4 - GE^{3}LS ASPECTS RELEVANT TO THE PROPOSAL

Among the issues raised by genomics research involving phytoremediation, the GE^{3}LS team has selected five aspects that will be examined:

(1) how phytoremediation is linked to the concept of sustainable development (hereafter SD);

(2) how receptive is the actual legislative framework;

(3) how the concept of corporate social responsibility (hereafter CSR) can promote it;

(4) how the policy makers may use this new scientific expertise; and

(5) how the public will receive this innovative technology.

1. Phytoremediation: an asset for a sustainable development (SD) strategy (André; Dufour; Leroux; Montpetit; Trudeau).

SD is a concept that still raises many questions. It is not always clear to the government, industry or the public, what this concept allows them or constrains them to do.

Objectives. This subproject will revisit the concept of SD and analyze its adoption and integration at the international, national and provincial levels, as expressed in conventions, legislations, guidelines and policies, as well as the resulting case law. We will then focus on how phytoremediation, associated with SD, could play a major role in the protection of the environment in light of public knowledge, industry willingness and administrative openness to this approach.

Methods. After a review of the literature and the study of the various legislations and directives (year 1), we will meet with representatives of departments at the federal and provincial levels and also with members of associations having an interest in SD strategy and its application (year 2). Qualitative research (web-based survey and interviews) will be used to obtain data. For the interviews, the cohort size will be determined by using the saturation principle, and the information gathered will be analyzed based on the grounded theory (Glaser and Strauss, 1967).

Contributions. A better and common understanding of values and principles related to SD, largely published by the team, should promote the endorsement of ecologically responsible and economically viable practices such as phytoremediation. Moreover, this project is pivotal because the concept of SD is the Ariadne's clew for the GE^3LS multidisciplinary team.

2. Phytoremediation: an innovative tool for land rehabilitation (Leroux; Trudeau).

It is crucial for land protection and rehabilitation that government departments and agencies adopt environmental management measures. It is important to study when phytoremediation should be selected by industries and/or government agencies as the appropriate measure for a particular remediation plan. Moreover, it is essential to discuss how to establish endpoints for remediation treatments that will be acceptable to regulatory agencies.

Objectives. This subproject will identify and suggest appropriate legal prescriptions and/or guiding principles in the use of phytoremediation, regarding the risks that might originate from it and the levels of decontamination that are anticipated from its use (how clean is clean?). Moreover, we want to find out if the precautionary and preventive action principles have been integrated into the practice of administrative agencies in Quebec and Canada in the rehabilitation of contaminated lands, and also how this could be achieved with respect to the new tool or technology that is now being offered through phytoremediation.

Methods. The specific legal aspects that must be assessed are twofold: (1) it is important that any risks to the environment or to human health that might result from the new technology be correctly identified, evaluated and taken into account both by the proponents of the technology and by the administrative agencies involved in the approval and monitoring procedures of the sites and/or the technology itself; (2) phytoremediation must lead to levels of decontamination that are ecologically acceptable. As the project will be developed in Quebec, a review of Quebec legislation related to remediation of contaminated lands and more general legal prescriptions applicable to projects that could modify the quality of the environment such as environmental impact assessment, administrative approvals and tort law will be conducted. The same exercise will be performed for federal prescriptions that might be applicable to the technology, including environmental evaluation, legislative and administrative approval of the use of the technology.

Preventive action and reliance on the precautionary principle are integral parts of the concept of SD. Any risks to the environment or public health must be identified and assessed, communicated to the public and integrated in policy-making procedures and decisions. Social acceptance of phytoremediation might depend on these prerequisites. The focus of the legal research will thus

be the application of both preventive and precautionary measures by administrative agencies in the management of contaminated lands. In terms of legal prescriptions, the precautionary principle has been imposed in Canada with respect to the evaluation of risks caused by the release into the environment of chemicals and the protection of endangered species (Trudeau, Leroux, 2008; Trudeau, Beaulne-Bélisle, Leroux, 2010). Our hypothesis is that prevention and precaution are taken into account in the rehabilitation of contaminated lands, even though the application of these principles might not be specifically addressed or referred to in existing legal prescriptions. To verify it, we will conduct interviews with civil servants in federal and provincial departments to determine their understanding of the precautionary principle and its application in the management of contaminated lands.

Contributions. With this analysis of the normative framework, we should be able to assess its capacity to promote the use of phytoremediation and the ability of the legislator to adapt the current rules, or to adopt new ones to facilitate the contribution of genomics in land rehabilitation. The results of this research will be published and any necessary guidelines will be proposed and made available to the proponent of the technology and administrative agencies involved.

3. The impact of the concept of corporate social responsibility (CSR) and of Chapter 11 of NAFTA on phytoremediation (Dufour).

SD also ties in with the concept of CSR, which recently started to emerge as a legal concept in Canada, as a result of two recent Supreme Court of Canada (hereafter SCC) decisions, the Peoples decision (SCC 2004) and the BCE decision (SCC 2008) cases. There are many definitions of CSR but from a corporate law standpoint, the salient issue is whether the board of directors of a corporation can, when it makes a decision, take into account social and environmental considerations, or whether it must be guided solely by the criterion of making profits for its shareholders. Until recently, making profits for shareholders was the only criterion acceptable but SCC decisions have changed our legal landscape; the SCC has stated that shareholders do not automatically have priority in all cases and that other interested parties, including governments, the community and the environment (hereafter, the stakeholders), can be taken into account.

Moreover, although the SCC and the legislator appear to both be taking steps towards more SD and CSR, it would be useful to examine certain international free trade agreements to verify to what extent the government has sufficient leeway to adopt laws or take administrative measures to promote phytoremediation and other SD practices. NAFTA Chapter 11 should be analyzed since it has already given rise to several lawsuits by foreign multinationals against Canada, including for environmental legislation and measures (e.g. Dow Chemicals is currently suing because Quebec has banned certain pesticides from use in cities). Therefore, it is important to determine how the government should promote SD and practices such as phytoremediation while at the same time avoiding costly lawsuits and preserving its sovereignty.

Objectives. This subproject will answer two crucial questions: 1) does CSR legally constrain industry to adopt the practice that is the most consistent with SD, or not? 2) to what extent does the government have sufficient leeway to adopt laws or take administrative measures to promote phytoremediation and other SD practices?

Methods. The new legal situation in Canada regarding CSR and its ties to SD will be analyzed and compared with the United States situation. In addition, the variables most relevant to the

development of a new corporate governance model will be identified, and a new decision-making process and toolkit for boards of directors will be developed, to help them stay within the law as reformed by the SCC and assist them in balancing the various conflicting interests of stakeholders when making decisions (such as electing to use phytoremediation). With respect to chapter 11 of NAFTA, the relevant treaty provisions and case law will be analyzed, and the most relevant pending cases against Canada, the United States and Mexico will be studied, to identify any issues that may be raised in connection with SD legislation, policies or practices promoting ecological tools such as phytoremediation.

Contributions. This study will make three major contributions: (1) it will clarify the characteristics of CSR and create a toolkit for Canadian businesses, who are now legally bound to apply this concept as developed by the SCC, but have received little guidance on how to do so; (2) it will identify, in publications, variables relevant to the development of a new corporate governance model taking into account not only the shareholders but also the stakeholders, which is important in connection with the promotion of SD and phytoremediation; (3) it will establish the current lay of the land pursuant to NAFTA chapter 11 (including the issue of the availability of the precautionary principle under that chapter), identifying any issue which could have an impact upon the adoption of a legislation, policy or administrative practice promoting ecological tools such as phytoremediation. Appropriate solutions will be published.

4. Phytoremediation and the policy-making process: a long way to go (Montpetit).

Scientific information can make enormous contributions to policy objectives (notably in terms of risk reduction); scientific discoveries may also trigger policy processes (Weible and Sabatier, 2008). When discoveries fall outside well-defined regulatory parameters or categories, policy adjustments may in fact be required (rDNA technologies, for example, led to policy adjustments in most OECD countries). In other words, scientific discoveries may have important policy implications.

Objectives. This subproject will assess the implications of phytoremediation for regulatory processes and examine the extent to which the scientific knowledge generated by the experts involved in the project can contribute to the realization of environmental policy objectives.

Methods. We expect phytoremediation to have two different types of policy implications. As a novel technology, phytoremediation may or may not match with current regulatory processes. If not, adjustments may be required. Therefore, we will conduct a comprehensive review of Canadian regulations covering novel technologies comparable to phytoremediation and interviews with civil servants responsible for regulatory application. With this review, the team will have the capacity to assess the adequacy of current regulations and propose adjustments to make certain that phytoremediation is properly used.

As discussed above, phytoremediation can contribute to environmental policy objectives. We will therefore encourage the transfer of knowledge generated by the project to policy-making actors. We will first organize meetings among the members of the project to identify transferable knowledge. We will also organize a symposium during which members of the project will expose interest group representatives, journalists, civil servants and policy-makers to knowledge from which they can design innovative ways to meet environmental policy objectives.

Contributions. This study will help policy makers meet the challenge of adjusting regulatory arrangements smartly to a novel and promising technology. Second, it will identify and transfer scientific knowledge, which will help governments meet their environmental policy objectives. Articles and a «points to consider» document will be produced.

5. Phytoremediation and sustainability assessment (SA): a hardship to perform successfully (André; Leroux).

Projects, whatever their nature, are frequently subjected to the test of sustainability before their approval (i.e. ex ante), despite the confusion surrounding the concept of sustainability. SA as a methodology was developed over the past 15-20 years, but it gets a lot more attention now. Greatly inspired by Impact Assessment, its main objective is to assess the environmental, social and economic aspects of a project through the lens of SD principles such as fairness, economic efficiency, prevention of damage, social acceptability and intergenerational solidarity.

Objectives. This subproject will review the various approaches currently used to assess the sustainability of a project for contaminated site rehabilitation, develop an evaluation guide for such projects including the scenario of phytoremediation, and apply the approach to the project under study to make the necessary changes in the light of current practice.

Methods. The various approaches to SA will be reviewed and evaluated for their usefulness for rehabilitation projects. The literature will be reviewed (year 1) through the exploration of the main databases, first to understand SA as a general approach, second to compare the existing methodologies for site rehabilitation and phytoremediation. Following this literature review, we will engage in the development of an adapted methodology to SA for site rehabilitation (year 2). The researchers of this project (about 20 persons) will hold a three-hour working session to identify the main principles of sustainability to take into account in such a SA as well as the main questions to be addressed. The same exercise will be performed with the GE^3LS advisory board and with a group of 10-15 citizens (individuals or NGO representatives) interested by this issue. The team will then develop a step-by-step methodology for SA for discussion; interviews (n=30) with researchers with different expertise, involved in this project as well as with other experts in site rehabilitation projects, will be required. An interdisciplinary sub-group of experts (selected from those which have been previously interviewed) will be invited to a one-day workshop during which basic information on SA will be provided; a project of methodology will be presented and discussed. Finally (years 2 & 3), the developed methodology will be applied to the

project. This phase will require frequent contact with all members of the project. The assessment will then be presented and discussed both with the GE^{3}LS advisory board, with the same group of selected citizens, and with the full research team at our annual meeting. The methodology will then be revised in light of the discussions, and published.

Contributions. This approach will guide the decision-maker on when, where and under what conditions this technique would be preferable to other approaches to rehabilitation. Local and national governments, planners, landowners and developers all need to understand the various aspects surrounding the contaminated land and how sustainability issues can be addressed in the selection of rehabilitation options for these sites. To date, to our knowledge, there are few studies of sustainability applied to contaminated soil remediation or phytoremediation.

Deliverables

- ***Analysis of the normative framework leading to guidelines for decision makers.***
- ***Toolkit for Canadian businesses to apply the concept of corporate social responsibility.***
- ***Current lay of the land pursuant to NAFTA chapter 11.***
- ***Points to consider document for policy makers in order to meet their environmental objectives.***
- ***Step-by-step methodology for sustainability assessment for site rehabilitation.***