

RESULTS FROM THE CHCEDs MEETING AND WORKSHOP:

NSERC Reallocation Exercise, London, June 7-8, 2000

Compiled and Reviewed

by

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Preface

Successful discussions on the NSERC Reallocation Exercise were held at the CHCED's meeting in London on June 7, 2000. A well-attended and equally successful workshop followed the next day (Appendix I, List of Participants). The purpose was to provide the next Steering Committee for the Third NSERC Reallocation Exercise with a strong basis of support from the civil engineering community. The meeting and workshop were held in conjunction with the CSCE Conference in London.

The NSERC Reallocation Exercise was designed to redistribute every four years money among research disciplines, represented by their Grant Selection Committee (GSC), contribute 10% of their annual budget to a pool. The pooled fund is redistributed in response to submissions from the various disciplines describing their visions, strategies, priorities and needs. The reason for this reallocation exercise is to ensure that NSERC has its funding priorities in the right place in order to fulfill its mandate. The key objective is to redistribute a portion of the Research Grant budget, shifting some resources to research needs identified, through broad community input and peer review, as the most significant for Canada. This approach is considered important, especially in view of fast changing world of technology and emerging areas of research. NSERC will invest, according to its mission statement, in people, discovery and innovation to build a strong Canadian economy and to improve the life of all Canadians.

The Third Reallocation Exercise has been started in March 2000 with its announcement and the call for nominations of Steering Committee members. The discussions and the workshop in London were the first steps to organize the CE community and to start the preparation of its submission, due in January 2002. The active participation and continued support by the CE community are extremely important for improving CE's share in the redistribution of funds and the impact this increase in funding will have on our research program.

Subsequent sections give a summary of the discussion at the June 7 CHCED's meeting and a discussion of the NSERC Reallocation Exercise Workshop on June 8, followed by concluding comments and an outline of the next steps.

Summary of Discussion at the June 7, 2000 Chair's Meeting

The discussion was preceded by summary presentations of the following documents:

1. "Discussion of Future Prospects and Emerging Growth Areas in Civil Engineering", by Hans Vaziri (see Appendix II)
2. "Notes For NSERC Reallocation Discussion at CHCED'S Meeting, London, Ontario, June 7, 2000", by Ralph Haas (see Appendix III)

Following are comments from participants in the meeting, in “bullet” form:

- We have to accept changes and have to give up things in order to do so, recognizing that there may be CEAB constraints; the challenge is to set priorities
- Civil engineering is central to humanity; we have to focus on that
- Collaboration with other disciplines is essential; recognize, though, that “territorial imperatives” are strong
- Need to work closer with colleges; much of our traditional work can and should be done by technologists
- Some comments on the last (NSERC Reallocation) exercise from Denis Mitchell:
 - there was little response from the Chairs or from the group as a whole (e.g., review panel of 17 individuals) to different versions of the proposal
 - it is critical to get external referees who are solid supporters (last time one was negative, one marginal and three were excellent)
 - selectivity in awarding research grants is a big issue (last time our Civ. Eng. GSC was third from last)
 - recommendations: (a) the Steering Committee must include top notch researchers who are also knowledgeable of the NSERC process, (b) the Chairs must contribute data, (c) extra care is needed in choosing external referees, and (d) must increase the average grant size
- Every member of the Steering Committee must be committed to work
- Requests to Chairs should be short but it is critical that they respond
- The proposal will need success stories
- Support from industry is needed
- Professional societies can submit supporting briefs (there were none for Civ. Eng. last time)
- The proposal must be driven by real Canadian needs
- All people who have been nominated for the Steering Committee should be involved in some way; could have reallocation subcommittees
- Need strong commitment from each university, not necessarily the Chair but his/her designate (e.g., someone who has a high grant and benefits from NSERC)
- Maybe turn our disciplines perceived or real lack of focus into a positive (e.g., breadth and diversity)
- Really need to make the case for more funds and the negative impacts of past cuts; hiring lots of new faculty
- At the next CHCED’s meeting one year from now (in Victoria) need to hear from the Steering Committee (possibly a Workshop)
- CHCED’s need to consult with their local industry and public agencies; get feedback on draft proposal
- Workshop tomorrow needs CHCED’s participation and will help to get the broader Civ. Eng. Community involved.

While not part of the discussion at the CHCED's meeting, some relevant comments from the Conference Opening Session on June 8 are provided as follows:

- Dianne Haskett, Mayor of the city of London and Dianne Cunningham, Minister of Colleges and Universities remarked that civil engineers make the cities of today livable and they will build the cities of the future; they ensure our quality of life.
- Mr. Tom Davey, Publisher of Environmental Science and Engineering and Keynote Speaker commented that “civil engineers create poetry from physics and mathematics”, that “civil engineers have done more than any others to stem the flow of misery” – also though that our Achilles heel is the low bid ethos; we should sell skill and experience. He remarked that civil engineers embody a “generosity of spirit” and tend to serve (pro bono) more than any other discipline on public bodies.

NSERC Reallocation Exercise Workshop, June 8, 2000

Introduction and Presentations

The workshop was held in the afternoon of June 8, 2000 at the Convention Centre in London. Dr. Ralph Haas who chaired the proceedings of the workshop, welcomed the participants and then outlined the objectives and expectations of the NSERC Reallocation Exercise. The overall objectives and major expectations are summarized below:

Objectives

- Assist in setting direction for the next CE submission and obtain support from the CE community by:
 - Bringing together wide representation
 - Addressing key issues
 - Initial vision of future → input to Steering Committee
 - Mobilizing support

Expectations

- Increased awareness of need for successful submission
- Ideas for submission
- Documented discussion results → input to Steering Committee

He then proceeded, joined by Ms. Lise Desabrais, NSERC, to summarize the reallocation process and to field questions for clarification from the audience. More information on the NSERC's Third Reallocation Exercise (i.e. Bulletin 1, the schedule, and a poster advertising the Exercise) is also available electronically on NSERC's Website:

Dr. Gerhard Kennepohl presented an overview of the background document, which was prepared for the workshop and distributed in advance to provide background material including key issues, suggested guidelines and ideas to help set the stage for a successful workshop (see Appendix IV). He emphasized the need to develop a clear vision for CE in Canada. This vision for the future direction of CE will set the stage for the development of the required technology. An important recognition is that CE in its diversity is affecting life of all Canadians, but faces associated with technical issues many non-technical issues. Opportunities exist, given the advances in technology and in particular information technology, to develop the data base and knowledge, to deal with interacting issues and become proactive and a world leader.

Summary of Group Discussions

The participants were divided up in five groups each with a facilitator and recorder. All seated at round tables, they proceeded to discuss the three basic questions posed in the background document for the workshop. Much interest was shown in the development of a vision and the future direction of CE in Canada. The discussions and debates were lively, spontaneous and overall productive.

Workshop Question #1, “What should be the Vision for CE in Canada?” was discussed for 30 minutes and then reported in summarized format on a viewgraph. The key issues that the participants of each round table identified and felt that needed to be addressed in the vision for CE in Canada are summarized in Table1.

Table 1 Question #1 “Vision for CE in Canada”

Key issues to be addressed	Round Tables No.				
	1	2	3	4	5
➤ Improve quality of life, high standard of living, Creating benefits and wealth for Canada, ‘Civil and Lifestyle Engineering’	-	√	√	√	√
➤ Explore advanced, smart technology to improve infrastructure	√	√	√	√	√
➤ Use multidisciplinary research approach to encourage and enhance technology development, e.g. advanced communication and sensing devices,	√	√	-	√	√
➤ Emphasis on sustainable development, health and	√	√	√	√	√

- natural environment,
- Create an interactive/proactive infrastructure/asset management system √ √ √ - -

The agreement on the key issues for the future direction of CE research for formulating a vision statement based on the summarized presentations and subsequent discussions, is amazingly close. Based on these findings a new vision statement can be written such as:

“The CE research community foresees the way to enhance and assure a continued high quality of living standard for Canadians is through:

- exploiting innovative technology to modernize and automate CE methodology
- use a multidisciplinary research approach to technology development with emphasis on sustainable development, health and natural environment, and
- creation of an integrated, proactive infrastructure management system.”

Workshop Questions #2 and #3, “What strategy/work plan should be used for the future development of CE?” and “What specific research proposals are needed to address the work plan?” were discussed together for little over an hour. The results reported by each round table dealt mostly with the strategy and work plan. Only two tables listed specific proposals in answer to question # 3. It appeared to be a case of running out of steam.

Nevertheless, a closer analysis of the submitted ideas showed encouraging similarity and agreement in the proposed approach and focus, which can be used as a basis for developing a strategic work plan. The most identified issues and task, which were considered and discussed by each table, are summarized in Table 2.

Table 2 Workshop Question # 2 Strategy for CE Development and Work plan

Task Description	Round Tables No.				
	1	2	3	4	5
1. identifying and prioritizing CE challenges and understand cause and effect	√	-	-	-	√
2. use and exploit the latest information technology (IT)	√	√	√	-	√
3. establish a comprehensive data base, incl. basic information as well as result from interactive studies of technical and non-technical issues	-	√	√	√	√
4. screen and test innovative technologies for potential solutions	√	√	√	√	√

5. modeling and optimization of alternatives	√	√	√	√	√
6. determine long term impact and performance	√	√	-	√	√
7. develop a decision support system	-	√	√	-	√
8. implement an integrated infrastructure and asset management system	-	√	√	√	√

Additional comments with regard to the proposed and compiled tasks are:

1. The task of identification, defining and prioritization of CE's challenges of increasing complexity and diversity is very appropriate, but was discussed only by two tables. However, it is a natural and required step for most research programs and probably also pre-supposed by the participants of the other tables. Therefore it was decided to include this one.
2. The use and exploitation of the latest information (IT) received a lot of attention. Communicating information, results and knowledge in particular from other disciplines was recognized as all important to the modernization and updating of CE research of the future. We probably heard this one first from the Canadian communication theorist, Marshall McLuhan. He, when asked about the content of communication, promptly responded: 'Communication'. We left the industrial economy about 20 years ago and, as Time Magazine in its feature 'Vision 21 (May 22, 2000) points out, are living now in the **info economy**.
3. IT gives CE the tremendous opportunity to establish, as apparent from the discussions, a comprehensive database. The interest and need for interfacing with other disciplines, including non-technical issues in a multi-disciplinary approach, is apparent from the various proposed topics, such as sustainable development, safety, intelligent systems and smart material, etc. CE wants and needs to move conscientiously from using one-dimensional specialist logic to emphasize the 'connectedness' of things, recognizing and mastering the total impact in the application of their expertise.
4. Screening innovative technology through a multi-disciplinary approach for potential solution was extensively covered by all round tables. The presented examples of innovative technologies include intelligent buildings, trench-less technologies, cold-in-place recycling, automated pavement compaction, intelligent transportation systems, health monitoring of structures, active sensing and control systems, etc.
5. Everyone also proposed the modeling and optimization of relationships and the interaction of driving forces at underlying conditions.
6. The need for establishing the long-term impact with respect to such activities as rehabilitation, preventive maintenance, recycling, sustainable development, etc. received considerable attention.
7. Three round tables proposed the development of a decision support system. This would involve the tools and decision criteria such as life cycle cost analysis, risk analysis, and other non-technical issues. The use of such decision support system would also provide the means for rapid response and real time implementation.
8. The implementation of an integrated infrastructure-asset management system was considered my

most participants a key end product. The decision making process must be based on sound facts and not on anecdotal information and intuitive judgement. This approach would combine engineering principles with sound business practices and recognizes system user needs and infrastructure utility factors.

The foregoing ideas and submissions have been used here to produce the first draft of a suggested work plan toward developing a civil engineering reallocation strategy, as shown in Figure 1.

Specific project proposals, which were listed by participants from two round tables, are listed in Table 3.

Table 3. Workshop Question #3 “Specific Research Proposals”

1. Models for developing interdisciplinary linkages
2. GIS based data analysis
3. Development of recycle-able building materials
4. Extending service life
5. Life cycle cost analysis
6. Integrated real time operation
7. Intelligent buildings, smart materials, etc.
8. Trenchless technology
9. Intelligent transportation system
10. Active control systems
11. Health monitoring of structures.

Regarding theme areas in Step 1 of Fig. 1, our “lesson” from the previous reallocation exercise is that these should be limited in number and focused. Following is a suggesting for civil engineering (which is a post workshop idea from the authors of this document):

1. Spatial technologies
2. Clean air, water and earth
3. Infrastructure

These provide an umbrella/scope for a considerable number of projects or initiatives. For example, spatial technologies would include remote sensing for a variety of civil engineering applications, GIS based data and integrated asset management platforms, digital image processing and distribution, navigation on land and water, communication/media applications, etc.

The clean air, water and earth theme would encompass a wide range of technologies and innovation potential that can certainly be articulated by experts in the field.

As far as the infrastructure theme is concerned, some transportation related examples might include the following:

- ✓ Use of digital photography/video for pavement distress survey followed by cutting edge image analysis
 - ✓ IT for automatic, computerized field data monitoring, data collection, transmission and analysis to produce traffic loading patterns, temperature profiles etc.
 - ✓ X-ray tomography and/or nuclear magnetic resonance (NMR) imaging to develop microstructure models for paving mixes
 - ✓ GPS for precise site measurements and control in real time, thereby reducing costs of design and construction
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- ✓ Upgrading performance assessments in material technology to cope with rapidly changing and novel materials e.g. advanced composites, fiber optics, high performance concrete, etc.

These three themes provide a wide scope of possibilities in almost all areas of CE to develop research proposals. But they must be coherent and specific and be clearly demonstrated to fit within the strategic direction established by civil engineering's reallocation Steering Committee.

Summary of Terry Hrudey's Closing Comments

At the end of the workshop, Dr. Terry Hrudey, University of Alberta, made closing comments which are summarized as follows:

- Good consensus on the developed vision: "Civil Engineering of the future will continue to maintain the high quality of life for Canadians."
- Implicit is the notion that some problems are expected, but will only become visible as "the train comes down the tracks".
- The need for an interdisciplinary approach with other areas of science came through very clear.
- There was some agreement on the nature of the problems and challenges facing CE in the future e.g. water quality, population issues, etc.
- A common theme for providing solutions was the concept of developing an integrated system based on and utilizing large amounts of data and information.
- Regarding the Question # 3, specific proposals, the delegates seemed to run out of steam at the end of the workshop.
- Questions #2 and #3, which still require further development, need to be more specific.

Concluding Comments and Next Steps

The first stage of meetings and the workshop on the Third NSERC Reallocation Exercise, which were held in conjunction with the CSCE Annual Conference, was rewarding indeed. The interest and active participation at the workshop (62 delegates) was high and the discussions were quite productive. The

results have been compiled and will be transmitted to the Steering Committee. At the time of compiling these results, the Steering Committee has just been formed. They have a formidable task in front of them but the potential “reward” of a substantial increase in civil engineering’s reallocation makes it well worthwhile. We wish them every success.

Another workshop is planned at the next year’s CHCED’s meeting. At that time a first draft of the reallocation submission document will have been completed and transmitted for review.

Acknowledgements

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