

# Current practices of Land Surveyors: part of Sustainable Development?

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**Key words:** land surveyors and surveying, sustainable development, professional practice and spatial planning

## SUMMARY:

In 2015, the Government of Quebec adopted a new strategy of sustainable development that, among other goals, plans to adopt by year 2020 a sustainable development plan of the Quebec territory which supports the dynamism of communities. The same year, the United Nations (UN) supported the adoption of 17 sustainable development goals and today many countries are mobilizing effort to achieve by 2030 this sustainable development agenda. Some of these goals are closely related to land surveying. In facts, goal #11 suggests that cities and communities be built in a sustainable way and goal #12 recommends a responsible consumption and production.

In this global trend of sustainable development, we are asking what is the role of land surveyor in this key societal venture? How is the land surveying profession involved in/concerned with achieving those goals? Are land surveyors suitably instructed or trained to be part of them? Should the land surveyors be part of these actions? If yes, at which level? How land surveyors can act as leaders in the achievement of the sustainable development objectives? What is their current level of interest in sustainable development or what are their concerns? What can be done and more importantly, how should it be done?

This paper addresses some of these questions. To enable the discussion, a questionnaire of 15 questions was prepared and circulated among the members of the *Ordre des arpenteurs-géomètres du Québec-OAGQ* (Professional Association of Land Surveyors). We received 212 responses that correspond to a response rate of 20% of the membership. The paper presents the main outcomes of the survey.

For example, the presentation will show that even though Land Surveyors pay attention to the matter of sustainable development, their level of knowledge about the subject is relatively low; in addition, the number and the diversity of actions currently implemented are also low. Another key finding is that although 78% of the respondents consider that sustainable development is important in their activities, only 24% of them recommend sustainable measures to their clients when producing subdivision plan. Likewise, only 17% of the respondent pay attention to the water consumption and 32% to the greenhouse gases emissions.

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## 1. INTRODUCTION

Since the 1992 United Nations Conference on Environment and Development at Rio de Janeiro, sustainable development is well recognized as one of the major challenges facing our society today. At various levels, international, national and local, institutions are placing more and more emphasis on this issue. For instance, the United Nations adopted in 2015 the 17 Sustainable Development Goals. Among them, goal # 11 suggests building sustainable cities and communities while goal # 12 recommends sustainable production and consumption (UNDP, 2015) and many countries such as Finland or Iceland (Annabelle, 2017) are mobilizing effort to achieve this Sustainable Development Agenda by 2030.

In the same direction, Quebec has adopted a sustainable development law (*Loi sur le développement durable*<sup>1</sup>) in order to adopt a government strategy for sustainable development every five years. One of the objectives of the current strategy is to ensure sustainable city planning and support the vitality of communities (MDDELCC, 2015).

## 2. RESEARCH INTEREST

In this context, where the importance and the urgency of sustainable development is no longer to be demonstrated, you may ask yourself: What is my role as land surveyor in this key societal venture? How is the land surveying profession involved in/concerned with achieving those goals? Are land surveyors suitably instructed or trained to be part of them? How land surveyors can act as leaders in the achievement of the sustainable development objectives? What is their current level of interest in sustainable development or what are their concerns? What can be done and more importantly, how should it be done?

After having reviewed the literature, we did not find much analysis or exploration that specifically address the role of land related professions to sustainable development as we may find for other specialists as engineers (Royal Academy of Engineering, 2005). France is now proposing a Charter for French licensed land-surveyors with the professional Agenda 21 (OGE, 2010). The foundation of this study is that the role of land professional is central to achieve sustainable development since “land” is the main target in both themes. How can we demonstrate this appreciation and is the role of land professional distinct from other professional as engineers? The undertaken approach is to interrogate the land surveyors and ask them their point of view and their concrete actions related to sustainable development.

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<sup>1</sup> <http://legisquebec.gouv.qc.ca/fr/ShowDoc/cs/D-8.1.1>

Then, the main research question of the study is: Do the practices of land surveyors help to achieve the goals/objectives mentioned above? To answer this question, it would be appropriate on one hand to first determine whether land surveyors are awareness and concern about this issue of sustainable development and if they have the necessary knowledge to factor it in their deliverables. On the other hand, we should also examine how land surveyors could contribute to sustainable development by their professional activities.

### **3. METHODOLOGY**

The methodology used to find answers to those research questions is based on a questionnaire sent to a specific group of specialists. In absence of specific literature on the topic, this approach was estimated valuable and easy to set up at low cost. Furthermore, in the province of Quebec, land surveyors have to be part of a professional association, so it was quite easy to identify and contact them. Also, as we are member of this professional association and well recognized as active researchers, we were expecting good response rate to this questionnaire. In the province of Quebec, land-surveyors are mandatory member of the *Ordre des arpenteurs-géomètres du Québec-OAGQ* (Professional Association of Land Surveyors). Currently, about 1000 professionals are member of the OAGQ.

The list of questions were prepared based on a literature review on sustainable development and from specific interests in our group of research. We adapted the BNQ 21000 standard grid for our study context (Cadieux & Dion, 2012). This adapted grid is composed of different issues of sustainable development, mainly four as environmental, social, economic and transverse dimension. As well, the grid proposes indicators and actions to be considered. To reduce the length of the questionnaire and thus possibly increase the rate of response, we shortened the questionnaire and focused only on the environmental issues for this survey. In order to validate the content of the questionnaire, pre-tests were performed with a group of three land surveyors.

The final version of the questionnaire was sent on April 11<sup>th</sup> 2017 and it contains 15 questions presented in three sections. The first section includes questions related to the socio-demographic profile of respondents. The second section inquires about the interest and knowledge of land surveyors in terms of sustainable development. The third section asks questions about concrete actions taken by the land surveyors in line with the sustainable development goals. Most of the answers is obtained through closed-ended questions with multiple choice, except one question was an open one.

### **4. RESULTS**

The questionnaire received 212 responding surveyors, giving a response rate of about 20% of the membership. To present the results in this paper, we group them into three topics as interest, knowledge and actions, and afterward a discussion is trying to correlate those results. All our results are also sorted out by the socio-demographic profile of land surveyors. The socio-

demographic profile comprised age, region land surveyors come from, the size of their organization and the activities domain (public or private).

#### 4.1 Sustainable development interest

To answer this point, we directly asked land surveyors about their interest in sustainable development as unconcerned, little concerned (i.e. very few of their actions will be taken in the future) moderately concerned (i.e. a certain number of their actions are taken by them), very concerned (i.e. majority of their actions are done based on sustainable principles). As shown on figure 1, it appears that 78% of land surveyors, who responded to the questionnaire, are concerned by sustainable development (moderately and very concerned), 11% of the respondents are indifferent i.e. they consider that sustainable development does not concern their activities.

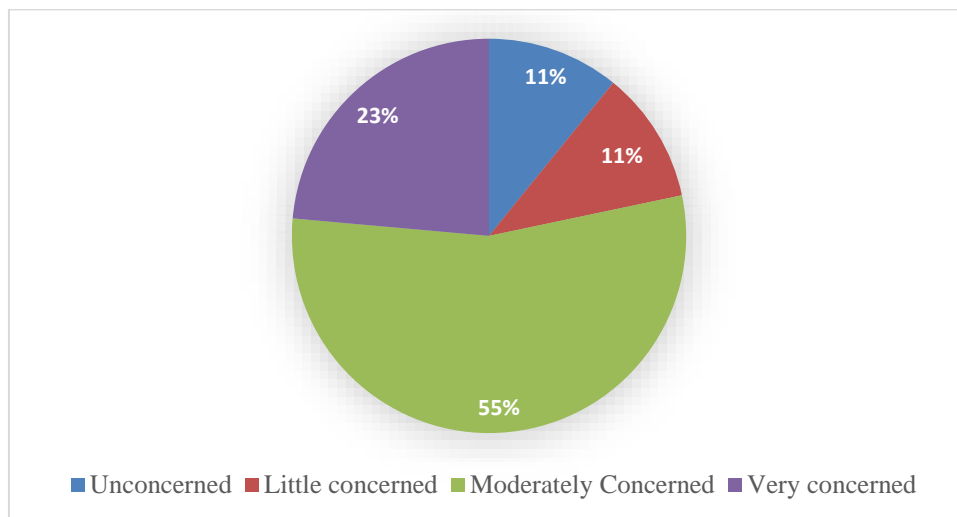


Figure 1: Sustainable development interest by Quebec land-surveyors

#### 4.2 Sustainable development knowledge

In terms of knowledge, we asked land-surveyors four questions. The first one was about whether respondents previously attempted presentations or training sessions on sustainable development. Second, we inquired if land surveyors know the different issues of sustainable development and their potential influence on their professional activities or organisation. Finally, we asked if they are aware of any regulations or standards related to sustainable development.

Figure 2 shows that most of the land-surveyors (67%) did not attend any training or conferences on sustainable development. Very few of them attend training on a regular basis (6%). Figure 3 illustrates what land surveyors consider as part of sustainable development while figure 4

shows their vision of how sustainable development may affect their professional activities and social behavior. For 82% of the respondents, environment is related to sustainable development but only 47% and 27% of the respondents related respectively social and economic as part of sustainable development. This supports our choice to prioritize the environmental issue in our survey. Concerning the potential impacts of sustainable actions on land surveyor’s activities, the main incidence is to preserve biodiversity, the second is to have a better organization image and the third one is to improve strategic planning.

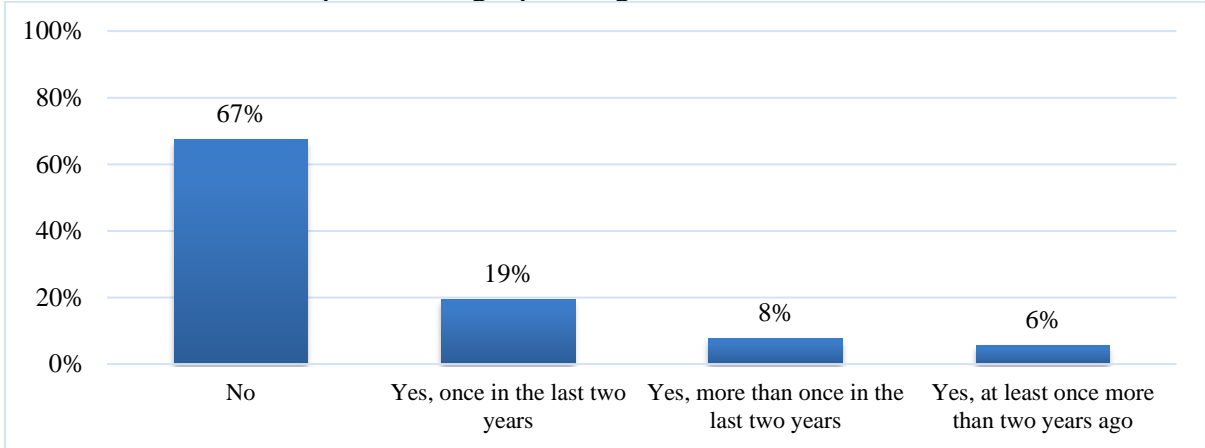


Figure 2: Level of participation of land-surveyors to attend training or conferences on sustainable development

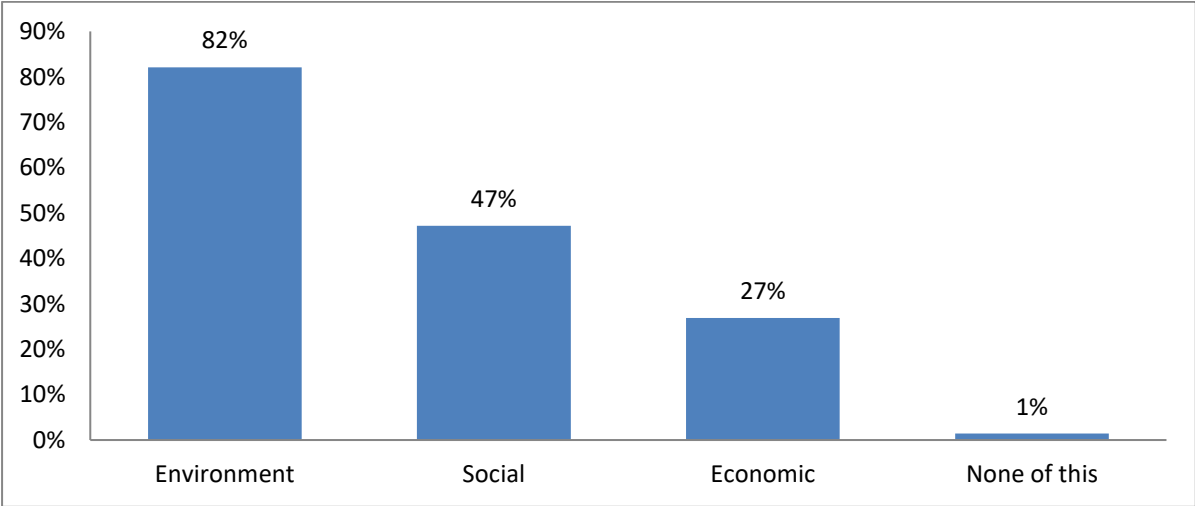


Figure 3: Awareness of land-surveyors about sustainable issues

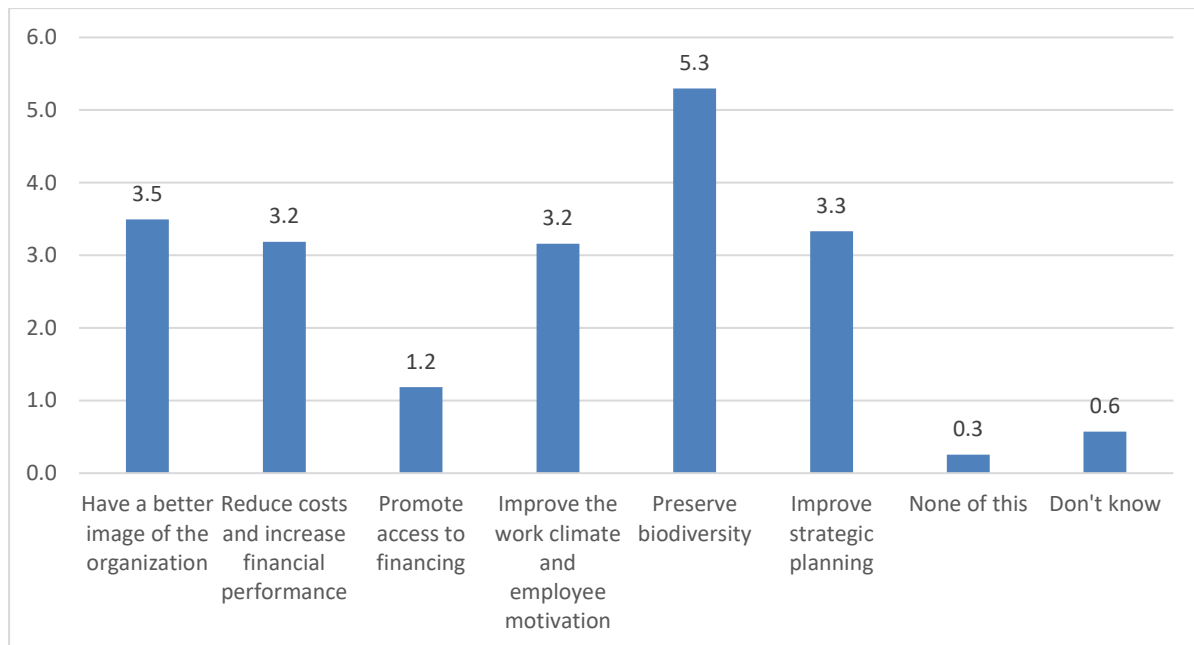


Figure 4: Potential impacts of sustainable actions on land surveyors activities

Figure 5 shows that the standards related to sustainable development are very little known in general by land-surveyors. The most recognized standard is ISO 9000 related to quality management. This is not surprising since this standard is currently applied in professional activities as mandatory in most of the Quebec and Canadian governmental contracts.

For now, if we cross the interest and the knowledge about sustainable development, we can observe that they are not really correlated. For instance, most of the land-surveyors are interested in this topic but the majority of them have very low level of knowledge about what exactly means sustainable development and how such principles may be applied in their day-to-day activities. So, a clear need in training appears as an important commitment for the land surveyors group.

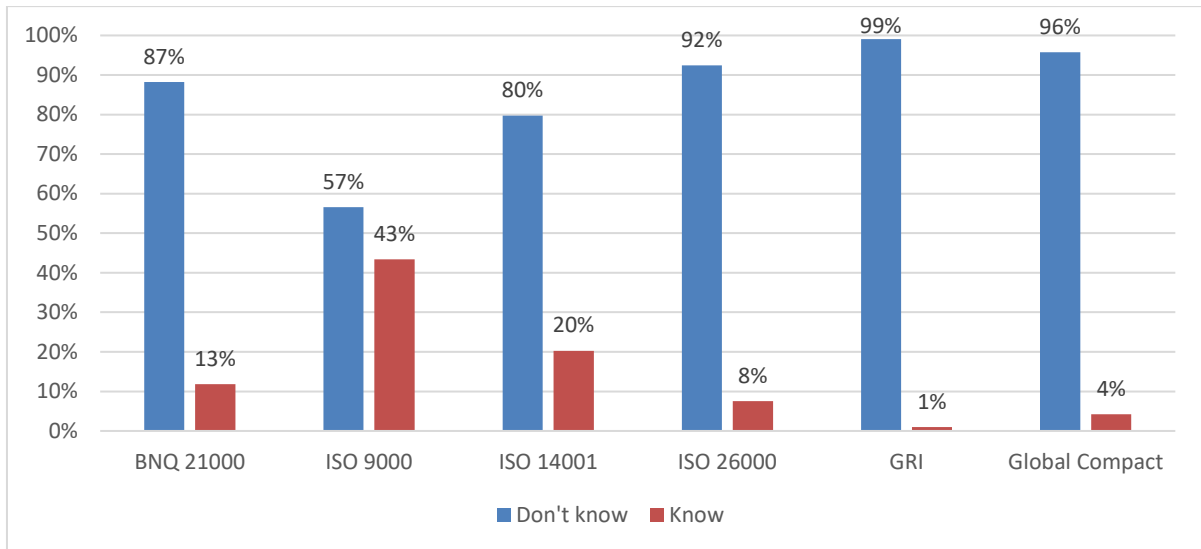


Figure 5: What standards in sustainable development is known by land-surveyors

### 4.3 Sustainable development actions

In order to understand the current actions performed by the Quebec land-surveyors, we asked them three questions, all related to environmental issues. We first asked a direct question about the actions (at a professional or at the personal levels) they currently perform. Figure 6 presents the results grouped by category of actions. We observe that more than 94% of the respondents sort residual materials and more than 82% reuse residual materials. In addition, for energy, water and GHGs, respectively, 55%, 83% and 68% of respondents have no monitoring system to reduce their consumption. However, free access and usage of drinking water in Quebec could be one of the reasons why few respondents are interested in managing their water use.

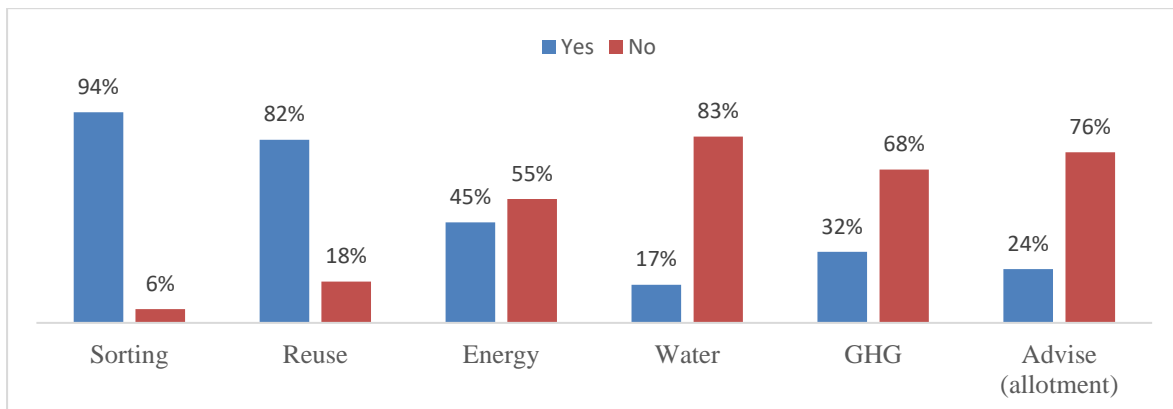


Figure 6: What environmental actions do land surveyors take

To go one step further, we crossed the results of the respondents between the actions they undertake and the importance they attach to sustainable development. Figure 7 shows the distribution of responses on energy consumption management in relation to the importance attached to sustainable development. For each class of concern about sustainable development, the percentage indicates those who either track (yes) or not (no) their energy use. It appears that the respondents who have a system for monitoring energy consumption are mainly those who have integrated sustainable development into their internal management, considering sustainable development as very important. Indeed, 68% of these have a tracking system. It also appears that 22% of the respondents who are unconcerned by sustainable development have a system for monitoring energy consumption.

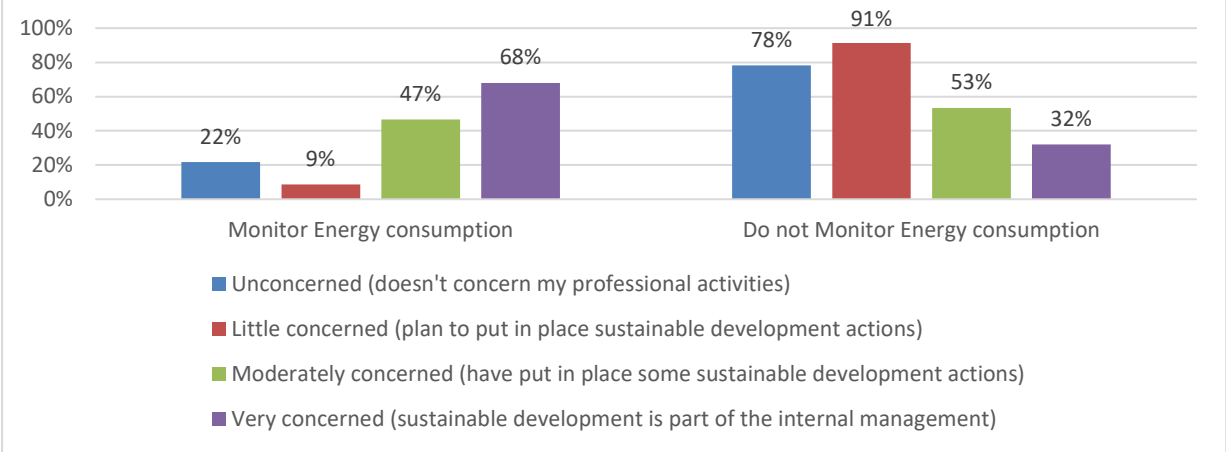


Figure 7: Energy consumption management in relation to the importance attached to sustainable development

In terms of monitoring water consumption in relation to the importance attached to sustainable development, figure 8 illustrates the percentage of people who monitor or not their water consumption. We note here that the respondents who have a system for monitoring water consumption are those who have integrated sustainable development into their internal management or who are implementing some sustainable development actions. Indeed, only 14% of those who consider sustainable development as moderately important and 40% of those who consider it very important have a monitoring system of water consumption.



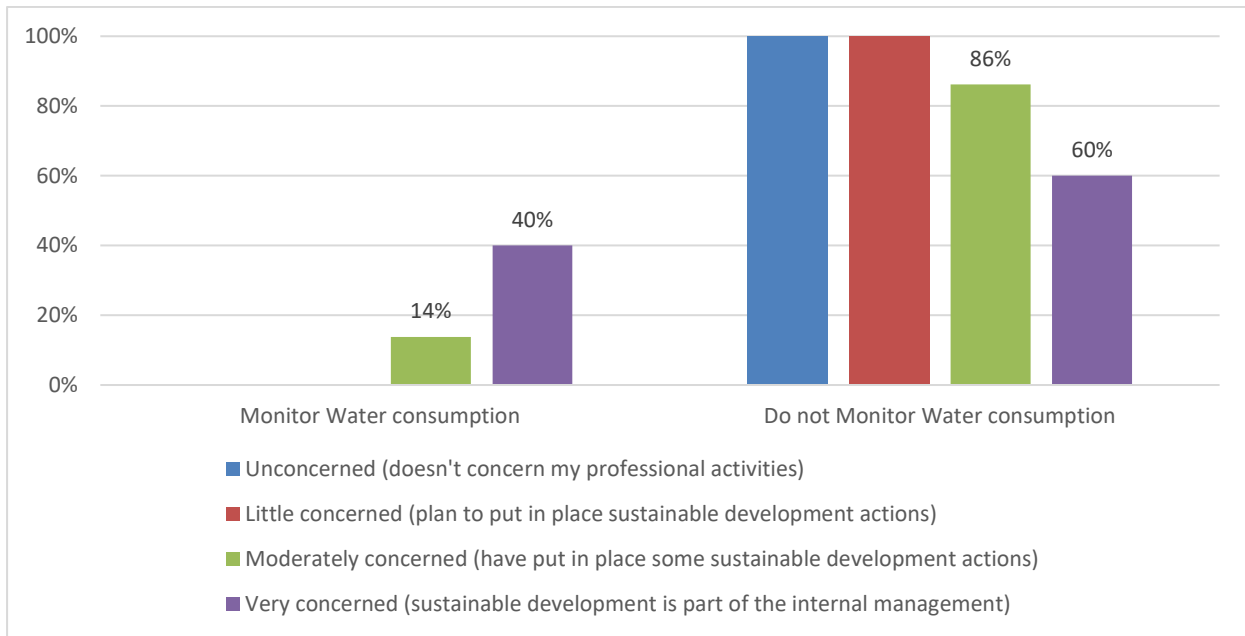


Figure 8: Water consumption management in relation to the importance attached to sustainable development

Monitoring of greenhouse gas (GHG) emissions is also a crucial point in the protection of the environment. The next figure shows that the respondents who manage their GHG emissions to reduce them are mainly those who have integrated sustainable development into their internal management considering sustainable development as very important. 74% of the respondents who foreseen sustainable development as important track their GHG emissions.

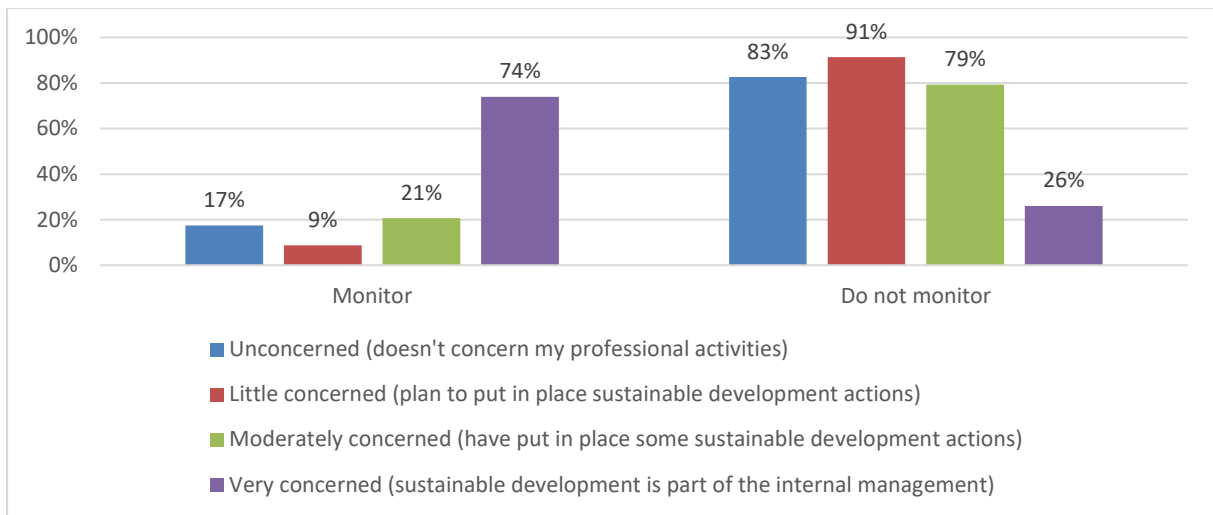


Figure 9: GHG emissions management in relation to the importance attached to sustainable development

Another point of interest in our study was to verify if land surveyors is advising clients on sustainable development when they meet and work with them. The figure 10 shows the distribution of responses to client advice on the importance respondents place on sustainable development. We noted here again that the respondents who consider sustainable development very important are the most numerous to advise their customers on sustainable development.

One more course of action that could contribute to sustainable development is the digitalisation of registry. This practice is more and more popular among land surveyors. It can be consider as one of the environmental specifics actions. The figure 11 shows the distribution of respondents according to whether they have a digital registry in their organization or not. We note that 61% of respondents have a partially digital registry, 23% a fully digital registry and 15% do not have a digital registry.

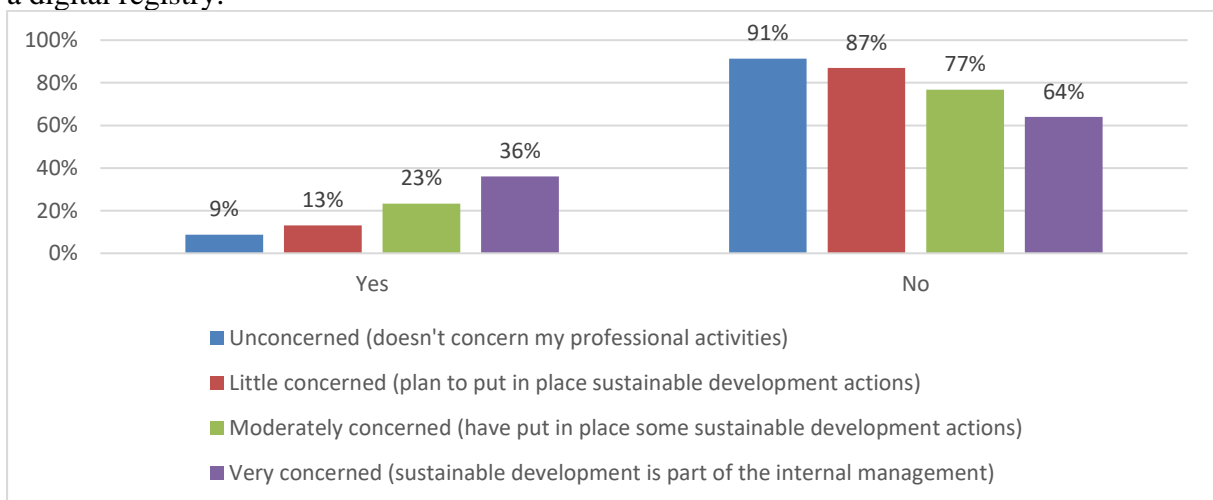


Figure 10: Advice to clients

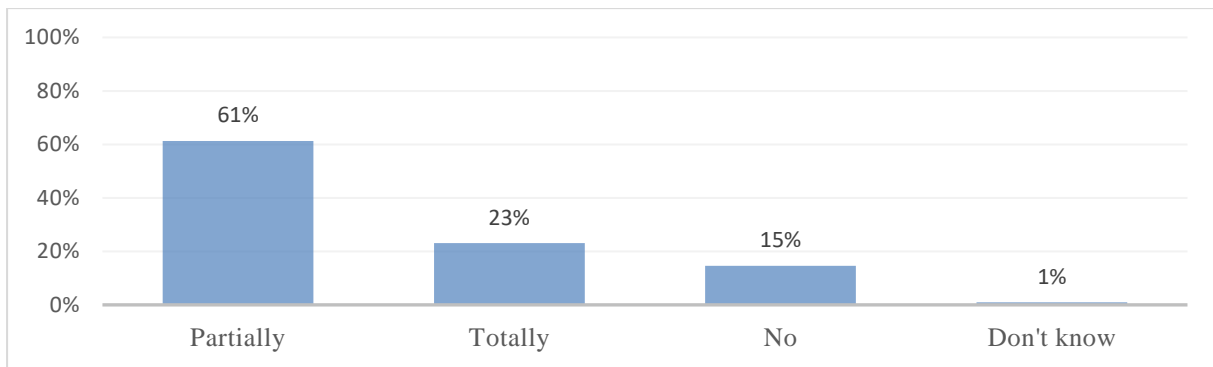


Figure 11: The number of digital register store and manage by Quebec land surveyors

The following figure 12 depicts the percentage of respondents, according to two criteria: (1) the importance they attach to sustainable development and (2) having a digital registry in place. 39% (82 out of 212 respondents) consider sustainable development as moderately important and have partly implemented a digital registry. Respondents who view development as moderately important have either fully or partially a digital registry. It is the same for those who consider sustainable development as very important. This could mean that people interested in sustainable development commit to having a digital registry.

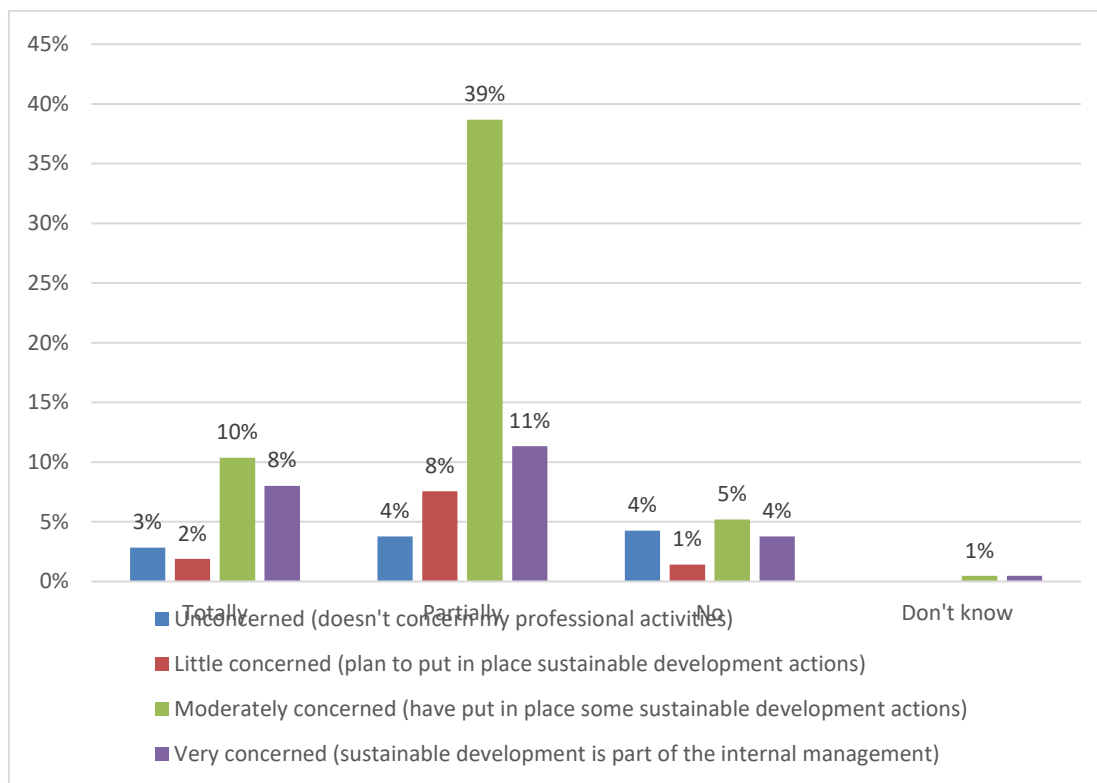


Figure 12: Digital registry in relation to the importance attached to sustainable development

In the survey we were also interested to actions that land surveyors can do as far as subdivision plans are concerned. Some actions that surveyors can recommend that emerge from our questionnaire are:

- Take into account uses and their impact on people and the environment
- Apply protection strips to "sensitive" areas
- Densify housing developments
- Reduce deforestation
- Adapt orientation to optimize sunshine and ventilation
- Privilege parks instead of paying park fees
- Provide green spaces in subdivisions
- Identify contaminated sites

At the end of the questionnaire, we asked an open question about what kind of actions, they, as land-surveyors, may or would apply to pursue sustainable development. Some general actions that can be considered in achieving the sustainable development agenda appear. Among them, we can mention:

- Public transit - car sharing - carpooling
- Strategic planning of field trips
- Collaboration with various real estate professionals to avoid repetition of tasks
- The digital registry - Electric cars - Recycling
- Continuing education
- A long-term policy
- Building Construction Leed (A certification in construction area)
- The use of biodegradable paint

## 5. DISCUSSION

In order to enable the discussion, we cross the results of the three previous topics. In summary, it appears that (figure 13):

- The level of interest of land surveyors seems to be high
- The level of knowledge of land surveyors is medium
- The level of implementation of actions is low

We also cross the results with the socio-demographic profile. This show us that land surveyors between 40 and 60 years are those who have the most integrate sustainable development in their internal management in comparison with land surveyors between 25 and 40 years or more than 60 years. Furthermore, land surveyors from the public sector are more involved in sustainable development than those from the private sector.

Moreover, the chi 2 test shows us that there is no significant relation between:

- Interest and knowledge
- Interest and age, activities domain and region
- Knowledge and age, activities domain and region
- Actions and organization size

In crossing the interest, the knowledge and the concrete actions, raise the question of whether the interest in sustainable development is real and deep when talking about professional activities or it is more general and personal.

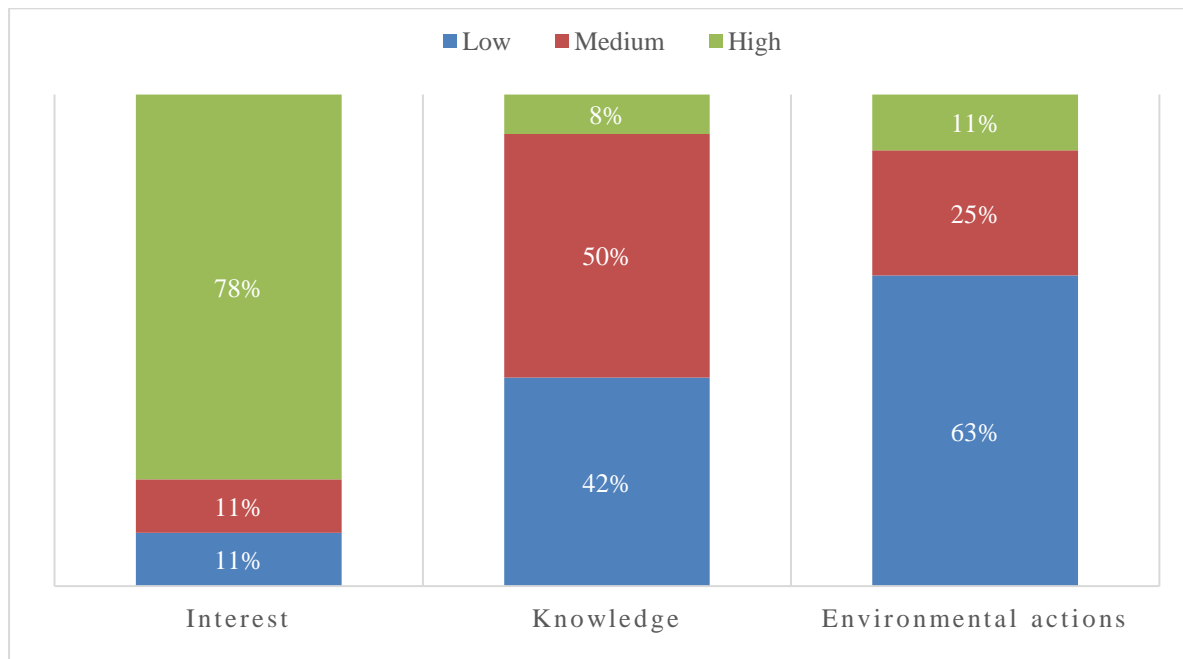


Figure 12: Recapitulation of land surveyors sustainable development interest, knowledge and environmental actions

Thus, the current practices of land surveyors seems to contribute a little to sustainable development. We estimate that there is a strong potential for improving this contribution. It can go through the will and the motivation to implement a sustainable development policy and adopt a strategy to reach the goals and objectives defined. The challenge for the community appears to be high. We must find ways to increase motivation and concrete actions among land surveyors to increase the contribution to sustainable development. Based on the results of this survey, we are proposing hereby a non-exhaustive list of actions that could enable land surveyors to contribute more effectively to sustainable development:

- The OAGQ (Quebec Professional Association of Land Surveyors), through his leadership, may give the momentum and motivation to land surveyors; for example, an OAGQ sustainable development policy may be agreed;

- Conferences, workshops or continuous training on sustainable development be organized for land surveyors to improve knowledge levels, to share ideas, and to move towards the adoption of new politics and practices;
- A guide can be written in order to help land surveyors understanding the sustainable development involved on their profession and how those principles can be applied to land surveying projects;
- Since land-surveyors use to do lot of field work, the exploitation of electric or hybrid vehicles be promoted in progressive replacements of large trucks; this could be achieved via global agreement between the OAGQ and car dealerships;
- As the land surveyors increasingly move towards digital registry, the OAGQ should implement a system which offers the necessary guarantees to ensure the safety of the customer information;
- A "sustainable development" component be included in official documents as the certificate of location; one of the professional activities mostly performed by Quebec land-surveyors. This note may reveal professional activities that contributes to sustainable development as paperless, sound mapping accessibility, possible options in terms of optimizing green spaces
- Like ISO 9000 in quality management is required in governmental contacts, we may even consider having specific condition for professional activities that operate and act responsibly in a way that contributes to sustainable development;
- Regarding students in land-surveying, university program could be more engaged in integrating sustainable development as transversal skill or to promote the current profile related to sustainable development (Université Laval, Québec, already have a sustainable development profile in the bachelor's degree in geomatics sciences).

## 6. CONCLUSION AND PERSPECTIVES

In this study, we did a preliminary and straightforward survey on how sustainable development is integrated in the Quebec land surveying profession. As far as we know, this study is the first in this matter. Our contribution can be considered as a form of result insofar as it raises awareness and increases knowledge among land surveyors on the sustainable issues. The study demonstrated that although Quebec land-surveyors pay attention to the matter of sustainable development, their level of knowledge about the subject is relatively low. Furthermore, the number and the diversity of actions currently achieved by land-surveyor are also low. Is this result comparable to other professionals? We are currently not able to answer this question since we did not find analysis on this topic.

As mentioned, this research was exploratory and gave only a restrictive view of the current situation. We also focus intentionally only on the environmental issues that are normally the one issue better known in society. Further works are required as:

- Look at ongoing research or other bodies regarding sustainable development and compare their outcomes with our results.
- Investigate what is being done in other professions to identify the most effective mobilization actions and adapt them to stimulate adherence among land surveyors.
- Explore professional acts of land surveyors and find links and relevance with sustainable development activities.
- Survey other aspects of sustainable development as social, economic, transverse issues.
- Develop a guide or principles to provide assistance and support in applying sustainable development actions in land surveying.

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## BIOGRAPHICAL NOTES

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