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Sustainable Mobility: definitions, concepts and indicators

By
Catherine Morency (Ingénieure)
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There's a lot of talk about the concept of sustainable mobility. Today, I would like to try and define it, I'd like to talk to you about some different but related concepts, and determine how we can measure this concept of sustainable mobility. Clearly, this has now become a major issue for transport, since transport is a key driver in attempts to increase the degree of sustainability in our societies, and for our local authorities. It has a direct effect on all the negative impacts that can be measured environmental impacts, social impacts, economic impacts. The aim here is to achieve a more uniform understanding of what constitutes sustainable mobility. As a subject at the heart of transport strategies, several countries and regions have equipped themselves with tools, policies and action plans in a bid to focus the decision making in transport-related matters, and to try to improve the level of sustainability. Obviously, it's fairly difficult to define the best possible level of sustainability that can be achieved, and even more difficult to identify the targets. Several people have thought about the concept, which is used in several different areas, but any 'operationalisation' requires a better understanding of the concept and, above all, a definition of the relevant indicators. So we're going to talk a little about all this today.

What is a sustainable transport system, and what do we mean by sustainable mobility?

To start with, there are different definitions that we can use. The first of these is the definition of sustainability put forward in the Brundtland report. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Obviously, if you want to adapt this to transport systems or to mobility, you have to look at the consequences that it could have for them. The Winnipeg Centre for Sustainable Transport has put forward a different definition of a sustainable transport system: one that enables individuals and societies to satisfy their needs for access to activity areas in complete safety, in a way that is compatible

with the health of mankind and ecosystems, and which is also balanced fairly between different generations. It's a system that will come with reasonable costs, that will operate efficiently and that will offer all populations a choice between different transport alternatives. So, one of the characteristics this system needs to have is the ability to limit polluting emissions, waste etc, so as to try and ensure that the planet's ability to absorb all of this is not exceeded. There are a lot of definitions of mobility too. They can all be summarised as having an accepted understanding that mobility is the ability of people and goods to move or be transported, and that this mobility is sustainable when it is created in a way that respects safety and the environment, ensures the provision of life's material needs and guarantees fairness among individuals.

Improving sustainable mobility: through supply or demand?

What strategies are available for trying to improve the sustainability of mobility? On the one hand, action can be taken regarding supply, the supply of transport in order to try and modify behaviours; for example, by investing in infrastructures, even though that can produce various non-intuitive effects. Alternatively, financial measures can be taken: for example, tolls, pricing structures and car parking management. Action can also be taken to reduce supply by limiting, for example, the potential usage of vehicles that have lower levels of sustainability, according to any collective understanding. Finally, it's also possible to try and influence the demand side of the equation. If I'm asked what needs to be done to limit congestion, I would simply say that we need to reduce demand, because everyone wants to move around in the same places at the same time. So action can also be taken on the demand side in terms of communication, of making people aware of the negative impacts of their transport choices. You can also have urban development and time management policies, for example, that change timetables or support home-working etc.

How can we ensure fairness across society?

If we go on to look at the challenges and objectives of sustainable development in the field of transport, there are also objectives of a social nature. People talk about accessibility, fairness across society as a whole, making sure that every segment of the population has the same possibilities in terms of accessing areas of activities. People also talk about the quality of life in city areas, the quality of life of commuters and people's autonomy. A lot of thought is going into the need to ensure that the elderly who live in less accessible areas are able to access different transport options when they are no longer able to get about on their own. Obviously, this creates a certain amount of friction towards decision-makers because it comes at a cost, and the economic value of autonomy has not yet been quantified. Should it be? That's another question. Then there's the issue of a sense of community; how can we make sure that everyone can be part of society? And what about questions of isolation and segregation, if the transport system doesn't allow everyone to play an active part in society?

How can we meet the environmental and economic challenges?

The challenges linked to the environment are far more easily met, individuals and societies are far more sensitive to the impact of pollution and the production of greenhouse gases. These issues are much better understood and are far better integrated into various processes. There are other environmental aspects, though. People talk about consuming space, the number of parking places that a vehicle needs, the fragmentation of habitats, the issue of water run-off when there is paving everywhere, because this can obviously create hotspots, and limit the ability to get rid of this excess water. Finally, there are all the issues to do with air quality and noise pollution. The other aspects, the economic ones, are very difficult to control. To increase the level of sustainability of transport systems, you need to be sure that transport costs are affordable for everyone. And obviously, there's the whole question of collective investments, and of the collective budget that's devoted to transport; and there's obviously the contribution made by all the employment that's linked to transport systems. So there are all these challenges linked to the economy that people are trying to understand when it comes to identifying the different degrees of sustainability of transport systems.

“Operationalising” the measure of sustainable mobility

I'd like to make an observation about the measurement of sustainable mobility, because obviously there is only one step between defining sustainable mobility and trying to measure it; that said, it's an important step because if it can't be measured, it's going to be very difficult to take it into account in any project evaluation process. So, we are forced to take this step, to define the indicators that can be used for an evaluation, which could be in the form of a matrix, a system integrating different indicators and various weightings. And that's a relatively difficult thing to do... In this context, I have made an observation in five points, in which I will try to understand where we are with the question of measuring sustainable mobility. This is what could be called the “operationalisation” of the concept, so that it can actually be put into practice.

Observation 1: the multiplication of indicators

The first observation, is an observation of muddles. By muddles, I mean a group of disorganised elements. If we look at the literature on sustainability, we can see that authors have put forward a wide variety of indicators, but it's all totally disorganised. There are a lot of indicators that will enable us to assess sustainability, but we also witness duplication in indicators, we're not sure about the way the indicators have been estimated, whether the choice of indicators is more or less relevant. So, it's all very debatable; and sometimes there are going to be missing elements because we are simply unable to measure them.

Observation 2: the disproportionate influence of certain indicators

The second observation is a state of imbalance. Cyclically, what we observe is that some indicators are given too much weight. In particular, I mean the amount of greenhouse gases produced. In recent years, these have been given a disproportionate weight in the sustainability level equation. There has been a degree of awareness, governments are committed to making reductions and to setting objectives, and a great deal of importance has been attached to this indicator at the expense of others. That can have impacts, paradoxical effects: some projects can have a reduction in greenhouse gases as a consequence; but, even so, they can also result in negative impacts which, in the overall sustainability equation, will make it clear they were a bad decision. We can take the example of electric cars. I don't want to shock certain people, but if you switch from a petrol car to an electric car, there will certainly be a reduction in greenhouse gases locally, but we are nevertheless going to perpetuate other problems, the occupation of space, congestion and the use of infrastructures and parking areas. So, it doesn't solve all the problems: an imbalance can arise from the choice of some indicators at the expense of others.

Observation 3: when the choice of indicator is dictated by opportunism

The third observation that can be made is one of opportunism. Too often, in the choice of indicators, there will be a degree of reliance as regards the available data. We'd like to measure something, but because we don't have access to the relevant data, we measure other things instead, or we simply ignore the lack of data, or we take several indicators that are a bit more vague, a bit more qualitative in nature.

Observation 4: giving an economic value to social and environmental topics

The fourth observation concerns what I'd call economic simplification. The economy is a central element in the sustainability equation. However, it shouldn't be at the expense of the two other spheres the environment and, above all, the social sphere. You often get the impression that the strategy chosen for trying to take into account these other aspects, greenhouse gas emissions or the social aspects is to translate them into something else and therefore to attribute an economic value to a concept. In the

particular case of greenhouse gases, an economic value is given to a tonne of gas. The same thing is also done for human life; a value is attributed to human life so that it can be entered into an equation, so that, in the end, a verdict can be reached on whether the strategy is good or bad. Obviously, all of this is highly debatable; these are choices involved in the evaluation process, but they still imply some simplification and it still means having to attribute economic values to the barriers that need to be taken into account.

Observation 5: taking the causality chains into account

The final observation is an observation of unidimensionality, meaning that chains of causality are not taken sufficiently into account and that, often, neither are space-time interactions between different impacts. So you can have an impact that will have an effect on a second impact, without the chains of causality being known, and therefore on the effects of a strategy, either in the short or the long-term. So, we can end up with strategies that have paradoxical impacts, contrary to those that were hoped for. So, here are the five observations that can be made about evaluating the level of sustainability or, at least, the efforts which are being made to try and measure the level of sustainability in projects. Obviously, the stages that follow when we try to 'operationalise' this measure of sustainability involve trying to define the different types and to define the different indicators which can later be used in the context of a more organised evaluation; one in which these causality links will indeed be taken into account.

Creating types of indicators, classifying them, 'refining' them and structuring them

Among the types of indicators that can be put forward, there are several indicators that characterise mobility and that are fairly well understood. Work has been underway for a long time to measure mobility behaviours. Obviously, there are also indicators of context, and for these you need a full description of the context in which journeys are made: the price of petrol, the local conditions, the use of the land, people's personal characteristics, the demographic structure, etc. There are indicators that we will call inputs, which will be the costs and resources required to try and put these strategies into practice, and there are output indicators, an equivalent that will be the result of a certain intervention in the networks. There will also be indicators of impacts, everything to do with the consequences of modifying mobility behaviours, for example. It is therefore very important to be able to classify what's being measured, to see if it's something that can be acted upon, or can be modified by introducing a strategy. The other challenges to be faced involve "refining" these indicators: defining estimating methodologies that can be adapted according to the type of project being deployed or being studied. For example, there is the whole notion of spatial scale: if there's an intervention in an urban district, there will be a need for more local indicators, ones that deal specifically with urban districts. There are also questions of temporal scale: is the effect going to be spontaneous and simultaneous with the introduction of the strategy? Will it be a short-term effect? Will there be an effect in 10 years' time? Then there is the question of the effect on people: is it going to affect every section of the population or only certain segments of the population? And finally, step three in the estimation, is structuring all that in the form of systems that can perform an evaluation. The best indicators have to be selected, then defined, then formalized, and then subjected to mathematical formulae. After that, it's a matter of proposing methodologies, determining how these are going to be assessed, how all these different figures are going to be put together and how recommendations are going to be made about the data that is going to be collected, in order to ensure a continuous monitoring of the impacts of projects. There's also the need to make clear the causality links which are not always easy to predict in advance, and to have systems which will make it possible to support this evaluation of transport projects.

Challenges: defining a transparent and reliable methodology

In the end, the process of defining sustainable mobility is, above all, about having systems which makes it possible to assess the various levels of sustainability. The challenge is to have methodologies that are transparent, so that people know, or are able to work out where the results come from. You

have to ensure a continuous collection of data to be able to measure the impacts in different time horizons and to organise them in the form of systems. Obviously, all this has to be practical or 'operational'; we have to end up developing indicators that institutions can use to take more informed decisions, ones that reflect the new collective visions of increased levels of sustainability.

Mobility

For the Mobile Lives Forum, mobility is understood as the process of how individuals travel across distances in order to deploy through time and space the activities that make up their lifestyles. These travel practices are embedded in socio-technical systems, produced by transport and communication industries and techniques, and by normative discourses on these practices, with considerable social, environmental and spatial impacts.

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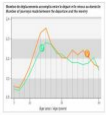


Catherine Morency

Ingénieure

Catherine Morency is a civil engineer and professor of transportation planning at Polytechnique Montréal. She heads the Mobilité Chair which focuses on the assessment and implementation of sustainable transportation and the Canada Research Chair which studies interactions between different modes of transportation. Her research concentrates on modeling individual travel behaviors including active and alternative modes of transportation, data collection methods and the development of simulation tools.

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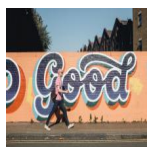
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