FROM THE NIMES AQUEDUCT TO THE SMART CITY

The development of artificial intelligence inevitably allows us to reflect on our human condition.

What characterises humans?

What do we want to preserve?

What do we want to do with our society?

The control of innovation at the service of our needs, not the other way around, must remain a human prerogative. The human and societal values that underpin choices must be preserved at all costs and form the foundations of every democratic system. On the front line, municipalities more than ever have assumed the role of the link between the state and its citizens. How should they organize themselves to be intelligent and sustainable in an increasingly globalized and connected world?

Executive Summary

This paper is indicative that already in Roman times, almost 2000 years ago, the municipalities found smart solutions to improve the everyday life of their citizens. In Nimes, in the South of France, a challenge at the time was to bring water to the cities.

Today, water is still the most precious commodity and is a pressing sustenance issue. Adapting our cities to best meet the social, economic and sustainability challenges is a global issue. Building an aqueduct might still be a solution in some cases but cities' challenges today are more complex and the range of solutions is quite wide.

BDO has been assisting cities globally for decades with solutions related to complex developmental priorities. We remain committed to embracing the complexities of the modern age to help cities identify the priorities and the best solutions for their development.

We believe that an entrepreneurial vision, a human-centric approach and balance between economics and sustainability are essential. This also requires an agile and robust approach to defining indicators to monitor progress and adapt the initiatives if needed.

In that respect, the UN Sustainable Development Goals (SDGs) and the United for Smart and Sustainable Cities (U4SSC) are examples of valuable frameworks that allow and support benchmarking and exchange of best practices at both national and global level.

A smart and sustainable city in Roman time

In the first century AD, Nimes had more than 20,000 inhabitants. In order to supply fountains and baths in the city, the authorities decided to build a new aqueduct to exploit the springs of the river Eure, near Uzès.

With only a lens and a plumb line, engineers and workers built a 52km aqueduct, with a total height of only 12.5 meters, representing an average slope of 25 cm/km. With 1 cm/km in addition, the aqueduct would have reached the optimum height two kilometers before Nimes.

This aqueduct carried more than 35,000 m3 of water per day, or nearly 2 m3 per capita, through the scrubland, spanning the Gardon at 48 meters high by the majestic Pont du Gard. Its construction mobilized more than 1,000 people for 15 years and has been used for five centuries.

With so little difference, how could one know that the altitude of Nimes was lower than the altitude of Uzès? How could we know this difference in altitude with sufficient precision to deduce the slope of the canal and therefore the line to follow on the ground? The altimeter was invented in the 19th century. Today, without satellites to allow the operation of a GPS system, no one would be able to achieve such a feat.

What was the authorities' Vision for the development of the city? What information was available and what was the process in making that decision?

A project of this magnitude and complexity requires a perfect mastery of decision-making and communication processes, the mastery of analyzing and interpretation of information as well as the mastery of business skills.

Considering the imagination, inventiveness and intelligence that the men of the time showed during the construction of the aqueduct, we can imagine that the authorities already had an elaborate strategic approach to the management of a city.

Of course, the economic and social environment of the time was different, but the areas to be managed were very similar to those of today: general administration, tax collection, urban planning, construction, security, roads, schools and social protection. The key difference is that today's work processes are based on high-performance technologies that accelerate change at a dizzying rate. Control of water and information literacy were key strategic elements.

Today's powerful mix of intelligence

The etymological meaning of the word intelligence is: "choose between, picking among (a whole)". According to this approach, intelligence is the ability to collect, select and process information to achieve a goal.

Current technologies allow the production, collection and storage of information in quantities beyond comprehension. Increasingly intelligent systems are able to select and interpret a large number of data quickly. Like all technologies, artificial intelligence is a tool that assists "natural" intelligence, in order to enable people to make better decisions and to enhance their imagination and inventiveness.

Even more than the industrial revolution in the 19th century, the digital revolution disrupted not only organisational structures and working methods, but also training, skills development, decision-making and communication processes.

In an interconnected world subject to rapid technological change, it is essential to collaborate and leverage off networks of information and collective knowledge to achieve the synergies that lead to true innovation and development. It is necessary to adapt organisations, to make them flexible and to allow employees to collaborate on cross-cutting issues and projects. The aim is to foster the emergence of a collective human intelligence and innovation.

Municipalities handle a considerable amount of data. Sources of information are multiplying in all areas of public authorities' prerogatives and bring new challenges and opportunities.

For a municipality, the challenge lies on several levels:

▶ Identify how the needs of the population evolve in order to adapt the services;
▶ Find out what information is required, available and useful in order to mobilise the processes for collection and processing of data and information;
▶ Use the available information and communication technologies (ICTs) to improve efficiency in infrastructure management and in the provision of services expected by the population;

The intelligence of a city is demonstrated in the way the authorities collect and process information in order to provide the most appropriate services. However, the issue is not just technological. The issue is strategic and organisational.

Why intelligence is key for a sustainable city?

Any decisions taken towards achieving a sustainable city must be supported by both information and technology. The authorities' vision for the development of the municipality can only be realised through informed decision-making. It is for this reason that intelligence is key to building and developing a sustainable city. Technology on its own is an enabler, it does not provide direction.

The primary mission of a city is to preserve the quality of life, at the local level, of its inhabitants today and those of tomorrow. The rapid pace of change and current environmental issues we experience, makes it essential to include sustainability as a key factor in our reflection.

Sustainability is a goal. Intelligence is a means. A "Smart City" is a city that puts technological and human intelligence at the service of preserving the quality of life of its inhabitants, and in so doing, creating sustainability. The definition of the International Telecommunication Union (ITU):

> «A smart sustainable city is an innovative city that uses ICTs to improve quality of life, the efficiency of urban operations and services and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects.»
>
> *https://www.itu.int/en/mediacentre/backgrounders/Pages/smart-sustainable-cities.aspxcultural aspects.*

The first concern of the population is not the "intelligence" of the city, but the quality of life. Technology, however efficient, also has limitations. Technology is sometimes costly in terms of energy and in scarce resources. Issues related to digital sobriety and ethical and responsible data management are therefore relevant policy issues.

Municipalities of all sizes are at the forefront of the implementation of sustainable development. They have a pedagogical and exemplary role. The European Commission Joint Research Center has published a "Handbook of sustainable urban development strategies" and a "European handbook for SDG voluntary local reviews". These guides allow each municipality to take sustainability into account according to its means.

The "intelligence" of municipalities can also be measured in their resilience to react in the event of an unforeseen event or disaster. The lessons learned from the coronavirus pandemic will be very useful.

Intelligence applied to the organisation of a city in Switzerland

How a municipality can develop the collective intelligence of its political and administrative staff depends on its organisation.

In a private company, there is a clear division of responsibilities between strategic and operational bodies. The relationship between the Board of Directors and management is exclusively established between the Chairman of the Board and the Chief Executive Officer. In a Swiss city, it is different. Each member of the executive level also has a direct vertical relationship with the head of a service line. That is an essential difference. The interface between the strategic and operational bodies is therefore much more complex.

A decision-maker naturally has strategic leadership as primary responsibility. However, this person is also confronted with the management of human resources and of the skills available within the administration, as well as with issues related to activities of planning and control. However, this must not interfere with the management and decision-making levels within the organisational units of the administration. We could almost say that the issue is a question of "dosing."

One of the classic flaws of inadequate dosage is to work in silos with too much involvement of political power at operational level. Silo working leads to dilution of responsibilities and loss of control in the management of cross-cutting projects. The role of the executive is then reduced to endorsing the projects developed and discussed between the political head and his/her department. As a result, the capacity of the municipality's services to evolve is considerably limited, since it is limited to the perimeter of a single department.

In order to stimulate and exploit collective intelligence, it is necessary to strengthen transversality and agility, both at the executive level and at the administrative level. The key points of this approach are:

▶ Review the governance of the municipal executive level;

▶ Develop a long-term vision for the development of the city, including operational tasks of the city and their evolution;
▶ Develop the political term strategic plan and work on it to make it a strategic steering tool;
▶ Clarify and streamline the organisational structure of the administration;
▶ Review and establish decision-making and communication processes, specify each person's roles and responsibilities, and how to share tasks;
▶ Put in place a project management culture;
▶ Identify and track the needs of technical skills, as well as managerial and human skills

In this context, the function "Human resources and skills management" of the municipality must really be elevated at the strategic level, because agility and innovation are intimately linked to the culture of the municipal organisation.

Developing a vision is essential for a city

Whether they call themselves "smart" or not, municipalities select and use new technologies, especially ICT, to interact more closely with their population, as well as to manage administration and infrastructures in a "smarter", more efficient and economical way.

In order to develop and promote innovation, some cities (such as Basel for example) are creating Smart Labs, bringing together various players from industry, science and public sector. These Smart Labs aim to test ideas and technologies for mobility, logistics and urban management. Large cities have the means to create such laboratories.
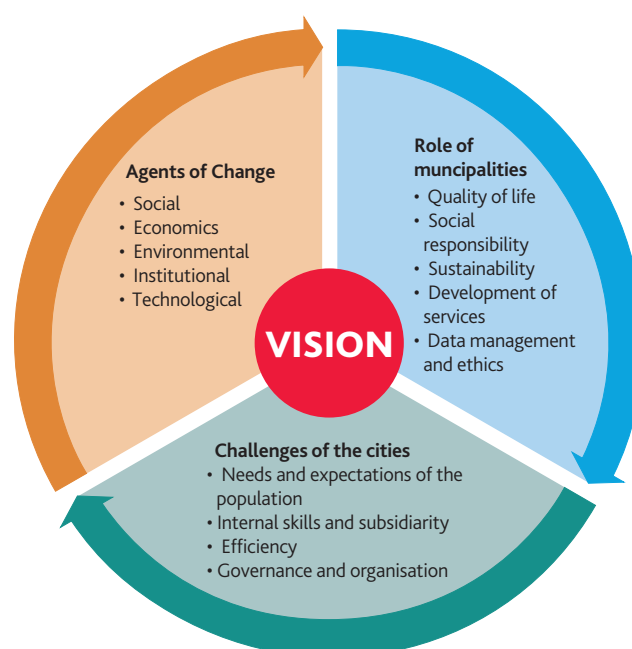
However, the real challenge for a municipality, large or small, is to know why it wants to use technology. The only real question is how this technology will be useful and necessary to improve

quality of life for its citizens. For this, a Vision is essential.

Quality of life must be the guideline for preparing this Vision: what do we want for our citizens, what do we want to keep, what do we want to change? It is during the development of this Vision that sustainability, environmental and resource protection will be taken into account. The authorities will have to decide how best to manage spaces and infrastructure, develop mobility services, approach security, provide support and assistance to people in need and the elderly, to educational institutions and nurseries.

With the rapid changes and increasing complexity, the development of a Vision is an essential step. A Vision serves as a key to selecting and prioritising projects and then actions. It allows the municipality to adapt and verify the relevance of its actions in a process of continuous improvement.

Indicators to learn and measure

We can only manage what we measure and raw data on its own is useless. Data only becomes useful when it is transformed and analysed into meaningful information to feed intelligence. By developing an adequate monitoring and reporting system, the cities transform data into information at the service of its intelligence. It thus gives itself the means to lead the implementation of the city's Vision.

New technologies offer huge data exploitation potential. To be useful, indicators must be carefully selected and combined, respecting the following criteria:

• Be defined and serve a specific purpose;
• Be accessible at a reasonable cost;
• Be available at the right time;
• Be reliable, accepted and measurable.

In addition to the many general frameworks and guidelines aimed at improving the functioning of cities and achieving the United Nations Sustainable Development Goals, the International Organisation for Standardisation (ISO) has published two new indicator repositories in 2019 to assess a city's intelligence (ISO 37122) and resilience (ISO 37123).
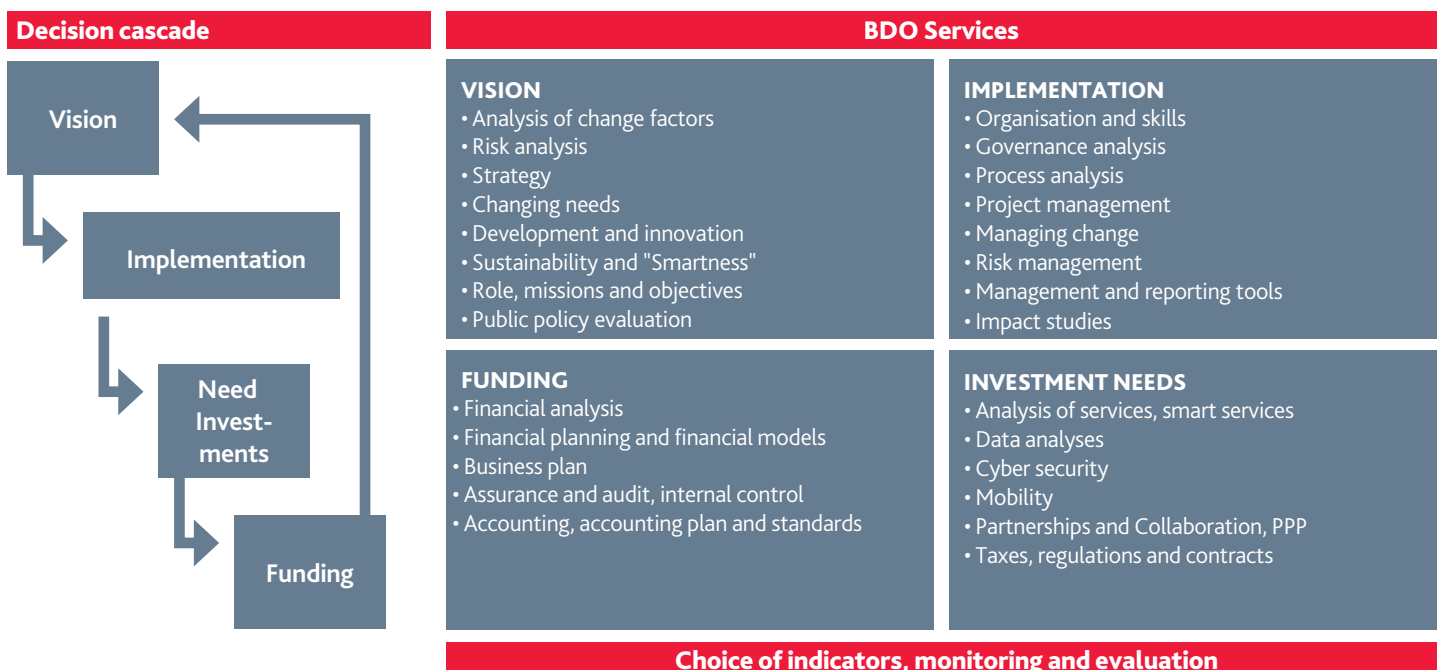
Pully, a smart and sustainable city
The example of the City of Pully speaks for itself. Pully is a model city in the sense that it is one of the first cities in Switzerland to measure in a completely transparent way different indicators in order to monitor its situation in terms of 'intelligence and sustainability'. In this case, the indicators used are those developed by the ITU (International Telecommunications Union) as part of the UN's U4SSC (United for Smart and Sustainable Cities) project.

BDO: Bringing coherence and methodology

BDO is able to mobilize governance, organisational and public finance skills in order to support our clients in setting up more "agile" administrative structures, to support them in the development of a strategic vision and project identification. We are also able to support them in the regulatory and financial areas affected by these developments. These combined resources allows us to apply a holistic approach in understanding the needs of a city, in identifying the priorities and finding the best solutions.

The benefits of BDO at each stage of the decision-making cascade of the municipal authorities:

Decision cascade	BDO Services	
Vision → **Implementation** → **Need Investments** → **Funding**	**VISION** • Analysis of change factors • Risk analysis • Strategy • Changing needs • Development and innovation • Sustainability and "Smartness" • Role, missions and objectives • Public policy evaluation	**IMPLEMENTATION** • Organisation and skills • Governance analysis • Process analysis • Project management • Managing change • Risk management • Management and reporting tools • Impact studies
	FUNDING • Financial analysis • Financial planning and financial models • Business plan • Assurance and audit, internal control • Accounting, accounting plan and standards	**INVESTMENT NEEDS** • Analysis of services, smart services • Data analyses • Cyber security • Mobility • Partnerships and Collaboration, PPP • Taxes, regulations and contracts
	Choice of indicators, monitoring and evaluation	

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