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CLIMATE AND WATER DATA TRANSFERS VIA INTERNET: FROM VISION TO ACTION

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INTRODUCTION

In the current technological world, one can already envisage Internet users accessing directly, by means of a friendly GIS-web based interface, metadata describing the available climate or hydrometric data, identifying what they wish to obtain and downloading these data in the most suitable formats (numeric data, analyzed maps, etc.) without needing to consider either where the information lies or the specific formats used by the data providers.

The implementation of such a vision presupposes the active collaboration of many partners and the resolution of several technological and managerial challenges. For example, in Quebec, the principal producers of meteorological data have agreed to share their data between themselves in real time (Réseau météorologique coopératif du Québec, RMCQ). Many technical and management issues related to data sharing were raised in that context. RMCQ managers have begun discussions on the potential widening of the distribution of their data to third parties and on access to historical data and metadata. The implementation of this vision also includes the development of necessary tools to access climatological archive. Moreover, concerning hydrometric and water quality data similar challenges arise.

This paper discusses which model of data access and distribution is best adapted to the Quebec reality, how the migration towards an easy access to data can be made and what role Ouranos (a Quebec-Canada consortium on regional climatology and adaptation to climate change) could play.

THE OURANOS CONSORTIUM

The government of Québec has launched Ouranos, a Consortium in climatology and adaptation to climate change which mission is to develop structure and produce synergetic team work dedicated to the analysis and the search for solutions to climate change adaptation issues in a North American context (http://www.ouranos.ca). In addition to greenhouse gas emission

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reductions called for by the Québec government, the creation of Ouranos constitutes an additional means of addressing climate change and a tool for adaptation to new regional situations stemming from global warming.

A partnership that is truly unique and without precedence in Canada, Ouranos will regroup over 150 persons in multidisciplinary research teams hailing from universities and governmental and para-governmental organizations in areas that have been traditionally working apart: climate sciences, statistical analysis, characterization, impact and adaptation studies. The merging of isolated teams of scientists under Ouranos, it is hoped, will pull in relevant scientific data and information needed by decision makers to plan responses to the rapidly evolving climate situation.

The creation of Ouranos has been made possible thanks to financial contributions from nine Québec government departments and agencies: Environnement, Affaires municipales et Métropole, Ressources naturelles, Sécurité publique, Recherche, Science et Technologie, Agriculture, Pêcheries et Alimentation, Transports, Hydro-Québec, Valorisation-Recherche Québec, as well as the Meteorological Service of Canada, Natural Resources Canada and the Canadian Foundation for Climate and Atmospheric Sciences. This effort to unify human, financial, technical and computer science resources is estimated to cost upwards of 9 million dollars a year and is supported by four universities, namely, Université du Québec à Montréal, McGill University, Université Laval and the Institut national de la recherche scientifique (INRS), all Ouranos Consortium members. The collaboration of scientists, all concerned with climate change, yet all of diverse backgrounds and disciplines, can only be indicative of success.

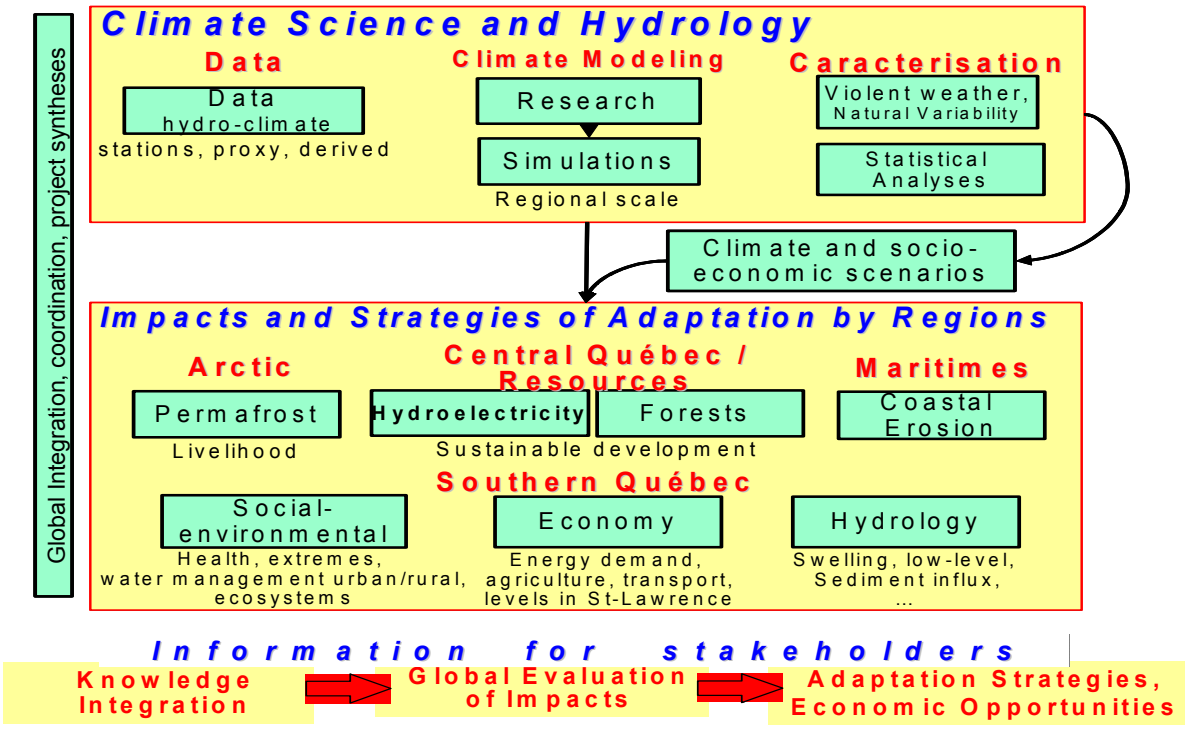

Figure 1. Graphic representation of OURANOS

Historical data issues within OURANOS

In order to support OURANOS and OURANOS partner organizations and researchers, a working group dealing with historical data issues has been formed in order to fulfill the following objectives:

(1) Provide quality climatological and hydrometric data required for the impact and adaptation studies (at the stations or "proxi")

(2) Provide complex data products for OURANOS partners

(3) Provide a service of access to data banks and to climatic and hydrological information

(4) Provide the data required for the initialization and the validation of the regional climate model.

Within the context of OURANOS with numerous data providers and users, a decentralized approach respecting the data ownership of each providing institution is privileged. It is also indispensable to set up a permanent dialogue between all providers formalizing a common data access and distribution framework (yet to be defined). Even if a decentralized and distributed approach is promoted for data, the development of a joint system containing a minimum set of the more common metadata parameters achieves consensus. The architecture of such a system has yet to be elaborated and will be addressed next. Moreover, experience in many highly reputed organizations, including the IPCC Data Center in East Anglia, underline the importance of professional scientific support to data users above and beyond the search for and access to data.

Of note amongst the issues to be addressed:

- Data access and redistribution policies
- Data support services
- Metadata content, format and exchange protocols
- Metadata search tools
- Stewardship and management of the data access system.

From Vision to Action

Ouranos and Ouranos partner organizations are already active in transferring paper archives to electronic format and quality controlling priority data. Many such projects are on-going at Hydro-Québec, the Centre d'Études Nordiques and Environnement Québec, for example.

In one of the Ouranos sponsored projects, MSC-Quebec used two commercially available GIS tools to assess the potential of such tools for meteorological and climatological data access. Lessons learned during this test bench put the emphasis on:

- Easy access to validated metadata is essential
- Data should be in a relational database (vs. flat files)
- Data must have undergone extended quality control
- Data transfer and visualization issues must be taken care of.

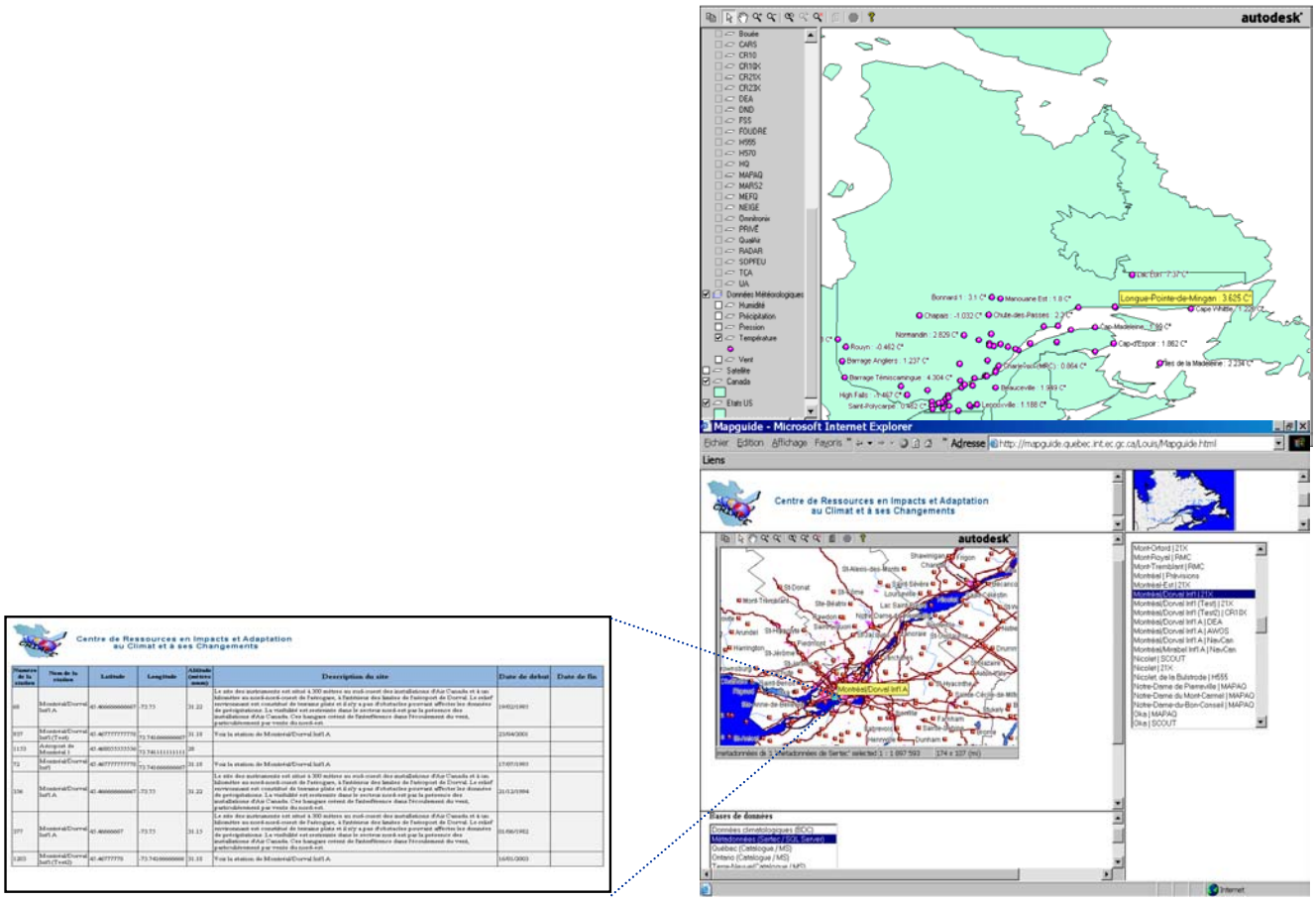

Figure 2 Test bench : Climatological data and metadata visualization by Internet

The next phase of this project will involve access to distributed data bases. This will provide an opportunity to identify and address new issues to move us closer to the vision expressed earlier.

The development of a common metadata system as well as incorporating analysis techniques, keeping in mind users needs, are seen as imperative extension of this exercise. Moreover, to

study climate change impacts on the water cycle, require a good understanding of long-term hydrological trends that is gained only through the analysis of long-term quality data sets. In the context of Ouranos, the regional understanding of impact of climate change on the Great Lakes and the St Lawrence River is one the emerging issue that will require in the future important level of scientific involvement and financial investments. Indeed, Lofgren et al. 2002 and Mortsh et al. 2000 have already anticipated tremendous changes in the great lakes level within a global warming situation. Moreover, using a two-dimensional mathematical model, effects of global warming on water level variations of the St-Lawrence river system has been calculated by the Canadian Meteorological Service (Morin et al. 2000). A loss of 24% in terms of river flow could occur downstream of Montreal. These predictions accompanied by a significant range of uncertainties need to be refined in order to better understand the all system with satisfactory accuracy. Thus easy access of quality data is a major step in the advancement of a better understanding of regional impacts due to climate change and to provide decision maker with a high scientific support.

CONCLUSIONS

Find, discover and obtain climate and water data to support regional climate change studies, are the three goals toward the historical data branch of Ouranos and its partners are working on, in order to support decision makers to plan the adequate responses to the rapidly evolving climate situation. Thus, internet web-based GIS tools are unavoidable tools to reach these three objectives: (1) to locate stations on an interactive map (2) to discover details of observing programs for each Station; and (3) to obtain data.

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Ouranos : http://www.ouranos.ca