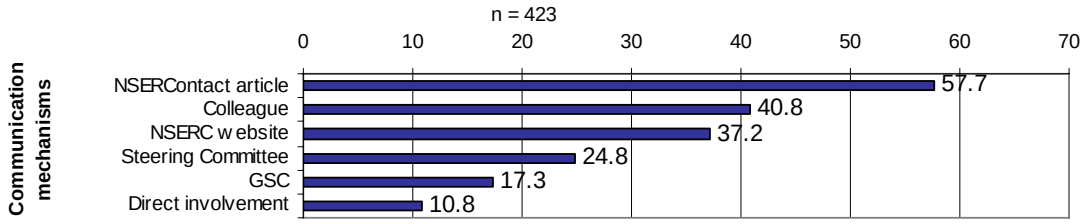
Overall, interview respondents felt that the results of the Reallocations Exercise have been communicated fairly well through some of the usual channels of communication

[39] Annual Reports (2004), GSC 20, GSC 32, GSC 334, GSC 335.

employed by NSERC, such as *NSERC Contact* and university information sessions. Some respondents also appreciated the feedback provided by the Reallocations Committee: "I was very appreciative of the response to each submission given by the Reallocations Committee; it left people with some degree of satisfaction in terms of knowing how their work was received."

Along the same lines, survey respondents were asked to indicate how they had heard about the Reallocations Exercise. Figure 6 summarizes the findings for this question:

**Fig. 6: Communication About Exercise**




Source: Reallocations Exercise Evaluation Survey, 2004

Therefore, the survey data confirm that NSERC initiatives to inform community members about the Reallocations Exercise, such as *NSERC Contact* and the website seem to be effective in reaching a considerable proportion of researchers. As can be expected, personal networks are also effective in generating and providing information about the Exercise, whether this occurs informally between colleagues, or as part of the Reallocations process itself.

Respondents who reported a lower level of knowledge about the Reallocations Exercise (i.e., aware of the Exercise or somewhat knowledgeable) also reported in greater numbers that they learned about the Exercise through the NSERC website, *NSERC Contact*, or from a colleague. Those who reported a higher level of knowledge about the Reallocations Exercise (i.e., somewhat knowledgeable or highly knowledgeable) indicated that they mostly learned about the Exercise through their involvement in a GSC, when they were consulted by the Steering Committee responsible for the submission for their discipline, or because they were directly involved in the Exercise. These findings are not surprising, given that a higher level of involvement results in a higher level of knowledge about the Exercise. The percentage of respondents for each of these categories is presented in Table 11. Note that respondents were able to select more than one category for this question. Results in "other" include all response categories not included in the original survey instrument.

*Table 11: Communications Mechanism by Level of Knowledge of Exercise*

| Communications Mechanism | Highly Knowledgeable (%) | Somewhat Knowledgeable (%) | Aware of the Exercise (%) |
|---|---|---|---|
| NSERC website | 20 | 50 | 30 |
| NSERContact | 15 | 43 | 42 |
| From a colleague | 17 | 47 | 36 |
| Through GSC involvement | 49 | 40 | 11 |
| Consulted by Steering Committee | 43 | 45 | 12 |
| Directly involved in the Exercise | 72 | 26 | 2 |
| Other | 16 | 49 | 35 |

Types of ways in which the submissions have been used

For the most part, interview respondents were not aware of the submissions being used outside of the reallocations process. A few respondents claimed that the results had been discussed at various meetings, or that some members used sections of it in various documents about the discipline and in their grant applications. One of the original plans was to publish the submissions in groups and share them with relevant stakeholders in government organizations, but this has not been done. An attempt was made to reach stakeholders across the federal government in order to assess whether the submissions had been useful to them, but no information was received from the contacted parties.

Summary of Findings (Section 3.3.2)

Interview and survey results confirm that the results of the Reallocations Exercise have been disseminated to the broader research community fairly well through the usual channels. Other than site visits, however, most of the dissemination is done through one-way communication, in various broadcasts to the community (such as the NSERC website and newsletter). The low degree of awareness of the Exercise in the general research community indicates that these dissemination mechanisms are not entirely successful, especially compared to more interactive mechanisms such as meetings or site visits to the universities. An important issue highlighted in both the interviews and the survey was the lack of awareness of further use of the submissions, beyond their use in the Exercise. This may be due to a lack of use of the submissions, or to a lack of awareness about their use. Given the comments of those closest to these submissions, the SC members, it is safe to conclude that the submissions have been used very little beyond the Exercise for which they were developed.

# 4.0 Discussion

The following discussion is based on the evaluation findings reported in the previous section and reflect the evaluation team's conclusions on the Reallocations Exercise and its future.

It should be stated that the findings clearly suggest that NSERC still requires a mechanism through which its allocations to Grant Selection Committees are systematically reviewed, in order to adapt to the evolving context of Canadian research. However, the findings also identify problematic issues concerning the reallocation process and this has led the evaluation team to recommend that the Reallocations Exercise, in its current form, be terminated.

## 4.1 Rationale for the current format of the Exercise

The results of the evaluation show that both the research community and NSERC staff recognize the need for a systematic review of the allocations made to each GSC. However, in retrospect, it appears as though the original rationale for the mechanism used to reallocate funds within the Discovery Grants program may no longer be relevant.

The Reallocations Exercise was created in 1992 to overcome the limitations of the former allocations mechanism, which was mainly based on university hiring practices. The new Exercise allowed increased input from the research community and provided a longer planning horizon for each discipline's operations. In addition to this, it was also meant to eliminate some of the major disadvantages of the previous system, such as the "personalization" of grants, the loss of funds to a committee when grantees left the system and the stigma attached to previously unsuccessful applicants who "brought" no money to a GSC. Although the documents resulting from the newly-created Exercise, which outlined a vision for the future of each discipline, were considered important additions to the planning efforts of the GSCs, the results of the Exercise did not reveal a clear direction for future research funding. Furthermore, the problems of "personalization" of grants and the stigma attached to previously unsuccessful applicants remained through the Reallocations Exercise process.

A formal mechanism such as the Reallocations Exercise has the advantage of clearly demonstrating NSERC's responsiveness to a changing research environment. However, the amount reallocated in each Exercise (10% of each GSC budget), when compared with federal investments made in targeted areas such as genomics, climate and atmospheric sciences or in programs such as CFI and CRC, is insufficient to influence the direction taken by the disciplines. Therefore, although the Exercise fulfills its objective of

accountability, it does not fulfill its primary mandate of reacting to the specific needs experienced by the disciplines in a significant manner.

## 4.2 Rationale for Termination of the Reallocations Exercise

The objectives of the Reallocations Exercise are to ensure that the Discovery Grants program remains dynamic and responsive to change in the various disciplines and in the research environment and to provide a mechanism for strategic planning of Canadian basic research in the NSE, involving the research community on a national basis. The evaluation findings reveal that neither of these two objectives were fully achieved over the course of the three exercises. Some of the major findings related to this issue are summarized below:

- The number of dollars having actually changed hands in each of the three exercises is approximately $6M; this represents about 23% of the total amount available for reallocation.

- The costs associated with the Exercise outweigh its benefits. Therefore, NSERC must find alternate ways of demonstrating the flexibility of the DGP to respond to various priorities in the research environment.

- The total amount of funding available for reallocations is insufficient to influence the research direction of a given discipline and to support emerging areas that overlap several "traditional" disciplines.

- The submissions have not been used for purposes other than the reallocation of funds, which suggests that the Exercise had little influence on the planning and direction of NSE research in Canada. Moreover, the strategic planning initiatives used in the Chairs and CFI programs are institution-based, and so may be more effective given the diversity in needs and expertise from one region to another.

- The task of Steering Committees to come up with strategic directions for their disciplines was found to be extremely challenging. The submissions, while interesting and relevant, cannot generally be considered as "community" documents. Obtaining the buy-in of the various communities in such documents would require much more work in terms of consultation and interaction. It is not realistic to expect such efforts from the research community itself, with the resources currently provided for the reallocations process.

- The Exercise requires the disciplines to compete one against the other for a set amount of funding. Each discipline is assessed them only through its written submission. This is inconsistent with the objectives of the Exercise, and

consequently, the second and third exercises did not result in priority-setting amongst and between Grant Selection Committees.

- The use of specific funding proposals within each of the submissions did not have the expected result. Small incremental supplements only were provided to individual Discovery Grants program applicants. The allocation of such small supplements limited the impact of the Reallocations Exercise and increased the complexity of the GSC competition process.

### 4.3 Discipline Dynamics

The evaluation results revealed that discipline dynamics (variations in the number of individuals applying to and receiving grants over time) is considered important by the research community in the allocation of funds. Discipline dynamics could be assessed on an annual basis by using available NSERC data. This would allow for regular adjustments to increasing or decreasing numbers of applicants in each GSC and would not require significant input from the research community. When considering discipline dynamics in its GSC budget allocation, NSERC could also take into account the size of the different populations of researchers, the number of HQP degrees granted, or the demand for HQP in the marketplace.

An internal budget reallocations process based at least partly on discipline dynamics would also have to consider to some extent the strategic planning done by universities, since this has a direct impact on the number of new applicants to the Discovery Grants program each year. Therefore, the evaluation team recognizes the merit of considering discipline dynamics as one criterion in the reallocation of DGP funding, although it should not be the only criterion considered.

# 5.0 Recommendations

The recommendations proposed in this section were developed with the primary intent of reducing the involvement of the research community, while meeting the Exercise's joint objectives of accountability and priority-setting. Two options for a revised reallocations process are presented along with more specific recommendations to the current process, should it be retained by Council.

Before a decision can be made concerning the next iteration of the Exercise, it is recommended that NSERC carefully review the two objectives currently guiding the Exercise and select one as a main, intended objective. In other words, the joint objectives of accountability and priority-setting are sometimes at odds with one another, and so only one of the two should prevail as the main objective of the Exercise. This will guide the changes made to the current Exercise and will make the Exercise and NSERC's goals more transparent to the research community.

## 5.1 Corporate Approach to Strategic Planning (Option 1)

This option focuses on strategic planning at a corporate level rather than being restricted to the Discovery Grants program. This option has several components: adjustment of GSC budgets through discipline dynamics analysis, strategic planning through the use of an expert committee, and modifications to the annual reports produced by the GSCs. The process recommended for this approach is outlined in the paragraphs below.

### 5.1.1 Strategic Planning and Decision-Making

The strategic planning and decision making required to establish funding priorities for NSERC could be made through some of its other programs, such as the Special Research Opportunities (SRO) program or the NSERC Innovation Platforms (NIP) program. While the Strategic Project Grants (SPG) program already involves the identification of target or priority areas, it may not be appropriate for strategic planning of basic research given its partnership requirement. Therefore, a proactive approach involving the SRO or NIP programs may be a more interesting avenue for a corporate strategic planning process. In this scenario, an expert committee, composed of senior university, government and private sector administrators, would become an advisory committee to Council and would therefore provide recommendations on specific priority areas for investment based on the expertise and knowledge of its members. A detailed analysis of university strategic plans submitted in the context of the CFI and Chairs programs would also conducted by NSERC staff to complement the work of the Reallocations Committee.

### 5.1.2 Discovery Grants Program

Because the Discovery Grants program is a large, "demand-driven" program, the reallocation of funding should be determined in part by changes in demand over time. In other words, discipline dynamics should be one of the principal factors on which a budgetary reallocation to the DG program is based. Changes to the GSC budgets could thus be made annually to ensure that the program remains flexible, and to support fast-growing disciplines in a timely fashion.

A secondary mechanism through which funds could be reallocated within the Discovery Grants program is the consideration of the cost of research in different disciplines. NSERC could conduct studies on a regular basis in an effort to better understand the cost of research associated to different areas and reallocate funding based on the results of these studies. The cost of research in each discipline was a criterion in the first Exercise; however, the results obtained at the time were inconclusive and this criterion was not retained in subsequent exercises. The interviews with NSERC managers conducted as part of the evaluation revealed that NSERC staff may be better able to identify the costs associated with research in various disciplines at this point in time, and so this criterion should be considered once again.

### 5.1.3 GSC Annual Reports

This option also involves the modification of the requirements and guidelines for the annual reports produced by GSCs . Aside from commenting on the overall competition context, the GSCs would also be asked to comment on the evolution of research within their discipline and to report on emerging areas or other factors that influence research in their areas. NSERC could therefore build a case for increased funding from the federal government based on these reports.

### 5.1.4 Interdisciplinary Research

The evaluation findings reveal that one of the most significant changes in the research environment over the last ten years is the increased focus on interdisciplinary research and on the integration of research areas. These issues have not been addressed consistently by the Reallocations Exercise, even though the third Exercise allowed Steering Committees to put forward joint proposals. The objective of this approach was to encourage and support emerging fields which are often situated between several disciplines; however, the response from the Steering Committees to this option was modest, with only five joint proposals. The proposed option is more likely to generate interest in interdisciplinary research, since the Reallocations Committee would be

composed of experts in different areas of science policy and research, and so could offer more of a broad perspective through which interdisciplinary areas would be identified.

*Conclusion – Option 1*

This option is based on the joint assumption that the GSCs are able to adjust to changes in their environment and that the strategic priorities which will guide NSERC are best determined through the consultation of expert policymakers, researchers, and university administrators. While it would be preferable to implement this option on the basis of new funding, funds could be taken from various NSERC programs in order to fund the strategic areas identified by the expert committee. Regardless of the source of funding, however, it should be noted and recognized that the funds required for such a priority-setting exercise must be significant enough to have an impact. This option is endorsed by the evaluation team as most likely to produce the desired results of the Exercise.

## 5.2 Priority Setting within the Discovery Grants Program (Option 2)

This option is similar to Option 1, except that it involves the Discovery Grants program only. The new Reallocations Committee would make specific recommendations to Council on priorities for basic research funding, as described above. Discipline dynamics would remain a factor, but the GSCs linked to the priority areas identified would receive additional funding. Once again, 10% appears to be a reasonable amount for reallocation. Specific weighing would be given to both discipline dynamics and degree of relevance to priority areas.

Alternately, once Council has approved the new priority areas, a call for proposals could be issued to the research community and funding would be allocated by the Reallocations Committee to the GSCs that make the best case for relevance to these priority areas. This scenario would imply that Steering Committees would have to be formed and that a "competition" would be launched among GSCs. The evaluation team does not recommend such an approach because of the problematic issues linked to the use of Steering Committees presented in the findings section of this report.

## 5.3 Status Quo

If Council determines that the Exercise's current format should be retained, the evaluation team brings forward the following recommendations for improvement:

NSERC should provide clear criteria to the Steering Committees responsible for developing the submissions. Although the "importance to Canada" criterion allows each discipline to make the best possible case, the inconsistency found between the submissions has resulted in a call from the community for clear, transparent

guidelines. It is further recommended that the Reallocations Committee be responsible for the development of the criteria, and that these should be communicated to the Steering Committees at the beginning of the process.

The Reallocations Committee could comment on submission drafts, both to establish benchmarks for the final decision-making process and to allow Steering Committees to improve unclear statements in their briefs.

The Exercise should make use of the strategic plans developed by the universities as a critical element in determining which areas of research to support.

NSERC should take on more responsibility for the Exercise and collect data prior to each cycle. These data could then be forwarded to the Steering Committees, who would have the opportunity to justify their submissions in light of this information or to refute the data in their briefs.

The Exercise should focus on the vision of the disciplines but remove the requirement to submit specific funding proposals. The reallocations process would therefore be based on the overall GSC budget rather than on smaller supplements for specific proposals.

The membership of the Reallocations Committee could be expanded to include economists or policy makers who would be able to comment on the socio-economic benefits of the disciplines to Canada and make use of other science planning initiatives undertaken by various organizations.

Steering Committee members should continue to receive direct support from Program Officers while they are developing their submissions, to ensure that guidelines are understood clearly and followed closely.

# 6.0 Conclusion

By reallocating funds between disciplines in a systematic manner, NSERC ensures that it remains relevant and accountable to the Canadian public. However, the mechanism through which this has been done has been met with resistance from the scientific community, in part because of the workload that it represents, but also because of the lack of impact that these efforts have had in the past. The evaluation findings presented in this report cover issues of relevance, cost-effectiveness, and success. It is hoped that they will be useful in providing clear information on the strengths and weaknesses of the current process, and that the recommendations made as a result of the evaluation will be carefully considered in the design of the next iteration of the Exercise.

Regardless of the decision that will be made by Council, the evaluation team acknowledges the efforts of the many researchers and NSERC staff members who have worked diligently in conducting the last three Reallocations Exercises. Although this report recommends the termination of the current version of the Exercise, the value of these past efforts deserves recognition and appreciation by the entire research community.

# Appendix A

## List of Documents Reviewed

## Appendix A – List of Documents Reviewed

The following documents were reviewed as part of the evaluation process. These include the documents referenced throughout the evaluation report as well as other documents consulted during the evaluation.

Letters and Other Feedback from Community

- Abrams, P. and Palmer, R., *Reconsidering the NSERC Reallocations Exercises* (October 2002)
- GSC Annual Reports (Excerpts)
- *Letter to NSERC* on behalf of G-10 Universities (August 2003)
- Letters to NSERC from Members of the Community
- Summary of Meeting with G-10 Universities (October 2003)

NSERC Reports and Internal Documents

- *Report of the Allocations Committee* (1994)
- *NSERC Report on the 1998 Reallocations Exercise* (1998)
- *NSERC Report on the 2002 Reallocations Exercise* (2002)
- *Research Grants Discipline Dynamics Report* (1994, 1997, 2001)
- *Report on Highly Qualified Personnel* (2001)
- *Research Grants Program Budget Pressures* (2001)
- Brochu, M., & Williams, D., *Final Report – Environment Scan for NSERC Evaluation of the Research Grants Program* (2001)
- *Final Report for the Evaluation of the Research Grants Program* (2003)
- *First Report of the Advisory Group on Interdisciplinary Research* (2002)
- *Synthesis Report, Analysis of Technology Foresight Pilot Project* (2005)
- *GSC Budgets – Documentation on Process and Calculations* (1999)
- Proceedings of the 43rd Meeting of Council (1989)
- Proceedings of the 44th Meeting of Council (1990)
- Competition Spreadsheets and Competition Data (1994-2004)
- Feedback from GSCs (1998, 2002)
- Analysis of GSC Composition by Department (2005)
- FPAM report – Operating Budget for Reallocations Exercises (2002)
- *NSERC Contact*, all issues starting in 1990
- *NSERC Policy for Remuneration of Council and Committee Members*
- *Questions and Answers on the Reallocations Exercise* (1998) http://www.nserc.gc.ca/programs/qasen.htm
- *Analysis of Level of Homogeneity Among GSCs*, NSERC Internal Document (2005).

Reports from Other Government Departments and Agencies

- Canada Foundation for Innovation, *Policy and Program Guide* (2004)
- Canada Research Chairs Program Guide, http://www.chairs.gc.ca/ (2004)
- Council of Science and Technology Advisors, *Science and Technology Excellence in the Public Service (STEPS)*, (2001)
- Council of Science and Technology Advisors, *Building Excellence in Science and Technology - The Federal Roles in Performing Science and Technology* (2000)
- Third Year Review of the Canada Research Chairs Program (2002)
- NRC website, http://www.nrc-cnrc.gc.ca

Documents from International Agencies

- EPSRC, internal documentation provided by email and website
- DFG website
- NSF website
- FutuRIS website

# Appendix B

# Survey Instrument

**Survey on the Reallocations Exercise**

**Natural Sciences and Engineering Research Council**

Thank you for participating in this survey. Please read the following instructions before proceeding:

Instructions

- Please enter the password provided in the e-mail in the box below. This will allow you to save your responses and return to your unfinished survey later, if necessary.
- Please try to provide an answer, even if it's a short one, to all of the questions. All of your answers will be useful to us.
- Once you've finished, please click on the "Submit" button.

Password: _____

Section A – Background Information

The following questions deal with some background information that will help us better contextualize the responses that we obtain on the survey from all respondents. If you would prefer to skip ahead to the next section, please click on this **skip this section** link.

1. Please indicate your primary institutional affiliation (name of university or other post-secondary institution at which you are currently conducting research):

   Name of university/affiliation: _____

2. What Grant Selection Committee (GSC) evaluated your last grant application?

| | Name | GSC Number | | Name | GSC Number |
|---|---|---|---|---|---|
| | **Life Sciences** | | | **Mathematical and Computational Sciences** | |
| ❒ | Cell Biology | 32 | ❒ | Computing and Information Science – A | 330 |
| ❒ | Evolution and Ecology | 18 | ❒ | Computing and Information Science – B | 331 |
| ❒ | Integrative Animal Biology | 1011 | ❒ | Pure and Applied Mathematics – A | 336 |
| ❒ | Interdisciplinary | 21 | ❒ | Pure and Applied Mathematics – B | 337 |
| ❒ | Molecular and Developmental Genetics | 33 | ❒ | Statistical Sciences | 14 |
| ❒ | Plant Biology and Food Science | 03 | | | |
| ❒ | Psychology: Brain, Behaviour and Cognitive Science | 12 | | | |
| | **Physical Sciences** | | | **Engineering** | |
| ❒ | Analytical-Physical Chemistry | 26 | ❒ | Chemical and Metallurgical Engineering | 04 |
| ❒ | Condensed Matter Physics | 28 | ❒ | Civil Engineering | 06 |
| ❒ | Environmental Earth Sciences | 09 | ❒ | Communications, Computers and Components Engineering | 334 |

| | | | | | |
|---|---|---|---|---|---|
| ❒ | General Physics | 29 | ❒ | Electromagnetics and Electrical Systems Engineering | 335 |
| ❒ | Inorganic-Organic Chemistry | 24 | ❒ | Industrial Engineering | 20 |
| ❒ | Solid Earth Sciences | 08 | ❒ | Mechanical Engineering | 13 |
| ❒ | Space and Astronomy | 17 | | **Interdisciplinary** | |
| ❒ | Subatomic Physics | 19 | ❒ | Interdisciplinary | 21 |

3. For how many years have you received NSERC grant funding? _____

- ❒ 0-5
- ❒ 6-10
- ❒ 11-15
- ❒ 16-20
- ❒ more than 20

Section B – Knowledge about Reallocations Exercise

4. Prior to receiving the invitation to take part in this survey, what was your awareness/knowledge of the Reallocations Exercise?

- ❒ Highly knowledgeable
- ❒ Somewhat knowledgeable
- ❒ Aware of the Exercise
- ❒ Never heard of it before **(Skip to Q7)**

5. How did you hear about the Reallocations Exercise? Select all answers that apply.

- ❒ I read about it on the NSERC Web site
- ❒ I read about it in an NSERC *Contact* article
- ❒ A colleague told me about it
- ❒ I learned about it because I sit or used to sit on a GSC
- ❒ I was consulted by the Steering Committee responsible for the development of a submission for my discipline
- ❒ I was directly involved in the Reallocations Exercise in some capacity
- ❒ Other (please specify): _____

6. If applicable, what was your specific involvement in the Exercise? Select all answers that apply.

- ❒ Steering Committee member responsible for the development of a submission
- ❒ Reallocations Committee member responsible for reviewing the submissions
- ❒ GSC member involved in implementing results of exercise
- ❒ Provided input into the preparation of the submission for my discipline
- ❒ Other (please specify): _____
- ❒ I was not involved in the Exercise

Section C – Rationale and Goals of Reallocations Exercise

7. Do you think that NSERC should periodically review the distribution of funds for the support of basic research among the various disciplines of the natural sciences and engineering?

   ❒ Yes
   ❒ No **(Skip to Q9)**

8. If yes, what factors should be considered?

   (List factors here) _____

***End of Survey for All "Never Heard of it Before" Responses on Q4. Go to Thank you screen. All other responses continue.***

9. The specific objectives of the Reallocations Exercise are presented below. For each objective, please indicate to what extent it has been met. Rate your answer on a scale from 1 to 7, where 1 means "not at all achieved," the mid-point 4 means "somewhat achieved", and 7 means "achieved to a great extent."

a) Objective 1: to ensure that the Discovery Grants Program remains dynamic and responsive to changes in the various disciplines and in the research environments.

| Not at all achieved | | | Somewhat achieved | | | To a great extent | Don't Know |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |

b) Objective 2: to provide a mechanism for national strategic planning and priority setting for science and engineering research in Canada.

| Not at all achieved | | | Somewhat achieved | | | To a great extent | Don't Know |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |

10. Please comment on your ratings and list any objectives that you feel might be missing from the list. (*insert text box*)

## Section D – Impacts of Reallocations Exercise

11. In your opinion, what has been the impact of the Reallocations Exercise on your discipline? Please explain your answer. *(insert text box)*

12. Please indicate your level of agreement with each of the following statements, using a scale of 1 to 7, where 1 means "strongly disagree," the mid-point 4 means that you neither agree nor disagree, and 7 means "strongly agree."

| | Strongly Disagree 1 | 2 | 3 | Neither 4 | 5 | 6 | Strongly Agree 7 | Don't Know |
|---|---|---|---|---|---|---|---|---|
| The Reallocations Exercise provides a useful framework for directing funds towards emerging research priorities. | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |
| The Exercise fosters interaction and communication within disciplines or sub-disciplines. | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |
| The submissions prepared by Steering Committees are useful tools in promoting Canadian science and engineering in specific areas. | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |
| The Reallocations Exercise is a useful tool to assist planning within universities or other organizations. | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |
| Other (please specify): _____ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ | ❒ |

13. Do you feel that there have been significant advantages or disadvantages to your discipline because of the Reallocations Exercise?

- ❒ Mostly advantages
- ❒ Mostly disadvantages
- ❒ Both
- ❒ Neither

14. Please explain your answer for the previous question. *(insert text box)*

15. Which of the following statements regarding the results of the Reallocations Exercise best applies to you?

- ❒ I received information directly regarding the results of the Exercise
- ❒ I looked up the Reallocations Exercise results on the NSERC Web site
- ❒ I'm not aware of the results of the last Exercise
- ❒ Other (please specify): _____

16. If you were asked to be part of a Steering Committee responsible for putting together the submission for the GSC in your discipline or sub-discipline, would you be willing to participate?

    - ❒ Yes
    - ❒ No
    - ❒ Maybe

17. Why/Why not? *(insert text box)*

18. Do you have any other comments regarding the Reallocations Exercise? *(insert text box)*

Thank you screen

Thank you very much for submitting your completed survey. Your responses will only be used for the purposes of evaluating the Reallocations Exercise. We appreciate your time and input. If you have any questions about this survey or the evaluation, please contact Isabelle Bourgeois, A/Chief, Evaluation, at 613-995-1818 or by e-mail at isabelle.bourgeois@nserc.ca.

# Appendix C

# Interview Protocols

# Reallocations Exercise Evaluation

## Interview Protocol: Reallocations Committee Members

Thank you very much for agreeing to participate in this interview. We are interested in gathering information about various aspects of the Reallocations Exercise in order to systematically evaluate its impacts. This interview is part of the multiple lines of evidence that we will use to evaluate the Exercise. The information that we receive from you will be treated as confidential and your comments will not be linked to your name in the evaluation report. If at any time you are not comfortable with answering one of our questions, just let us know and we will move on.

The interview should take about 40-45 minutes.

### Rationale Behind the Reallocations Exercise

First, I'd like to ask you about Canadian science in general and how the Reallocations Exercise fits into this landscape. Since the first Exercise was conducted in 1994, several initiatives have been implemented to improve the state of research in this country, such as the Canada Foundation for Innovation and the Canada Research Chairs.

1. In your opinion, what other changes have occurred that have improved the state of research? How has research evolved over the last 10 years?

2. Do you think that an exercise like Reallocations is still needed, given the changes that you just described? Why/Why not?

### Process

Next I'd like to ask you a few questions about the process used for the Reallocations Exercise.

3. In the 1998 and 2002 exercises, GSCs were asked to explain why it was important for Canada that the research communities under their purview receive some of the reallocated funds. In other words, the exercise had one broad criterion: importance to Canada. What do you think about the use of one criterion? What other criteria should be used?

4. Can you give me an estimate of the number of hours or days that you spent working on the Exercise as a Reallocations Committee member?

5. Did you find the specific proposals included in the submissions useful in your assessment? Why/why not?

6. What is your opinion of the process used in the last Reallocations Exercise? *(Prompt: What do you think of asking GSC-based Steering Committees to put forward specific funding proposals for evaluation by a multidisciplinary panel? What do you think of the process through which proposals are evaluated?)*

7. In your opinion, should the Reallocations Committee base its recommendations mostly on the quality of the specific submissions, or should they be based on an overall assessment of the relative importance of the areas represented by the individual GSCs? If the latter: How should "importance" be determined?

8. In NSERC's current GSC structure, some GSCs are more homogeneous than others. Do you think that the homogeneity of a GSC has any effect on the success of a submission?

9. *(Only for Engineering and Applied GSC Members)* What impact, if any, does being from a GSC in engineering or applied sciences have on the probability of success of a submission?

**Outcomes of Reallocations Exercise**

Finally, I'd like to ask you a few questions about the outcomes of the Exercise and its impact on the community.

10. Can you comment on the effect of Reallocations on your discipline?

11. How well has NSERC communicated the Reallocations results to the scientific community?

12. Do you know if the submissions prepared by your discipline has been used for anything other than the Reallocations process? If so, how?

13. And, finally, do you have any other comments on the Reallocations Exercise?

Thank you very much for your thoughts. They have been extremely helpful.

# Reallocations Exercise Evaluation

## Interview Protocol: Steering Committee Members

Thank you very much for agreeing to participate in this interview. We are interested in gathering information about various aspects of the Reallocations Exercise in order to systematically evaluate its impacts. This interview is part of the multiple lines of evidence that we will use to evaluate the Exercise. The information that we receive from you will be treated as confidential and your comments will not be linked to your name in the evaluation report. If at any time you are not comfortable with answering one of our questions, just let us know and we will move on.

The interview should take about 40-45 minutes.

### Rationale Behind the Reallocations Exercise

First, I'd like to ask you about Canadian science in general and how the Reallocations Exercise fits into this landscape. Since the first Exercise was conducted in 1994, several initiatives have been implemented to improve the state of research in this country, such as the Canada Foundation for Innovation and the Canada Research Chairs.

14. In your opinion, what other changes have occurred that have improved the state of research? How has research evolved over the last 10 years?

15. Do you think that an exercise like Reallocations is still needed, given the changes that you just described? Why/Why not?

### Process

Next I'd like to ask you a few questions about the process used for the Reallocations Exercise.

16. In the 1998 and 2002 exercises, GSCs were asked to explain why it was important for Canada that the research communities under their purview receive some of the reallocated funds. In other words, the exercise had one broad criterion: importance to Canada. What do you think about the use of one criterion? What other criteria should be used?

17. Did the Steering Committee on which you were sitting experience any problems or difficulties during the Reallocations Exercise? If so, what were they? *(Prompt: Have there been any problems or difficulties related to membership, the preparation of the submission, or soliciting feedback?)*

18. Do you think that mechanisms other than Steering Committees could be used in the development of submissions?

19. In your opinion, is the current timeframe of five years appropriate? Why/why not? *(Prompt: If not, what would be a more preferable timeframe?)*

20. Can you give me an estimate of the total number of hours or days that you spent working on the submission for your discipline?

21. What were the most rewarding aspects of your work as a Steering Committee member? What were the least rewarding aspects of this work?

22. What is your opinion of the process used in the last Reallocations Exercise? *(Prompt: What do you think of asking GSC-based Steering Committees to put forward specific funding proposals? What do you think of the process through which proposals are evaluated?)*

23. In your opinion, should the Reallocations Committee base its recommendations mostly on the quality of the specific submissions, or should they be based on an overall assessment of the relative importance of the areas represented by the individual GSCs? If the latter: How should "relative importance" be determined?

24. In NSERC's current GSC structure, some GSCs are more homogeneous than others. Do you think that the homogeneity of a GSC has any effect on the success of a submission?

25. Would you be willing to serve once again on the Steering Committee for your discipline in a future Reallocations Exercise? Why/Why not?

26. *(Only for Engineering and Applied GSC Members)* What impact, if any, does being from a GSC in engineering or applied sciences have on the probability of success of a submission?

**Outcomes of Reallocations Exercise**

Finally, I'd like to ask you a few questions about the outcomes of the Exercise and its impact on the community.

27. Are you aware of how the results of the Exercise were implemented in your discipline?

28. Do you have a sense of how the Exercise has affected your discipline?

29. How well has NSERC communicated the Reallocations results to the scientific community?

30. Do you know if the submissions prepared by your discipline has been used for anything other than the Reallocations process? If so, how?

31. And, finally, do you have any other comments on the Reallocations Exercise?

Thank you very much for your thoughts. They have been extremely helpful.

# Reallocations Exercise Evaluation

## Interview Protocol: Grant Selection Committee Members

Thank you very much for agreeing to participate in this interview. We are interested in gathering information about various aspects of the Reallocations Exercise in order to systematically evaluate its impacts. This interview is part of the multiple lines of evidence that we will use to evaluate the Exercise. The information that we receive from you will be treated as confidential and your comments will not be linked to your name in the evaluation report. If at any time you are not comfortable with answering one of our questions, just let us know and we will move on.

The interview should take about 40-45 minutes.

### Rationale Behind the Reallocations Exercise

First, I'd like to ask you about Canadian science in general and how the Reallocations Exercise fits into this landscape. Since the first Exercise was conducted in 1994, several initiatives have been implemented to improve the state of research in this country, such as the Canada Foundation for Innovation and the Canada Research Chairs.

32. In your opinion, what other changes have occurred that have improved the state of research? How has research evolved over the last 10 years?

33. Do you think that an exercise like Reallocations is still needed, given the changes that you just described? Why/Why not?

### Process

Next I'd like to ask you a few questions about the process used for the Reallocations Exercise.

34. In the 1998 and 2002 exercises, GSCs were asked to explain why it was important for Canada that the research communities under their purview receive some of the reallocated funds. In other words, the exercise had one broad criterion: importance to Canada. What do you think about the use of one criterion? What other criteria should be used?

35. What is your opinion of the process used in the last Reallocations Exercise? *(Prompt: What do you think of asking GSC-based Steering Committees to put forward specific funding proposals? What do you think of the process through which proposals are evaluated?)*

36. Can you give me a rough estimate of the cost or effort required to implement the proposals funded under the Reallocations Exercise, in terms of person-hours and dollars (if applicable)? What was the impact of each of these proposals on the GSC?

*37.* In your opinion, is the current timeframe of five years appropriate? Why/why not? *(Prompt: If not, what would be a more preferable timeframe?)*

38. In NSERC's current GSC structure, some GSCs are more homogeneous than others. Do you think that the homogeneity of a GSC has any effect on the success of a submission?

39. As a GSC member, would you be willing to serve on the Steering Committee for your discipline in a future Reallocations Exercise? Why/Why not?

40. *(Only for Engineering and Applied GSC Members)* What impact, if any, does being from a GSC in engineering or applied sciences have on the probability of success of a submission?

**Outcomes of Reallocations Exercise**

Finally, I'd like to ask you a few questions about the outcomes of the Exercise and its impact on the community.

41. How did the implementation of the results of the Reallocations Exercise impact the Grant Selection Committee's deliberations during competition?

42. How well has NSERC communicated the Reallocations results to the scientific community?

43. Do you know if the submissions prepared by your discipline has been used for anything other than the Reallocations process? If so, how?

44. And, finally, do you have any other comments on the Reallocations Exercise?

Thank you very much for your thoughts. They have been extremely helpful.

# Reallocations Exercise Evaluation

## Interview Protocol: NSERC Staff and Management

Thank you very much for agreeing to participate in this interview. We are interested in gathering information about various aspects of the Reallocations Exercise. The information that we receive from you will be treated as confidential and your comments will not be linked to your name in the evaluation report. If at any time you are not comfortable with answering one of our questions, just let us know and we will move on.

The interview should take about 40 minutes.

### History of Exercise

First I'd like to ask you about the history of the Exercise.

1. To the best of your knowledge, what were the conditions that brought about the Exercise? Who decided to implement the first Exercise, and why?

2. Since the first Exercise was conducted about 13 years ago, the landscape of Canadian science has changed in various ways. For example, the Canada Foundation for Innovation and the Canada Research Chairs were created. In your opinion, what other changes have occurred that have improved the state of research? How has research evolved over the last 10 years?

3. Do you think that an exercise like Reallocations is still needed, given the changes that you just described? Why/Why not?

### Process

Next I'd like to ask you a few questions about the process used for the Reallocations Exercise.

4. In your opinion, what factors should be considered in the reallocation of funds among disciplines?

5. Can you estimate the number of hours or days that you spent working on the 2002 Reallocations Exercise?

6. In the 1998 and 2002 exercises, GSCs were asked to explain why it was important for Canada that the research communities under their purview receive some of the reallocated funds. In other words, the exercise had one broad criterion: importance to Canada. What do you think about the use of one criterion? What other criteria should be used?

7. In your opinion, is the current timeframe of five years appropriate? Why/why not? If not, what would be a better timeframe?

8. Do you think that mechanisms other than Steering Committees could be used in the development of submissions? If so, what are they?

**Outcomes of Reallocations Exercise**

Finally, I'd like to ask you a few questions about the outcomes of the Exercise and its impact on the community.

9. Do you know whether the submissions prepared by each discipline have been used for anything other than the Reallocations process?

10. *For Management Committee members only:* Who should we approach in government in order to obtain further information on the impact and communications aspects of the Reallocations Exercise?

11. And, finally, do you have any other comments on the Reallocations Exercise?

Thank you very much for your thoughts. They have been extremely helpful.

# Appendix D

## Results of 1998 and 2002 Reallocations Exercises

# NSERC - 1998 Evaluation of Reallocation Exercise

| Steering Cttee | Prop'ls | $ Requested | $ Granted | Funding Rate | % of budget | Annual Amount |
|---|---|---|---|---|---|---|
| **LIFE SCIENCE** | | | | | | |
| **Animal Biology & Physiology - *30/31*** | *2- Animal & mol. Bio.* | 2,000,000 | 908,147 | 45% | 7% | 227,037 |
| **Cell Bio.& Mol. & Dev. Genetics - *32/33*** | *1- Grant supplements* | 1,561,000 | 1,560,000 | 100% | 8% | 390,000 |
| | *2- Increase success* | 1,561,000 | 1,304,092 | 84% | 7% | 326,023 |
| **Plant Biology and Food Science - *03*** | *1- First time applicants* | 2,760,000 | 670,825 | 24% | 6% | 167,706 |
| | *5- Multidisc. Networks* | 500,000 | 500,000 | 100% | 5% | 125,000 |
| **Evolution and Ecology - *18*** | *1- Molec. Methods* | 700,000 | 700,000 | 100% | 5% | 175,000 |
| | *2- Biodiversity* | 1,200,000 | 343,575 | 29% | 2% | 85,894 |
| | *4- Climate change* | 1,400,000 | 731,471 | 52% | 5% | 182,868 |
| **Psychology - *12*** | *1- Increase ave. grant* | 2,130,400 | 1,042,455 | 49% | 10% | 260,614 |
| | *2- Imaging studies* | 450,000 | 450,000 | 100% | 4% | 112,500 |
| | | | | | | |
| **PHYSICAL SCIENCES** | | | | | | |
| **Solid Earth and Environmental - *08/09*** | *1- Artic research* | 1,213,000 | 961,675 | 79% | 5% | 240,419 |
| **Chemistry - *24/26*** | *1- First time applicants* | 3,250,000 | 3,054,326 | 94% | 10% | 763,581 |
| **Space, Astronomy and Relativity- *17*** | *2- Gemini/Satellite* | 700,000 | 579,573 | 83% | 10% | 144,893 |
| **CITA** | *3- CITA* | 268,500 | 187,314 | 70% | 24% | 46,828 |
| **Subatomic Physics - *19*** | *1- 5 year plan* | 1,200,000 | 1,200,000 | 100% | 9% | 300,000 |
| | *2- Smaller new initiatives* | 600,000 | 225,352 | 38% | 2% | 56,338 |
| **Condensed Matter - *28*** | *1- Materials research* | 1,400,000 | 490,754 | 35% | 7% | 122,688 |
| | *2- Cost of research adj.* | 1,200,000 | 328,235 | 27% | 5% | 82,059 |
| | *3- Int'l Collaborations* | 150,000 | 81,260 | 54% | 1% | 20,315 |
| **General Physics - *29*** | *1- Laser & spectroscopy* | 660,000 | 442,392 | 67% | 11% | 110,598 |
| | | | | | | |
| **MATHEMATICS & STATISTICS** | | | | | | |
| **Pure & Applied Mathematics - *336/337*** | *1- First time applicants* | 1,000,000 | 538,949 | 54% | 6% | 134,737 |
| | *3- Increase for top* | 575,000 | 323,046 | 56% | 4$ | 80,761 |
| ***(Math. Institutes)*** | *4- Plms* | 800,000 | 513,079 | 64% | 24% | 128,270 |
| **Statistical Sciences - *14*** | *1- Massive data & IT* | 170,000 | 140,486 | 82% | 3% | 35,121 |
| | *2- Genetics & medical* | 170,000 | 140,486 | 82% | 3% | 35,121 |
| | *3- Stochastic modelling* | 170,000 | 140,486 | 82% | 3% | 35,121 |
| | *4- Environmental* | 170,000 | 140,486 | 82% | 3% | 35,121 |
| | | | | | | |
| **ENGINEERING** | | | | | | |
| **Electrical and Computer - *334/335*** | *1- First time applicants* | 1,000,000 | 1,000,000 | 100% | 6% | 250,000 |
| | *3- Experimental* | 2,000,000 | 1,642,814 | 82% | 10% | 410,703 |
| **Industrial - *20*** | *1- Base & FTA* | 1,042,000 | 156,476 | 15% | 3% | 39,119 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | *2- Research groups* | 97,500 | 97,500 | 100% | 2% | 24,375 |
| **Chem. & Metall.-** ***04*** | *1- Adv. Process Tech* | 1,280,000 | 1,140,603 | 89% | 8% | 285,150 |
| | *3- Biocompatible* | 640,000 | 606,500 | 95% | 4% | 151,625 |
| **Civil -** ***06*** | *2- Increase ave. grant* | 2,476,388 | 125,060 | 5% | 1% | 31,265 |
| **Mechanical -** ***13*** | *1- Emerging sectors* | 2,096,000 | 525,611 | 25% | 4% | 131,402 |
| | | | | | | |
| **COMPUTING & INFORMATION SCIENCES -** ***07*** | | | | | | |
| | *1- First time applicants* | 1,038,000 | 1,038,000 | 100% | 39% | 260,000 |
| | *2- Increase young fac.* | 778,500 | 778,500 | 100% | 29% | 194,625 |
| | *3- Increase top 25%* | 648,750 | 548,231 | 84% | 20% | 137,058 |

# NSERC - 2002 Evaluation of Reallocation Exercise

| Steering Committee | Proposals | $ Requested | $ Granted | Funding Rate % | % of budget | Annual Amount |
|---|---|---|---|---|---|---|
| **COMPUTING AND INFO. SCIENCES** | | | | | | |
| **Computing and Information Sciences -330/331** | *1- New Applicants*<br>*2- Senior News* | 4,250,000 | 3,085,000 | 73% | 14% | 617,000 |
| } | | | | % | | |
| **ENGINEERING** | | | | | | |
| **Chemical and Metallurgical - 04** | *1- New Techno. and HQP* | 1,600,000 | 440,000 | 28% | 3% | 82,500 |
| | *2- Sustainable emerging techno.* | 1,600,000 | 440,000 | 28% | 3% | 82,500 |
| **Civil - 06** | *1- Sustainable Infrastructure* | 500,000 | 390,000 | 78% | 3% | 73,125 |
| | *2- Smart systems & infrastructure* | 500,000 | 390,000 | 78% | 3% | 73,125 |
| | *3- Decision support systems* | 400,000 | 310,000 | 78% | 2% | 58,125 |
| **Elect. & Computer - 334/335** | *1- Emerging and speculative research* | 8,000,000 | 1,195,000 | 15% | 6% | 112,031 |
| | *2- Exceptional Innovation* | 4,000,000 | 600,000 | 15% | 3% | 56,250 |
| | *3- New applicants* | 8,000,000 | 1,195,000 | 15% | 6% | 71,700 |
| **Industrial - 20** | *1- HQP e-bus./e-society* | 1,200,000 | 310,000 | 26% | 6% | 58,125 |
| **Mechanical - 13** | *1- Biomedical Engineering* | 2,400,000 | 660,000 | 28% | 5% | 123,750 |
| | *2- Alternative Energy Systems* | 1,600,000 | 440,000 | 28% | 3% | 82,500 |
| **LIFE SCIENCES** | | | | | | |
| **Cell Bio. & Mol. & Dev. Genetics 32/33** | *2- New applicants* | 2,118,000 | 1,095,000 | 52% | 5% | 127,020 |
| **Evol. and Ecology - 18** | *4- New techno./modernization* | 1,440,000 | 260,000 | 18% | 2% | 48,750 |
| | *5- Field Research* | 1,344,000 | 245,000 | 18% | 2% | 45,938 |
| **Integrative Animal Biology - 1011** | 3- *Molecular biology costs* | 800,000 | 390,000 | 49% | 3% | 73,125 |
| | *4- Animal care* | 800,000 | 390,000 | 49% | 3% | 73,125 |
| | *5- Emerging technologies* | 800,000 | 390,000 | 49% | 3% | 73,125 |
| **Plant Biology & Food Science - 03** | *2- New research tools/techno.* | 900,000 | 670,000 | 74% | 6% | 125,625 |
| | *3- HQP* | 600,000 | 445,000 | 74% | 4% | 83,438 |
| **Psychology - 12** | *2- Imaging & animal care* | 800,000 | 560,000 | 70% | 5% | 105,000 |
| | *3- HQP - students* | 400,000 | 280,000 | 70% | 2% | 52,500 |
| **MATHEMATICS & STATISTICS** | | | | | | |
| **Pure & Applied Mathematics - 336/337** | 1- Leadership support/grp res. | 1,000,000 | 270,000 | 27% | 3% | 54,000 |
| | *3- News* | 2,970,000 | 805,000 | 27% | 8% | 161,000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Math. Scien. Institutes** | *4- CRM* | 475,000 | 178,000 | 37% | 6% | N/A |
| | *5- Fields Institute* | 650,000 | 97,000 | 15% | 3% | N/A |
| | *6- PIMS* | 1,100,000 | 399,000 | 36% | 14% | N/A |
| **Statistical Sciences - 14** | *1- Best Researchers* | 360,000 | 150,000 | 42% | 3% | 28,125 |
| | *2- Emerging areas* | 540,000 | 220,000 | 41% | 5% | 41,250 |
| | | | | | | |
| **PHYSICAL SCIENCES** | | | | | | |
| **Chemistry - 24/26** | *1- New applicants* | 1,800,000 | 1,505,000 | 84% | 5% | 301,000 |
| | *2- Early career scientists* | 1,200,000 | 1,000,000 | 83% | 3% | 187,500 |
| | *3- AGENO* | 2,400,000 | 2,005,000 | 84% | 6% | 401,000 |
| | ***Joint Proposal on Mat. Res.*** | 1,600,000 | 500,000 | 31% | 1% | 46,875 |
| **Condensed Matter Physics - 28** | *1- New applicants* | 1,800,000 | 825,000 | 46% | 9% | 165,000 |
| | *3- Novel materials/new structures* | 800,000 | 365,000 | 46% | 4% | 68,438 |
| | *4- Novel exp/computational tools* | 600,000 | 275,000 | 46% | 3% | 51,563 |
| | ***Joint Proposal on Mat. Res.*** | 1,600,000 | 500,000 | 31% | 2% | 28,125 |
| **General Physics - 29** | *1- New applicants* | 513,184 | 125,000 | 24% | 3% | 25,000 |
| | *2- Photonics* | 1,162,042 | 280,000 | 24% | 6% | 52,500 |
| | ***Joint Proposal on Mat. Res.*** | 1,600,000 | 500,000 | 31% | 3% | 18,750 |
| | | | | | | |
| **Solid & Env. Earth Sciences - 08/09** | *1- Targeted areas* | 2,800,000 | 700,000 | 25% | 4% | 65,625 |
| | *3- Field research* | 2,400,000 | 600,000 | 25% | 3% | 59,625 |
| **Space, Astronomy & Relativity - 17** | *1- PDF* | 800,000 | 515,000 | 64% | 8% | 96,563 |
| **CITA** | *4- CITA* | 300,000 | 190,000 | 63% | 20% | N/A |
| **Subatomic Physics - 19** | *2,3,4- ISAC /SNO/ATLAS* | 930,000 | 495,000 | 53% | 3% | N/A |
| | *5- Particle astrophysics* | 330,000 | 175,000 | 53% | 1% | N/A |
| | *6- Subatomic Phys, theory/news* | 1,720,000 | 920,000 | 53% | 6% | N/A |
| | *7- Advanced technology* | 480,000 | 255,000 | 53% | 2% | N/A |