

Accounting for Urban Scale Sustainability

Adrian Vickery Hill (BUUR), Miechel De Paep (BUUR), Johan Van Reeth (KU Leuven, BUUR)

Contact – adrian@buur.be

Sustainability is about making the most effective choices that have the lowest negative impact and the greatest quality. This in principle is the main objective of urban planning.

However urban projects are generally complex or wicked problems. Sustainability on an urban scale is torn between economic viability/prosperity, socio-cultural cohesion, environmental impacts while decisions are placed in the hands of generally diverse and contradicting interest groups. This makes negotiating urban scale sustainability an extremely complex challenge.

In an age where it is clear that urban areas are the source of most environmental issues and the living environment of the majority of the world's population, urban designers and planners need a tool to aid the development process in order to find the most sustainable solutions.

Existing assessment tools often provide an ex-post evaluation, but often fail in the process of guiding a holistic approach to decision making.

We have developed a 'sustainability compass', which is intended to orient, inform and evaluate the urban development process. Here we explain how we arrived at a theoretical perspective based on six fields of sustainability to help orientate the discussion surrounding urban planning. We will then explain how we use the compass within a professional capacity and provide a case example of how the compass has been applied.

Context

Sustainability tools are not new. Architects, industrial designers and engineers (and even economists) have assessment tools that are intended to improve the performance of buildings, structures and objects. Many of these models have been expanded into urban design, including the likes of: BREEAM, LEED, DGNB, HQE and so on. As assessment methods, they offer an analysis framework but not a process-integrated instrument that guides design or development. They are often focused on particular types of construction (housing, retail/commercial, industry and so on) and do not provide a holistic approach to urban planning and development. Moreover, they generally offer a 'one size fits all' approach that we have found is often inappropriate considering the complexity of urban planning where the context and actors are unique to location. Finally existing models tend to represent a certain industry and therefore they do not easily cross disciplines or form the basis for discussion amongst a diverse range of interest groups.

As a start, urbanism should involve studying and planning urban areas in full – not only focusing on the dynamics of urban environments but also the impact urban areas have on the territory beyond. The panorama of urban planning and development is diverse, themes include: housing, industry/manufacturing, long-term densification, public space, mobility systems, community/social development projects, economic/commercial activities, social planning, environmental design, energy and water systems, waste and resource management and so on. Likewise, urban planners are generalists who typically have a background in architecture, planning, engineering, sociology, economics and politics. We felt a system is necessary to allow urban planners/designers to apply this extensive knowledge in a comprehensive, process-integrated way.

This forced us to consider a number of simple but critical questions:

- > What does sustainability at an urban scale actually mean?
- > How can urban scale sustainability be assessed? How can quantitative and qualitative data be compared? How can decisions be made knowing that urbanism involves a complex array of dimensions?
- > How can the design and development process be structured around sustainability when it is fundamentally at odds with it?

These questions lead to a series of objectives:

- > Develop a simple perspective on urban scale sustainability that fits urban planning.
- > Find a solution (tool/process) that is comprehensive, yet easy to navigate. It must be useful for both specialists without strong generalist knowledge and generalists without specific specialist knowledge.
- > Adaptable to a vast range of possible urbanism projects: public space, urban design, infrastructure, strategic planning, urban social issues and even larger environmental systems affected by urban areas.
- > Dynamic integration within the design/development process –level of detail according to design phase, use in research and negotiating by design processes and so on.

What is urban scale sustainability - the theory

Sustainability is a controversial and complex term, that only becomes more complex when the scale in which it is looked at, increases. Thinking about sustainability on the scale of a large scale infrastructure project, a neighborhood, a city or even a region has to take various dimensions into account: environment, mobility systems, social structure and society, culture and identity, the creation of economic welfare, complex negotiations and development processes, participation,... To combine all these different notions of sustainability and establish a definition framework, the history and philosophy of sustainability was researched.

The start of this research has been the famous Brundtland definition of sustainability – addressing today's needs without impacting the opportunities for future generations. This definition is traditionally approached focusing on three main topics: environment, society and economy – the so-called triple bottom line, or three P's (people, planet, profit). This leads to a very general approach that has allowed much confusion and false or incomplete interpretation of the concept of sustainability. Greenwashing and other ways of 'weak sustainability' haven't brought the debate much credibility.

The alternative 'strong sustainability' emphasizes that economic activities are merely a result of socio-cultural conditions that are in turn dependent on the capacity of the environment. It was elaborated by the Forum of the Future in a concept called the five capitals: 'financial capital' and 'manufactured capital' that are rooted in 'social capital' and 'human capital', which find their foundation in the natural capital. This nuanced distinction makes the concept of sustainability clearer and explains the dependencies between the main topics. A sustainable development is one that takes all five capitals into account and makes sure that no capital is lost in the dependencies between them.

On top of the five capitals, the English Engineering firm, Halcrow, elaborated their own approach to sustainability. Their 'HalSTAR' toolkit and rating system adds a significant dimension of time and scale that turns sustainability from a static concept into one that has included the notion of evolution and growth.

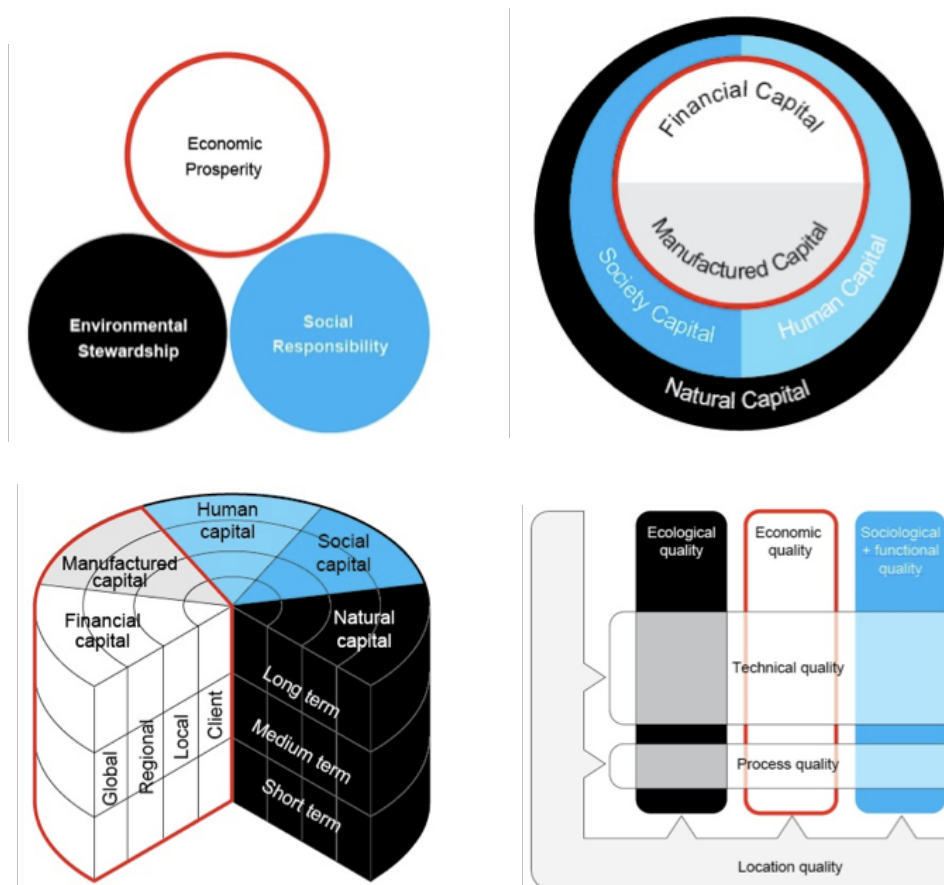


Figure 01: The six 'Fields' of urbanism

An important aspect when evaluating processes and systems on their sustainability is the role of technology. New technologies allow improving the environmental impact of projects and systems, without having to abandon modern comfort and consumption patterns. However, it is crucial that these technological solutions aren't purely environmentally oriented, but also take the social and economic dimension of sustainability into account. The German DGNB

has developed a sustainability approach for urban planning and architectural projects in which also technology plays a role. Their model starts from five qualities: ecological, economic, sociocultural and functional, technical and process quality. This approach is based on the triple bottom line, but the process quality adds the time-related concept of HalSTAR and it includes technology as a final element. The five qualities are supported by a sixth one, that of the location. Still, the concept of location quality as interpreted by the DGNB, misses an essential dimensions that characterizes all spatial projects and systems: that of space as a defining element for their cultural, esthetical and historical value.

A last element that remains when comparing the different sustainability models, is that they speak about influences between systems and about the quality of the system itself. This element can be expressed as the difference between impact and quality: the first points at the sustainable relationships between systems, the second at the intrinsic value of a system itself.

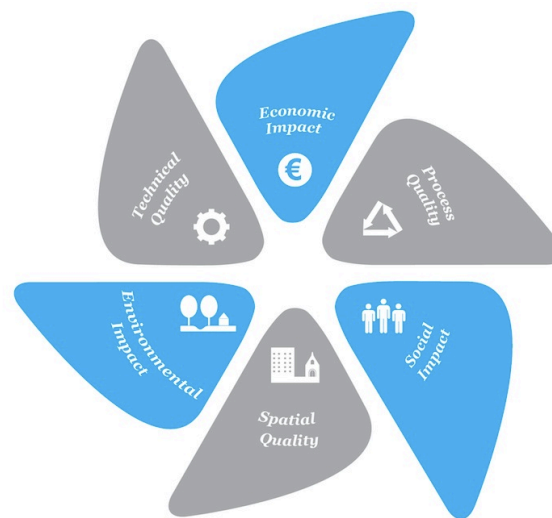


Figure 01: The six 'Fields' of urbanism.

Based on these various approaches, we developed a 'sustainability compass' that is a combination of six fields: environment, society and economy are the Brundtland-related dimensions of the impact systems have on each other, whereas technology, space and process are the three dimensions of quality that are at stake in complex spatial projects and developments.

Economic Impact: Economics, and particularly urban economics, regards connecting places and their generative economic capacity.

Social Impact: Social Impact refers to the spaces or activities required to ensure that the larger society is balanced, safe and healthy.

Environmental Impact: Environmental Impact relates to the health, wellbeing and efficiency of the environment (managed and unmanaged/wilderness) in which humans have a potential impact due to development.

Process Quality: Process Quality involves defining a robust strategy that ensures sustainable design and planning can be implemented successfully based on commitment, connection with stakeholders, openness and ongoing strategic project management.

Technical Quality: Technical Quality involves finding suitable tools for reducing resources demands, reduce demands on the environment, improve efficiencies and improve quality of life.

Spatial Quality: Spatial Quality refers to a sense of culture, connectivity, scale and context within a built environment.

The sustainability map

Sustainability on an urban scale is about weighing available options and looking for compromises between often-contradictive objectives. Likewise, no two sites are the same and therefore there are no standards to apply to certain project types (such as a mobility project, housing development or public space).

Based on the theory noted above, it was clear that each of six fields required much clearer and 'actionable' topics that could be used to analyse a problem/site and also confidently intervene in it. We found that this required a series of gradually more specific topics that could allow both meta level discussions (such as the focus on mobility systems) or allow a focus on very specific issues (such as the quality of tram stops). This means that urban planners can easily jump as between 'Meta' (the bigger picture) to the 'Matter' (the detail) very quickly: allowing one to focus on specific issues without losing a perspective of the bigger picture.

What resulted is a categorisation tree system that includes four levels of detail: Fields, Themes, Sub-Themes and Aspects. The existing theory was used to develop the Fields, Themes and Sub-Themes. A decision was made not to focus on quantifiable indicators, but to define 357 aspects of sustainability, that may be quantifiable or involve particular practices (such as stakeholder consultation).

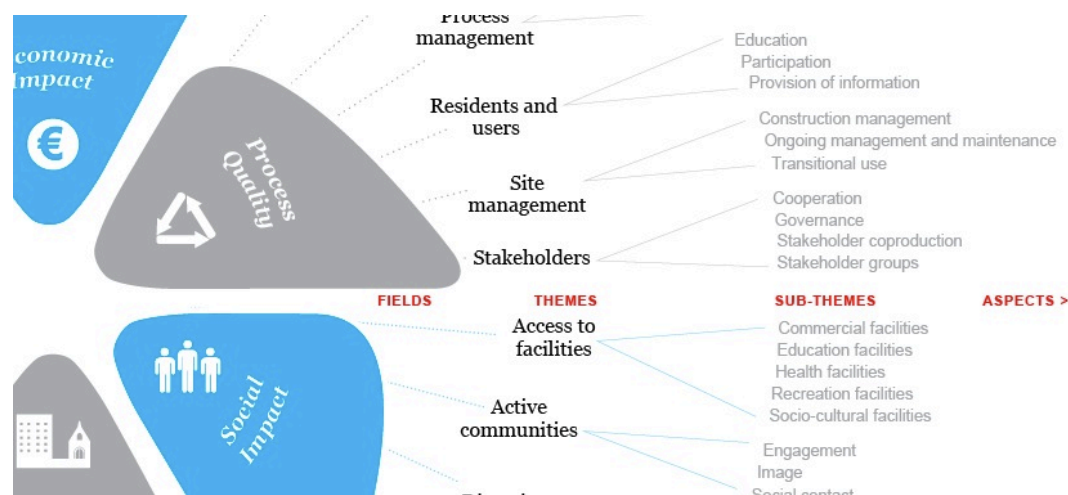


Figure 02: A cross-section of the main topics, including Fields, Themes and Sub-themes. The Aspects are not noted.

Process methodology

For the practical use of the Sustainability Compass, different tools have been developed. Using the 'Confluence' platform of Atlassian, we created a web-based knowledge database where users of the compass can find information on the different themes, sub-themes and aspects, including definitions, objectives, resources and project examples. The platform allows users to interact and upload information in a moderated environment. The static diagram that we showed before becomes here a dynamic, inter-linked environment of knowledge and inspiration. In MS Excel we created an evaluation tool that follows the complete design and development process of a spatial project and allows users to browse between hierarchies, select the relevant elements and measure performances of sites and design proposals. Thanks to a dynamic tool programmed in Processing, the evaluation tool allows all inserted data to be exported automatically as a graphic report.

During the planning process, the sustainability compass is guiding the development of vision, plan and strategic projects. The methodology of the compass introduces evaluation moments at different phases of the process, where the level of detail is growing and insight is given that allows steering the process, but without forcing a clearly defined design method. The compass is a directive instrument that shows the direction, inspires, judges and allows to compare options. Because the evaluation is looking at impact and quality, performances are measured

and not predefined solutions: the freedom of design remains intact, but the complex process of design decisions is simplified and the sustainability of the decisions made transparent.

Central in this process is the trialogue between the analyses of the existing situation, the definitions of targets and ambitions, and the performance of the design proposal in comparison to the other two. During the analysis phase that precedes each design, the compass is used to do a baseline evaluation of the existing situation that makes visible where the qualities and shortages of a site, city or region are in terms of their comprehensive sustainability. Based on that evaluation, priorities are deduced and the scale and topics defined on which the design process has to focus. The evaluation tool allows to make a selection of the relevant sustainability criteria and to choose the level of detail (theme, sub-theme or aspect) that they are approached in. Together with the client and other stakeholders (including the future users and local residents), the objectives of the project can now be defined that the design has to meet. This is summarized in a project definition and ambition note. During the design phase a regular evaluation can now be carried out to see if the decisions takes are indeed an improvement in comparison to the original situation, and if they do meet the objectives. Different options can be compared and complex decisions become transparent. The design process itself remains a cyclic process of planning, research by design, synthesis, evaluation and communication. The knowledge platform constantly provides designers with background information, technical data, spatial solutions and reference images. As soon as both the design and the evaluation have reached a sufficient level of satisfaction that is supported by all involved stakeholders and that meets the objectives, the project can be finished. The sustainability evaluation then becomes an essential part of the project description and a monitoring tool in the realization process.

For BUUR, the development of the sustainability compass has been an important, next step on the road the office is following since more than ten years: a road in the direction of projects that don't avoid the complexity of spatial developments, but instead manage to read that complexity in an intelligent way and shape it in such a way that the quality of both project and surroundings is guaranteed. The sustainability compass, being a dynamic process guiding instrument and an essential source of knowledge and inspiration, now formalized that engagement.

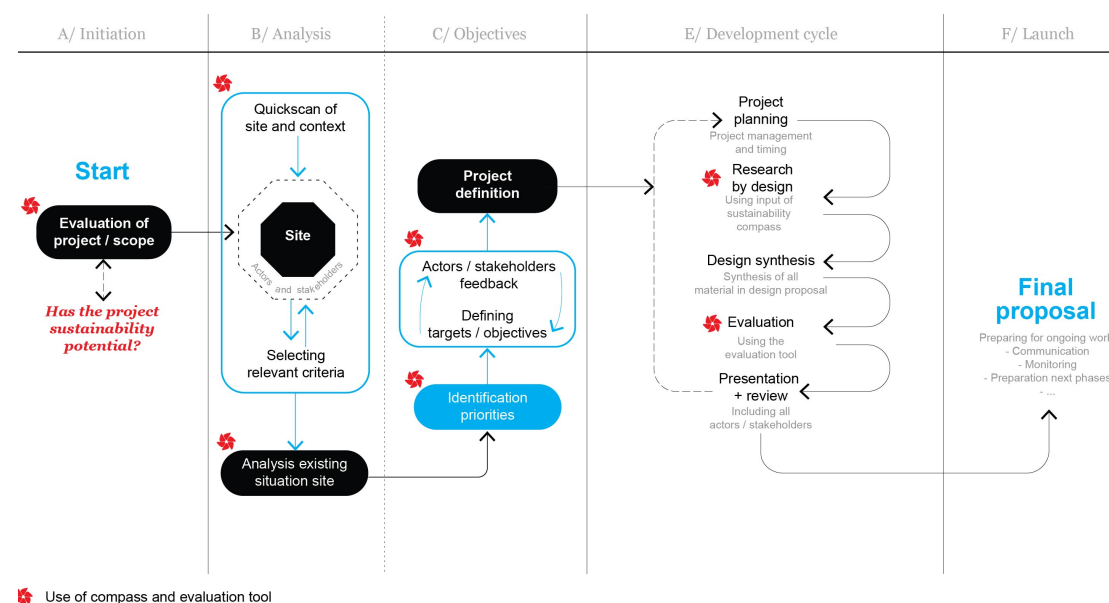


Figure 03: The use of the compass in a design and development process

Case study – Tram Track Tracer

Tram Track Tracer (<http://tramtracktracer.eu>) was one of the first projects to adopt the holistic approach of the sustainability compass. This project shows how the compass can be customised/specialised to address a specific problem area. TTT was developed to give objective guidance on a regional tramline strategy to extend Brussels' tram network in order to reduce the congestion that paralyses the Brussels region during peak hours (some of the worst congestion in Europe).

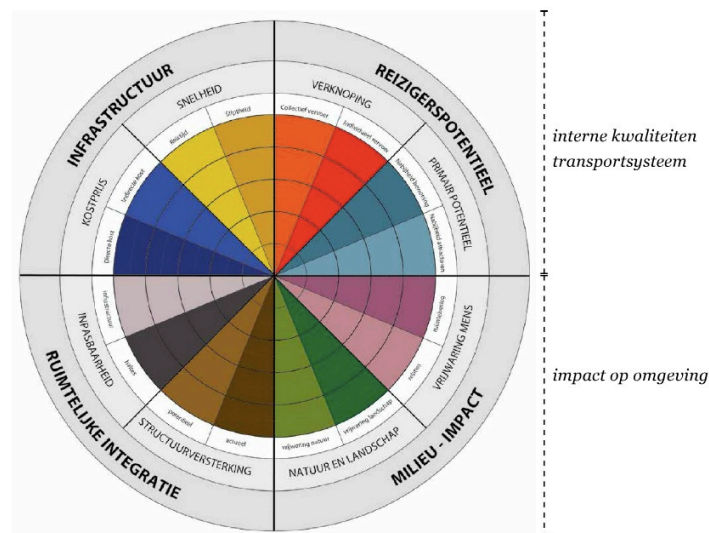


Figure 04: The TTT assessment diagram showing 16 analysis criteria.

Developing new tramlines in Belgium is complicated due to the vast range of stakeholders – a single stakeholder (IE a municipality or community group) has the power or capacity to block such project. Accommodation is therefore essential. The tool and process needed to be clear and transparent, easy enough to understand for outsiders while complex enough to cover main issues.

This resulted in three main aspects, in order of execution:

1. **Research by design.** Exploring particular trajectories based on the physical conditions. A large range of possible routes were analysed to connect main destinations /attractions. This is done by hand.
2. **GIS based evaluation tool.** An AutoCad Map plug-in to evaluate speed cost and so on.
3. **Multi-criteria analysis and communication diagram.** Assessment, focusing on 16 distinct 'themes' – from cost, to ridership experience, environmental impact and so on – based on a complex multi-criteria analysis with weighting developed in conjunction with the mobility partner. A simple set of diagrams (see Figure 04 and 05) to summarise this, allowing the merits of each option to be explored – no overall score given.

The multi-criteria analysis provides an example of how the complexity of the compass can be digested into tangible assessment criteria. In this case only the most significant issues were analysed in the multi-criteria evaluation. There were four main topics that were distinguished (ridership potential, environmental impact, spatial integration and infrastructure) and some sixteen analysis criteria – elements that can be found in the sustainability map.

Eventually over 1000 km of lines were analysed and allowed four main tram routes to be selected. This process ensured that the interests of a vast range of stakeholders could be addressed, transparently.

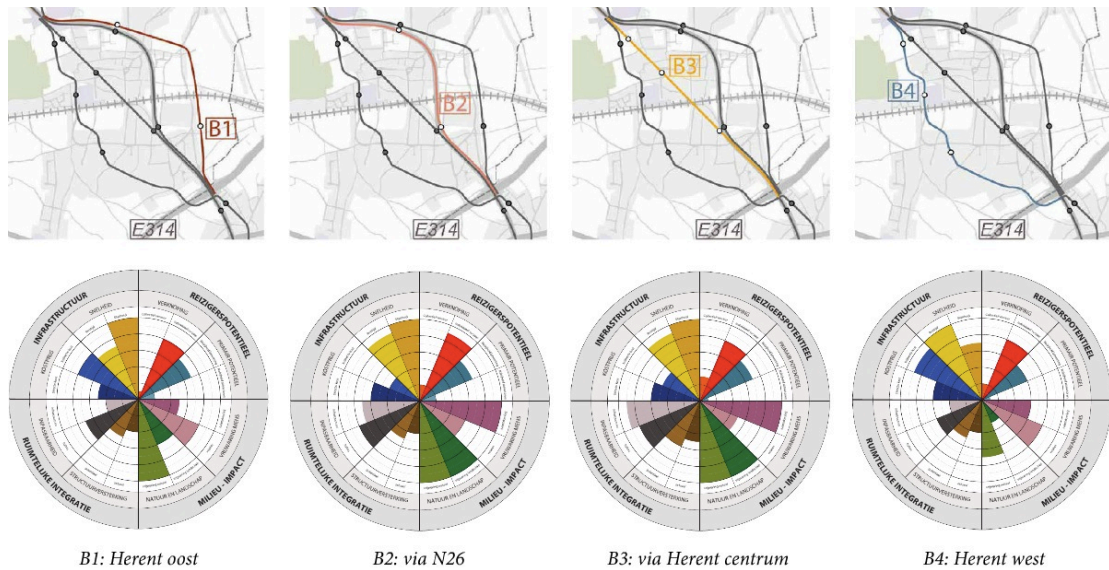


Figure 05: TTT, test results and comparison 4 route options.

Conclusions

Sustainability in urban planning is about managing complex problems while finding solutions that result in the lowest impact while providing the highest quality. Urban planning professionals need to holistic approach that to allow them to simultaneously work at the bigger picture while focusing on detailed interventions.

To deal with this, we have developed a decision-making tool to orientate the analysis and urban development process. The theory, methodology and supporting knowledge base can be applied to a vast range of urbanism projects at a range of scales – switching on and off relevant details without loosing a perspective of the whole. The objective is that this tool will serve a broad range of professionals and actors involved in urban planning.