Sustainable Development Indicators: An Introduction

Chien-Zer Liu*, Fanny Tremblay-Racicot**

abstract

At the United Nations Conference on Environment and Development (UNCED) held in Rio de Janerio, Brazil, in June 1992, more than 178 Governments adopted the Rio Declaration on Environment and Development, and the Agenda 21which mean comprehensive action plan to be taken globally, nationally and locally in every area in which there are human impacts on the environment. The United Nations Commission on Sustainable Development suggested, in 1995, a working list of some 134 indicators of sustainable development.

This research paper explores the various steps undertaken in order to define and implement an indicators system, as well as the challenges that this initiative faces and the research needs in this field. The aggregated results of the following experiences were used: the case of two countries (France and Canada), one region (Saguenay-Lac-St-Jean, Québec Province), one locality (City of Montréal), and one enterprise (Hydro-Québec).

The current indicator systems help to fulfill the data gap and improve the information access, as well as they help to interpret the information and contribute to the diagnosis. However, the current indicator systems do not contribute much to the understanding of the territorial system yet. However, some shared indicators do already exist for all countries, cities and enterprises, and the research could focus on development for shared indicators for all institutions within a country. Sustainable development indicators tend to be more and more used to raise public awareness, even if, often, no plan or strategy is adopted by the governments.

Key words：Sustainable development indicator, Sustainable development

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Background information

A　Sustainable development indicators: A brief history

At the United Nations Conference on Environment and Development (UNCED) held in Rio de Janerio, Brazil, in June 1992, more than 178 Governments adopted the Rio Declaration on Environment and Development, and the Agenda 21which mean comprehensive action plan to be taken globally, nationally and locally in every area in which there are human impacts on the environment.　An entire chapter of Rio Summit's Agenda 21 is devoted to the issue of information to support policy-making (Chapter 40). This chapter sets out two objectives:

a. To bridge the existing data gap; and

b. To improve information availability.

Chapter 40 puts also great emphasis on the need for indicators to increase focus on sustainable development and to assist decision-makers at all levels to adopt sound national sustainable development policies. Indeed, it calls on countries and the international community to develop indicators of sustainable development:

Commonly used indicators such as Gross National Product (GNP) and measurements of individual resource or pollution flows do not provide adequate indications of sustainability. Methods for assessing interactions between different sector, environmental, demographic, social and development parameters are not sufficiently developed and applied. Indicators of sustainable development need to be developed to provide solid bases for decision-making at all levels and to contribute to a self-regulating sustainability of integrated environment and development systems. (Dormoy, 2003: 6)

Following form the recommendations of Chapter 40 of Agenda 21, the United Nations Commission on Sustainable Development suggested, in 1995, a working list of some 134 indicators of sustainable development. The relevance of this list and the ability of these indicators to be expressed in figures were tested by a number of candidate countries (Austria,

Belgium, Finland, France, Germany and the United Kingdom), in partnership with developing countries. Based on these tests and some expert group consultations, a core set of 58 indicators and methodology sheets – derived from the latest working list – has been developed and is now available to all countries to use[1)] . This indicator set is currently undergoing revision. The United Nations has also encouraged further work on indicators of sustainable development by countries, in line with national conditions and priorities (Dormoy, 2003: 6; UNDSD, 2006a). Since, many other initiatives have emerged, for example from the OECD and other developed countries, and also from the private sector.

This research paper explores the various steps undertaken in order to define and implement an indicators system, as well as the challenges that this initiative faces and the research needs in this field. The following sections will be successively addressed: a brief presentation of the five cases examined in the present research; the use of indicators in the decision-making process; the development process (working method, choice of indicator's system, selection critters, collection of data, validation and interpretation, diffusion methods); as well as the challenges and the research needs. The aggregated results of the following experiences were used: the case of two countries (France and Canada), one region (Saguenay-Lac-St-Jean, Québec Province), one locality (City of Montréal), and one enterprise (Hydro-Québec). These experiences were presented at the Conference «Indicators of sustainable development: Reflexion and exchange working group», organized by the Hydro-Quebec Institute on the environment, development and society in collaboration with the Québec's Ministry of sustainable development, environment, and parks, in Laval University on June 1st, 2006.

B Presentation of the cases

a. Case of France (Country)

France has contributed to the emergence of two sets of 45 indicators. The first one has been developed between 1996 and 2003 by the French institute on environment, upon the request of the Ministry of ecology and sustainable development. This first set has originated from the United Nations Commission of Sustainable Development first indicator's working list. The second set was released in 2003 alongside the National Strategy on Sustainable Development. It was led by the Strategic Analysis Center. (Levrel, 2006；Dormoy, 2003)

b. Case of Canada (Country)

The Ministry of environment of Canada (Environment Canada) has first released a set of environmental indicators in 2003, and then released the Canadian Indicators of

1) For the complete listing of the 58 indicators, see: http://www.un.org/esa/sustdev/natlinfo/indicators/isdms2001/table_4.htm. (UNDSD, 2006b).

Environment Sustainability in 2005. These sets have been created within the government, without partnership. They include environmental indicators only; there are no social or economic indicators. The indicators are not directly linked to any specific plan or strategy. Environment Canada, in collaboration with the Canada Mortgage and Housing Corporation, has also released in 2001 a set of guidelines for the development of sustainability indicator, called Sustainable Community Indicators Program (SCIP) (Ditor, 2001). SCIP is an Internet-based reference guide to help communities and organizations develop indicators of sustainability and establish a sustainability indicators program.

c. Case of Saguenay-Lac-St-Jean (Region)

The Quebec's center on sustainable development, a private research center, has released a set of 40 sustainable development indicators in 2002 (CQDD, 2006). These indicators have been developed especially for the laboratory region of Saguenay-Lac-St-Jean, and the evaluation process, analysis and monitoring are still undergoing. The development of this set has involved many regional stakeholders and is not linked to any plan or strategy.

d. Case of City of Montreal (City)

The City of Montreal has developed a set of 62 indicators for the reference period 1999-2003. The set was released in 2005 along with the city's first Sustainable Development Strategic Plan. This diagnosis will serve as a reference document for the upcoming years. It was created by the Regional environmental council of Montreal upon the request of the City council of Montreal. (Comparot & Porlier, 2005)

e. Case of Hydro-Quebec (Enterprise)

Hydro-Québec is one of the most important electricity producers in North-America. Its energy production is 97% hydroelectricity and its revenues are CAD10,9 billions or TWD330,0 billions annually. The company has released its first annual environmental report in 1995. It has included social and economic indicators to its environmental report in 2001. The first annual sustainable development report has been released in 2002. It was inspired by the guidelines of the Global Reporting Initiative (GRI), an independent organization supported by the United Nations Environment Program, which develops, continuously improves and builds enterprises' reporting capacity around the use of a Sustainability Reporting Framework. The GRI guidelines were developed in collaboration with diverse stakeholders and more than 30 enterprises. They have inspired more than 800 reports in 57 countries. The 2005 Hydro-Quebec's sustainable development report was produced in conformity with the GRI guidelines and was verified by an external independent firm.

The use of indicators in the decision-making process

Sustainable development indicators are a tool aimed to facilitate the decision making process. (Florent, 2006) underlines the stage when the indicators should be used. According to him, the decision making process is composed by the five following stages:

a. Formulate the preoccupations;

b. Define the issues;

c. Evaluate the importance of the issues □

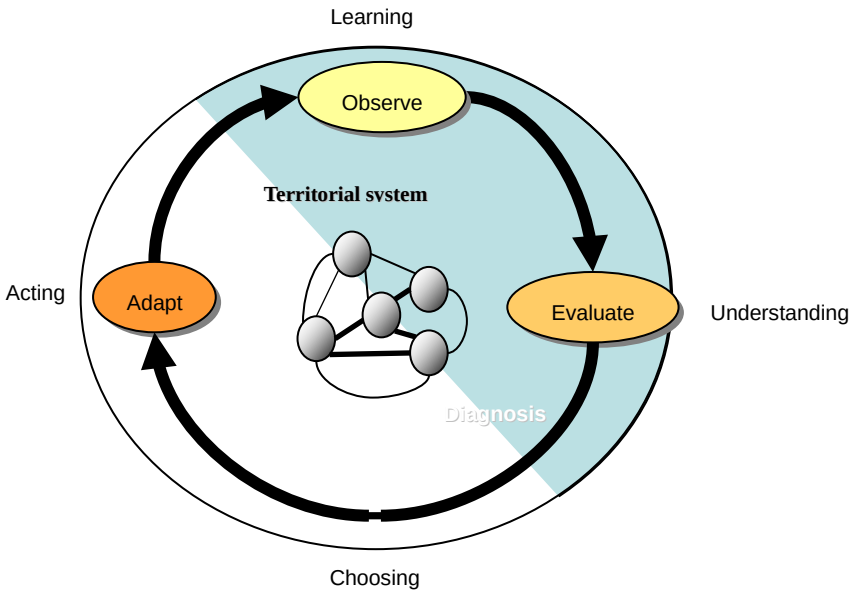
d. Chose the priority issues;

e. Adopt measures to address the issues.

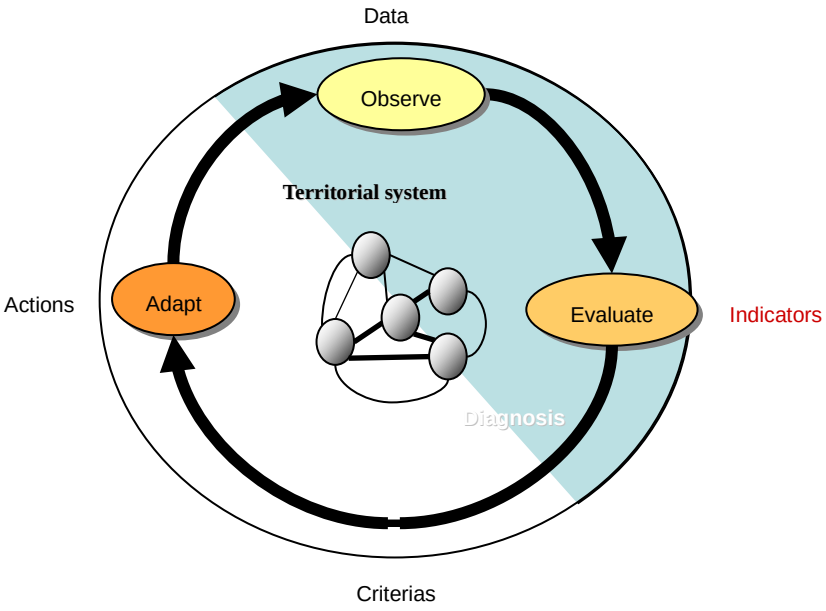
First, the decision makers formulate the preoccupations, such as the unemployment, the air choose quality, or the crime, for instance. Second, they define these issues: what are they, how, and why do they happen. Third, they evaluate the importance of the issues by using indicators, such as the unemployment rate, the air quality index, or the crime level. Then, they make priority choices according to the indicators and the indicator system, before adopting measures in order to address the issues. The same author (Joerin, 2006) illustrates the three different phases of the decision making process as the following:

These figures show the role of the indicators and the indicator system in the decision making process. They are meant to evaluate a territorial system after the observation, in order to make sound decisions and proper actions.

- Different phases…



- …that transform the information…



- …which needs different tools.

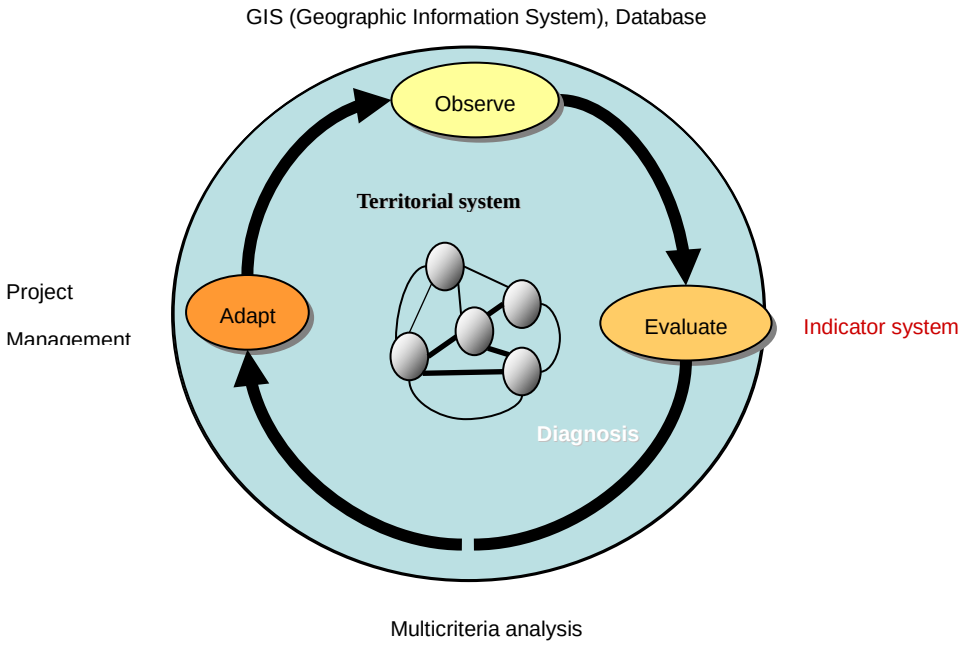


Figure 1 The decision-making process

Development process

Usually, the initiative of developing an indicators system follows the adoption of a sustainable development plan or strategy, in order to monitor progress towards the objectives

set out in approved documents. Indicators can also be developed to: compare (the situation between cities, for example); or to understand, to learn about a territory or a situation. The participatory diagnosis is also a way to sensibly and educate about what constitutes sustainable development. However, the primary role of an indicators system is to pronounce diagnosis that will serve to understand a situation in order to take sound sustainable development policy. In the case of the public sphere, the sustainable plan, or strategy, and the priorities are usually set by the public institutions, such as the national government, the provincial government, the city council, etc., and the indicators are developed by or in collaboration with independent research or specialized institutes and boards. In the case of the private sector, the development of the sustainable development plan and indicators can be processed internally, but in this case, it would have to verify by an independent external firm. (Joerin, 2006; Dormoy, 2003: 6).

A. Working method, choice of indicator system, selection criteria

According to the guidelines suggested by Environment Canada and Canada Mortgage and Housing Corporation (Ditor, 2001), the indicator development process comprises the six following generic steps:

a. Define and conceptualize sustainability;

b. Identify target audience and purpose of indicators;

c. Choose an appropriate framework;

d. Define indicator selection criteria;

e. Identify and evaluate potential indicators;

f. Choose final indicators.

A participatory, consensus-based approach is strongly recommended. The development process and the diagnosis should involve partners and stakeholders from various sectors. (Ditor, 2001; Dormoy, 2003; Joerin, 2006) For instance, in the case of the City of Montreal, the consultation of the partners was at the heart of the development process. Indeed, it has involved 80 partners coming from the public, the private and the associative sector through five orientation meetings, four thematic meetings, two questionnaires and two formal events. (Lussier &Porlier, 2005)

The choice of an indicator system or framework should depend on the target audience, as well as the objectives and the priorities set in the previous stages. Indicator frameworks may be classified into six general types: goal-based, issue-based, sectored, domain-based, causal, or a combination of the five latest. (Ditor, 2001) There are some examples of sets:

a. Environmental, Social and Economic (Pillars approach);

b. Social, Environmental, Economic, Institutional (UNCSD);

c. Indicators of the Environment, Indicators of Action (City of Montreal);

d. Human development, Culture and governance, Environment, Social systems, Economic systems, Resource management, Territory management (Saguenay-Lac-St-Jean Region).

According to the guidelines developed by Environment Canada and the Canada Mortgage and Housing Corporation, as well as the cases explored, the indicators selection criteria's can be resumed to twelve (Ditor, 2001；Lussier and Porlier, 2005; Joerin, 2006):

a. Scientific validity and theoretical soundness (Reliance and rigorousness);

b. Responsiveness to change ;

c. Evident links of cause and effect ;

d. Representative of sustainability issues ;

e. Accurate time-series, data available, collectable and public ;

f. Cost-effectiveness ;

g. Relevant and understandable to users ;

h. Comparable among jurisdictions ;

i. Useful at large and small geographic scales (can illustrate local phenomenon's);

j. Comparability to target, Thresholds or standards ;

k. Integrates social, economic and environmental factors ;

l. Periodicity.

Once selection criteria have been defined, they can be used to evaluate potential indicators. Because it is difficult to find indicators that satisfy all selection criteria simultaneously, judgement will have to be made about their relative importance. Meaningfulness to individuals in the community should be given first place in the list of selection criteria.

B. Collection of data, validation and interpretation

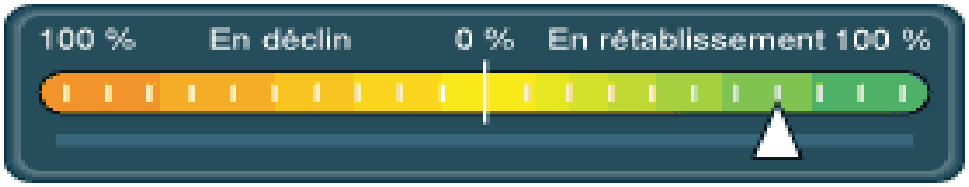
In order for the indicator set to be trusted by the public, an independent organization, such as the national statistic institute, should be mandated to collect the data. The organization responsible for the development of indicators should also be involved in the validation and interpretation process in order to ensure the independence of the process. The interpretation of the data is both objective and subjective, but not arbitrary.(Lussier and Porlier, 2005)

C. Diffusion methods

The communication aspect is important and should not be neglected.

Indeed, (In regression) (Hard to tell) (In progress)

Figure 2 Diffusion method for the case of Saguenay-Lac-Saint-Jean Region.(CQDD, 2006)



(Declining) (Restablishing)

Figure 3 Diffusion method for the case of Environment Canada (2006)

the set of indicators has to attract media attention in order to have good visibility to the public at large. The presentation format has to be adapted to the target audience. The choice of indicators and data format will be different if the audience comprises the professional's analysts and the scientists, the policy-makers, or the public. For the first group, raw data, highly detailed and complex indicators, as well as an emphasis on scientific validity and complexity is preferred. For the policy-makers, indicators directly related to policy objectives, evaluation criteria and target values are needed. For the public, a reduced set of indicators, easy to understand and that represents issues of direct concerns are the norm. (Ditor, 2001; Lussier and Porlier, 2005; Boire, 2006) The two following figures are examples of the way the diagnosis can be presented to the public:

Challenges and research needs

The current indicator systems help to fulfill the data gap and improve the information access, as well as they help to interpret the information and contribute to the diagnosis. However, the current indicator systems do not contribute much to the understanding of the territorial system yet. The practitioners have encountered many challenges in the development of indicators. First, the notion of sustainable development itself is still not clear as it is

multi-scaled (in terms of territory and time). Second, the mandate of developing an indicator system is quite complex, as it has to illustrate and simplify the complex reality. Indeed, the indicators have to illustrates short-term trends and they should not be too numerous (between 30 and 70 maximum depending on the user and the usage). Practitioners are also facing the challenge of qualification and interpretation of the trends, as well as the aggregations and interrelations between the indicators. In structural terms, it is sometimes hard to obtain and maintain resources aimed at developing indicators, as well as to carry out feedback and monitoring. It is also difficult for the indicator system to gain visibility and to have local roots. (Joerin, 2006; Lussier and Porlier, 2005)

Some practitioners suggested that further research should be conducted on the complexity of the indicators, about the navigation, the interrelations and the causal relationship between indicators. (Joerin, 2006) has suggested a method to conduct such research. First, a systemic model should be developed, and then the indicators as attributes of the system's components should be found. The interrelations between the indicators could be subsequently found more easily. However, the first step of this method, i.e. the development of a systemic model, would be hard to go through as it requires the deep and pragmatic understanding of what ensures the sustainable development for a specific territory, which is currently lacking. However, the sustainable development plans or strategies, if properly constructed, should provide some key information about the interrelations between the elements of the plan itself, which in turn should facilitate the researches about the indicators. Other practitioners have underlined the necessity of developing shared indicators between the municipality, governments, organizations, etc. (Lussier and Porlier, 2005). This also requires a great deal of comprehensiveness of the concept of sustainable development, and would be hardly possible between institutions or territories that are not at the same level of development, because they have different goals and priorities. However, some shared indicators do already exist for all countries, cities and enterprises, and the research could focus on development for shared indicators for all institutions within a country.

Sustainable development indicators tend to be more and more used to raise public awareness, even if, often, no plan or strategy is adopted by the governments. In addition, new initiatives emerge. For instance, at the national level, environmentally-adjusted GDP takes into account the environment damage and the waste created in the process of economic growth. This indicator is not a sustainable development indicator; it is more an economic indicator that takes into account some environmental aspects. The time to evaluate the policies' costs and benefits in a sustainable way has come.

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