Sustainable cities

0-Carbon, 0-Waste & Sobriety

Inter-disciplinary challenge – Spring 2021

Hacked by 30 students from Ecole Polytechnique & ESCP Business School

Designed by Manadvise & Sponsored by onepoint.

onepoint.

MANADVISE
Innovation at crossroads

ESCP
BUSINESS SCHOOL

ÉCOLE POLYTECHNIQUE

INSTITUT POLYTECHNIQUE DE PARIS

Introduction

Benjamin LEHIANY[1] & Jean-Pierre POINSIGNON[2]

WHY THE SUSTAINABLE CITIES CHALLENGE?

Whereas urban areas cover about 3% of the landscape on Earth, they account for about 80% of energy consumption and produce around 70% of greenhouse gas emissions. In a world where by 2050, more than two-thirds of the population will live in urbanized spaces, we share the responsibility of designing healthy and sustainable buildings to serve and meet the needs of all their occupants. Buildings must become a vector of well-being for their occupants, by offering digital services that will make life easier for the people who visit and work there as well as for those who operate and manage them. Therefore, implementing concrete innovations to accelerate the development of sustainable cities is both a requirement and an extraordinary opportunity to reach sustainable development targets and objectives.

Beyond smart cities, the concept of sustainable cities characterizes the development of urbanization through the optimization of the triple bottom-line: economic, social and environmental impact[3]. This old concept is now more than ever at the center of attention and addressed at many levels: at a global level first, making "cities inclusive, safe, resilient and sustainable" is the goal #11 of UN SDGs. Europe-wise, the ambition is to reach 100 climate-neutral cities by 2030 and make these cities into experimentation and innovation hubs for all cities. At a more local level, cities are developing many initiatives to commit to sustainable development targets and objectives and reduce their negative impacts.

Reaching these ambitious objectives is now made possible by connected, technology-enabled urban development, in which digital assets and information are leveraged to manage city services and improve citizens' quality of life in a sustainable way. However, cracking the challenges of sustainable cities will not exclusively rely on tech-based development and requires a smart combination of technology, economic and social understanding of the sustainability challenges: it calls for a multidisciplinary, multicultural, and inter-generational approach. The DNA of the challenge.

[1] Co-founder of Manadvise and researcher at Ecole Polytechnique.

[2] Partner Smart Building at Onepoint

[3] See for instance Register, Richard (1987), *Ecocity Berkeley: Building Cities for a Healthy Future*, North Atlantic Books. Or David Satterthwaite (1997) 'Sustainable Cities or Cities that Contribute to Sustainable Development?', Urban Studies, Vol. 34, No. 10, pp. 1667-1691.

ONEPOINT PIONEERING THE TOPIC

Based on these observations and onepoint expertise in digital, data and building, we have partnered with Spinalcom to develop and offer the Connect Building platform, a new repository both in the way of designing and building sustainable and intelligent buildings as well as apprehending and integrating technology for the benefit of a smooth, high-quality user experience with a positive impact.

Onepoint is about architecting new models with customers. We co-construct solutions promoting smart operations, innovation, resilience, and green growth. Leveraging the use of digital and data technology, keeping the human interactions in mind.

1. **Co-construction**: Using a Collective Intelligence approach, we co-architect and co-deliver the transformation with our client employees within their ecosystem, shaping a value driven super-collective. #ConsultingWith
2. **Sustainability**: We believe that an enabled response to customers Social, Technical, Economic, Environmental demands leads to a sustainable operation. Analyzing individual component effectiveness constituting your ecosystem we will determine where the weakness lies and address these together with you. #Responsible
3. **Breadth of Expertise**: Our 10 communities of expertise collaborate and drive multi-disciplinary innovation with our customers. The variety of talents is mobilized on a need basis. #GlobalNiche
4. **Fit for Purpose**: We work with our 3 consulting postures, COACH, FACILITATOR & CONSULTANT to deliver an effective outcome for you. #Adaptable

For example, onepoint has built an application with an important French bank in order to assess the value at risk of its assets regarding flood risk in France. Onepoint is also working on a tour in Montréal, using its state-of-the-art technology to promote sustainability and wellness amongst users.

MANADVISE, INNOVATION AT CROSSROADS

Manadvise specializes in open-innovation projects that integrate economic, societal, and environmental impacts in their value model. Our conviction is that sustainable innovation develops at the crossroads of disciplines, cultures, and generations from knowledge creation to market success.

Our style of open-innovation in three words:

1. **Explore**: we lead research[4] projects to innovate beyond the frontier of knowledge.
2. **Learn**: we design and animate tailor-made learning programs to boost innovation skills.
3. **Activate**: we orchestrate innovation projects with our Manadvisors, master and PhD students, consultants, and experts to leverage synergies.

Since the creation of Manadvise in 2019, we have coordinated dozens of innovation projects that brought together master and PhD students, researchers, consultants, and experts to crack sustainable innovation challenges. The partnership with onepoint on the Sustainable Cities Challenge with ESCP Business School and Ecole Polytechnique perfectly illustrates our ambition: bridging academia and business to innovate at the crossroad of disciplines, cultures, and generations!

THE SUSTAINABLE CITIES CHALLENGE WITH ECOLE POLYTECHNIQUE AND ESCP BUSINESS SCHOOL STUDENTS.

In Spring 2021, the sustainable cities challenged has been organized by Manadvise and sponsored by onepoint in an open-innovation setting:

- **15 ESCP Business School students** from the option *Consulting Dynamics and Practices* coordinated by Pr. Daniel ROUACH.
- **15 Ecole Polytechnique students** from the course *Sustainable Strategy & Business Models* coordinated by Dr. Benjamin LEHIANY and Dr. Cécile CHAMARET.
- Mixed-up in **5 teams of 6 students** competing for the best solution including technology and business model components.
- Jean-Pierre Poinsignon and Olivier Temam, Partner at onepoint, have helped students addressing the challenge from the most relevant perspective.

The questions asked to the students where very broad to foster serendipity and creativity:

- Beyond smart cities, what makes cities sustainable from both economic and ecologic perspectives?
- What are the pre-requisites in terms of governance, data management and strategy?
- What are the most relevant use cases and « quick-wins » for buildings, cities, or districts?

The challenge has been split into three subthemes, 0-carbon, 0-waste & Sobriety.

By hosting a challenge with students from ESCP Business School and École Polytechnique, we aim to provide some answers to the questions above.

[4] Manadvise has been accredited research organization by the French Ministry of Research and Innovation within the Crédit Impôt Recherche government program.

"For onepoint, architect of major transformations ahead of its time, supporting students from leading engineering and business schools such as the Ecole Polytechnique and ESCP is a guarantee of excellence. It is by hybridizing skills, strengthening interdisciplinarity, technology with economic models and the social dimension, that we will build the sustainable and resilient city of tomorrow, and its urban development serving the quality of life of citizens."

Muriel Touaty, Partner Education & Innovation, onepoint

CHALLENGE OUTPUT : 6 SOLUTIONS TO SUPPORT SUSTAINABLE CITIES

After 6 weeks of hard work and coaching, the students have presented their solutions in front of onepoint experts at ESCP Business School in a hybrid setting, half on site and half online, due to the health restrictions. 3 projects were presented on the "0-Carbon city" topic, 2 on "0-waste in my city" and 1 on the "Sober city" topic. All were outstanding in terms of the depth of analysis and originality of the solution (see below) but only 3 has been selected for the final:

- **The 0-Carbon City**: the team led by Shivangi Tripathi who designed an innovative app called 'BIONE', a data-driven solution for producing biogas in the cities.
- **0-waste in my city**: the team led by Beatrice Biazzo who designed Waste Warrior App, a multifunctional solution that can provide all the services needed to make citizens collaborate in the zero-waste journey of cities.
- **The sober city**: the team led by Margherita Mauri who proposed Sobrius, a synergy-based solution addressing three key pillars of sobriety: energy, mobility, and housing.

"It was exciting to work with Polytechnique students! I think the best part of this challenge is the system of student-led feedback from teachers and professionals. I would like to thank all the teachers and Onepoint for their support and help in this semester's project."

Yang Xi, ESCP student and participant to the challenge.

After a very tight deliberation, the jury has selected BIONE for the originality and the great potential of their solution. Congratulations to the laureates of the challenge for their amazing solution to reach cities' carbon neutrality through a Biogas Integration platform, Tali BOURDON, Yue LI, Mike LIU, Shivangi TRIPATHI, Yang XI and Chongqi XU.

Many thanks to Renaud MIGNEREY, Julie GAUTHIER, Olivier TEMAM, Florent GITIAUX, Sybille URVOY, Adrien BETON, Isabelle SCUILLER, Cécile CHAMARET, Nicolas GOUZIEN and Stéphane LESAGE for their participation!

"At onepoint we consider that the collaboration between high schools, universities and companies and the variety of competences are the pillars to build a sustainable and wellbeing world. This challenge was in a heart of our value and I was very impress by the quality of the work done by each team. It's open new way to find solutions against global warming."

Jean Pierre Poinsignon, Partner Smart Building

"This challenge was a great opportunity from many points of view. I learned a lot about the environment and the solutions in place to help it and to achieve sobriety. A partner of Onepoint also showed interest in really implementing our initiatives and told us to contact him if we wanted to work with him. This is really an achievement!"

Margherita Mauri, ESCP student and participant to the challenge.

Check out the students' solutions for the future of sustainable cities!

ZERO CARBON IN MY CITY – TEAM 1 (WINNERS)

Tali Bourdon
Israel

Chongqi Xu
China

Mike Liu
Taiwan

Yue Li
China

Shivangi Tripathi
India

Yang Xi
China

What is the situation of carbon emissions?

Currently, the huge population in large cities are responsible for around 75% of the CO2 emissions. Emissions have continued to rise at a rapid rate, emitting **over 36 billion tonnes each year** now. Reducing carbon emissions is essential to protect the living conditions of future generations. Our challenge is to find ecologically and technically viable solutions ensuring a proper data management system.

Food accounts for over **a quarter (26%) of GHG emissions**. Each year, France wastes nearly **10 million tonnes** of food products and of these 10 million tonnes, more than 1.2 relates to food that can still be consumed. Hence targeting food waste reduction becomes especially important to reduce carbon emissions.

Why is the issue worth solving?

The biogas market is among the most dynamic and has a huge potential in reducing carbon emissions. The quantity of biomethane injected into French distribution networks has reached **1235 GWh in 2019** (73% more than it was in 2018). Biogas plants use feed stocks from agriculture, thereby reducing food waste in the city. Replacing fossil fuels has also become a main concern as it is harmful to both environment and public health. One out of every 10 energy dollars (roughly $170 billion) goes to fossil fuel projects. Hence producing more biogases will help replace fossil energy.

What is our solution and why is it innovative?

As the waste from cities is more diverse, and physically needs to be collected from multiple sites, the origin of the waste and its influence on the biogas produced by it is necessary to succeed. We have designed **an innovative app called 'BIONE'**, a data-driven solution for producing biogas in the cities. The app tracks the quality and quantity of the waste collected and predicts biogas production capacity and quality. This biogas and the solid fertilizer (by-product) is then sold to the bio gas distributors and other end users at profit.

The expected result is 3-fold: first is recycling at least **a quarter food waste** generated from both households & factories. Second is targeting **12% renewable gas generation** for consumption purposes by 2030. Third and the most important goal is to curb CO2 emissions by **22% within next 5 years**.

Why is it innovative?

It is an innovative way to:

- integrate and manage data for biogas production
- track waste management in the city
- optimize supply chain and forecast biogas production levels and understand overall impact on the society
- provide incentives to farmers and cities to get more involved in the process

*For further insights, please refer to our complete report **here**.*

ZERO CARBON IN MY CITY – TEAM 2

Abrar Ahmed Bhandigadi
India

Marc Evenst
Carribean

Vishal Sumanna
India

Emmanuel Coulibaly
Ivory Coast

Florian Schnorz
Germany

Yuhang Wang
China

What is the situation of carbon emissions?

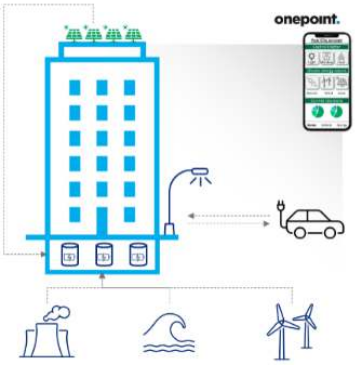
Worldwide carbon emissions have been on the rise for over a century. Greenhouse Gases are already reaching 50bn tons per year. Considering that climate change has already increased global temperatures by half of the set limit, the EU vouched to cut their emissions by 55% as compared to the 1990 number by 2030. Plans to reduce emissions must also incorporate ways of absorbing carbon gases instead of just reducing them. The realistic goal is not Zero-Carbon but instead Carbon Neutrality. It implies removing annually as much CO2 through sinks, as is emitted to stop the accumulation of carbon gases in the atmosphere.

In Europe, the Energy sector for electricity, heat and transportation, accounts for almost 75% of the total emissions. Given France's employment of nuclear power, their main source of emissions lies in transportation. Especially in our example of the metropolitan region of Lille, a very considerable source of carbon gases

Why is the issue worth solving?

Four years in a row, climate change has been ranked as the number one challenge to solve by the World Economic Forum now. It is a challenge whose impacts are just now becoming apparent, and which will, if not addressed properly, yield irreversible damages to planet, economy and people. With GHG emissions being the main driver and cities accounting for 72% of those, measures taken must aim for Carbon Neutrality. Following current policies, temperature increase limits will be missed by at least 1°C. The demand from the population and from city governments to implement measures to become more sustainable will fuel a growing number of projects revolving around a reduction of carbon emissions.

What is our solution and why is it innovative?



Essential to our solution is sector coupling. Our approach incorporates all the major emitting sectors in three goals. The solution aims to increase the efficiency in using energy, increase the amount of renewable energy used and to promote new, sustainable business models.

The ideal solution to couple the sectors for synergies and enable increased usage of renewable energies is gas. Gas in different forms can help fight the unsteady provision of renewable energies. It will be created by using power from renewable sources and will then serve as energy storage throughout the sectors. Financed by EU funds, Green bonds and carbon certificates, our solution enables a reduction of residential energy demand by up to 80% and a decrease of transportation energy demand by up to 50%. We are proposing more efficient heating and insulation in buildings. Transportation will transition to electricity and hydrogen with individual traffic reduced to a minimum. It is crucial to include the citizens. They ultimately carry out the change and must thus be educated and empowered on how to make a difference. An app will allow them to learn about and dynamically control their energy source and usage.

Why is it innovative?

Current goals set by governments lack ambitions and measures that are connected realistically. They are either scoped at a decrease of overall national emissions without actions or concretely address one specific emitter. Our solution proposes a comprehensive framework of integrated measures to reach Carbon neutrality.

*For further insights, please refer to our complete report **here**.*

ZERO CARBON IN MY CITY – TEAM 3

Pranay ADDEPALLI
India

Qahar NIAZAI
Afghanistan

Jaime TRINIDAD
Mexico

Tiffany BAZERJI
Lebanon & Canada

Yulin CHEN
China

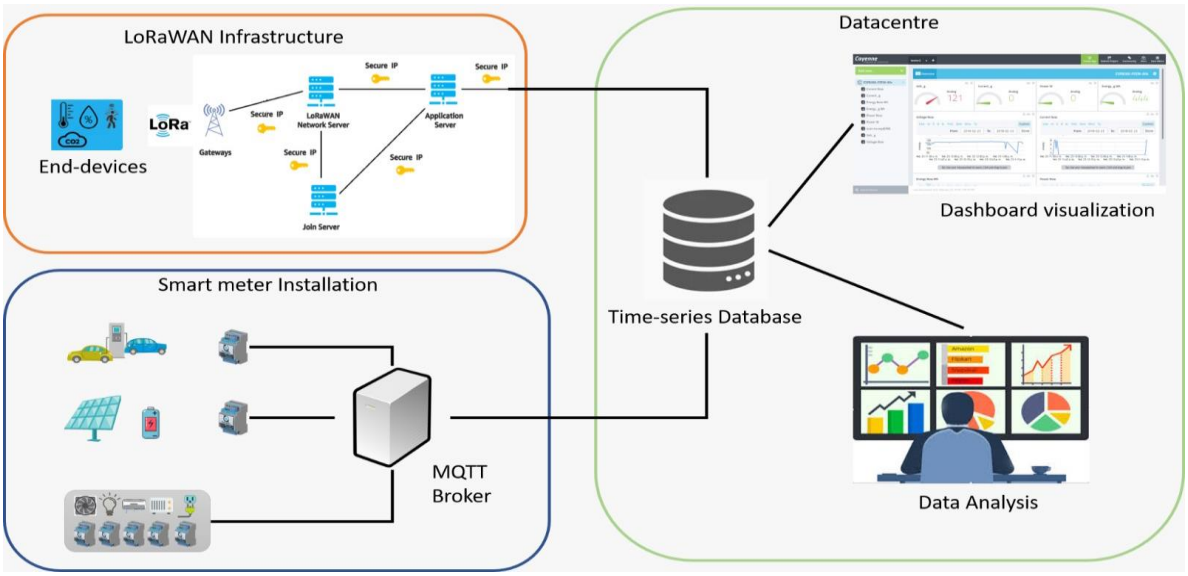
Zirui WANG
China

What is the situation of carbon emissions?

The amount of heat-trapping greenhouse gases in the atmosphere hit a new peak of 407.8 parts per million in 2018. Although most of those emissions are generated by the transportation sector, we decided to tackle the building sector as the second largest emitter in France. In order to achieve a neutral carbon environment in the construction and building sector, one should take into account the governance, strategy, technicality of the solution, data management perspective, and finally awareness of users. This is what our team aims to do through our proposal.

Why is the issue worth solving?

Future generations will be faced with more serious climate change effects, such as and temperatures, more extreme weather, water stress, sea level rise, and damage of aquatic and land habitats, as a result of the increase of carbon emissions. It is thus urgent to tackle the issue.



What is our solution and why is it innovative?

The solution consists of an energy management system relying on IoT technology with a user-friendly dashboard which enables monitoring and optimization of all carbon emissions.

Our solution for a building of 5 floors would set you back 177.325 Euros. The price breakdown can be seen in detail in the presentation. This is for the proof of concept. This includes the cost of technology and also the deployment cost. We aim to establish this in the city of Strasbourg.

Why is it innovative?

Although multiple 0 carbon housing exists today, our solution rather monitors and reduces emissions in existing older buildings which represents a vast majority of the French residential areas today.

Moreover, thanks to the valuable data gathered through our solution, one will be able to better monitor its use for ecological and economic reasons. It also allows governmental institutions to provide targeted incentives and regulation to achieve 0-carbon in the city.

*For further insights, please refer to our complete report **here**.*

ZERO WASTE IN MY CITY – TEAM 1

Danya Ben Yosef Castro
Chile

Morgane Chapuis
France

Stefanie Dacosta
Mexico

Marie Laloux
France & Switzerland

Maximilian Nomrowski
Germany

Karl Zayat
Canada

What is the situation of waste?

Zero Waste refers to a movement that aims to **reduce the amount of waste** produced, acting individually and collectively through a general strategy of reducing the amount of waste produced by industrial civilization.

Firstly, the strategy is based on modifying **production processes** by encouraging the redesign of product life cycles, with the aim of promoting the reuse of all components.

Secondly, the in-depth modification of **waste recovery** processes has the aim of eliminating landfill disposal or partial combustion in an incinerator, and therefore the emission of toxic substances for both health and environment.

In 2019, **550 kg of municipal solid waste** was generated by each French citizen (*Eurostat*). Altogether, the best waste is the one that is not produced.

Why is the issue worth solving?

Waste itself is inefficient by nature as products, leftovers etc. are not fully incorporated into the system of a circular economy. Waste laws and regulations differ between countries, regions and sometimes even within cities, leading to **20-50% of municipal budgets** being dedicated to waste management. For a city considered as best-in-class like Strasbourg (280 000 inhabitants), the yearly budget rounds up to 95M €.

Sorting errors represent 20% of recyclable trash in yellow bins implying a costly resorting process. Meanwhile, less than 0.2% of generated biowaste is being collected.

What is our solution and why is it innovative?

Because we believe the issue could not be handled with a single solution, we created a portfolio of **12 various initiatives** tackling all kinds of waste at each stage of the waste management process. Among those initiatives, we identified **3 quick wins**: local workshops and increasing the number of bins, refill stations and single-use plastics items law.

Our core initiative called **World Wide Waste** is a multifunctional app which offers a high degree of customization depending on the context. Through its multiple features, it enables the cities to:

- **Simplify** the waste sorting experience for citizens
- **Manage** interactions between multiple stakeholders.
- **Improve** the overall waste treatment process.

Why is it innovative?

Thanks to its customization possibilities, World Wide Waste may gather useful information in multiple features such as barcode scanner, waste calculator, map with collection points and zero waste initiatives, etc. Therefore, the app is innovative by creating a multidimensional interface custom-made for cities and citizens.

Scan the QR Code or click here to see the app in action

*For further insights, please refer to our complete report **here**.*

ZERO WASTE IN MY CITY – TEAM 2 (FINALISTS)


Behnaz Zehtabian
Iran


Alejandra Gómez
Spain


Zhengqing Liu
China


Beatrice Biazzo
Italy


Albane Lacroix
France


Yuwei Liu
China

What is the situation of waste?

We relayed on the World bank group report on waste to have an idea of the panorama of waste.

Key figures on solid waste:

- 0,74 Kg of waste per capita per day in the world
- 64% share of waste generated by upper-middle and high-income countries
- 12% secondary materials and resources being brought back into the economy in EU
- 83$/y Average user fee in Europe and Central Asia Regio

Why is the issue worth solving?

Waste is no longer seen as output of the system, but there is a possibility to **recover this value from waste** in cities. We identified that many of the problems come from the fact that we are still on the educational stage of the journey to 0 waste. That's why we decided to focus on a digital and innovative solution to facilitate the task for both, the cities and the citizens, thanks to their interaction and collaboration.

What is our solution and why is it innovative?

Click on the image to see the prototype's video

1.Waste Warrior App: Is a multifunctional solution that can provide all the services needed to make citizens collaborate in the zero-waste journey of cities.

To encourage them to do the right thing, the app provides **points** for each positive gesture made by citizens. These points can be used in the game inside the app or as discount in partner shops and restaurants.

Features to gain points:	Other features:
- Higher the % of waste recycled by scanning code on the bin to truck own waste production. - Use own bag/bowl to takeaway - Buy/Donate second-hand clothes - Photograph and locate unplaced waste	- Locate bins with fill level - Locate recycling centres - Scan product to learn how to recycle it - Book waste pick ups - Check waste fees

2.Software: thanks to the app and to innovative sensors placed on bins, the waste management department of cities can gain data. These are analysed by our software to give back clear information on the waste situation and processes. Cities can easily understand if there are inefficiencies or use data to implement incentives based on specific need of the neighbourhoods.

Why is it innovative?

Compared to the actual solutions provided in the market, our Waste Warrior App provide an **all-in-one** solution to make citizens make their own part in waste reduction by:

Recycle more, reduce waste and collaborate by playing a game and gaining discounts.

At the same time waste management department of the cities have the possibility to gain data and use it to develop customised practises for their needs.

*For further insights, please refer to our complete report **here**.*

SOBRIETY IN MY CITY


Marquerite Demaël
France


Emna El Gharbi
Tunisia


Leonardo Falabella
Italy


Margherita Mauri
Italy


Qijia You
China

What is the situation of sobriety?

There is no well-acknowledged definition of Sobriety at the moment, what is similar is the concept of Eco-cities, which emphases on the self-sustaining resilient structure and function of natural ecosystems. However, the concept of Sobriety comes from the word "Sober", which has been developed as a way to **limit consumption** to a reasonable way. Sobriety means growing while using resources more **efficiently** and to realize the combination of sustainability and digitalization.

Why is the issue worth solving?

In this period of time, the consumption is continuously increasing and people need to be **aware** of the situation and to learn how to behave to help the planet and the environment. A change of perspective is needed, **win-win strategies** and partnership between public and private sectors are useful to reach **sustainable growth**. The goal is to achieve growth and sobriety at the same time in a **demo city**.

What is our solution and why is it innovative?

In order to have a deep impact we believe that the most efficient way to reach sobriety is to have an impact on **key pillars of society**. Our project *Sobrius* is based on three initiatives, each one acting on one key pillar of society: social, energy, mobility.

- **Social initiative**: creating social eco-housing would allow the city to achieve sobriety by acting with and for the people on social concerns. Inspired by the neighbourhood of Bonne in Grenoble, creating energy efficient buildings in social housing facilities, with photovoltaic panels, parks, water and waste management systems, would ensure better quality of life for social housing and more sustainable habits.

- **Energy initiative**: installing and developing the initiative *Info Energie* developed by the ADEME to have a positive impact on energy consumption while improving the comfort of accommodation and raising citizens' awareness.

- **Mobility initiative**: developing an API to provide citizens with trip assistance by giving them the best alternative in terms of duration and environmental impact. It would reduce the environmental impact of citizens while improving their health.

Why is it innovative?

The innovation is embedded in developing different initiatives tackling key pillars of what we know today about sobriety. The launch of these three initiatives would create **synergies** on social, economic and environmental matters, with **benefits** on the short and long term. Finally, and most importantly, they are successful in what we believe is the critical point of sobriety: **increase awareness**.

*For further insights, please refer to our complete report **here**.*

Meet the expert: sustainable cities at a crossroad

By Adrien BETON, Manager Innovation & Sustainable Development @Onepoint

Over 70% of the world's population will live in cities by 2050. Spaces, cities, and larger territories face unprecedented social, economic, and environmental challenges to maintain the quality of the services provided to their citizens, retain their attractiveness, and use their resources responsibly. The complex, interconnected, and global nature of such challenges makes the task even more daunting.

The climate crisis increasingly informs public policies in order to prepare for the inevitable effects of climate change, increase the resilience of territories, and fight against greenhouse gas emissions. As a matter of course, carbon neutrality is becoming a priority for all the relevant stakeholders in every territory.

Cities have a vital role to play in the sustainability transition. Firstly, they are major focal points of energy and resource consumption, contributing significantly to direct, indirect, and induced greenhouse gas emissions. Secondly, they are key players behind the definition and implementation of public policies for the climate and energy transition. And finally, they are the ecosystem of the citizens whose lifestyle, based on the abundance of fossil fuels, we aim to transform towards greater sobriety, an essential prerequisite for the sustainability transition.

At onepoint, we can help local authorities to tackle these significant challenges. We believe in relying on the strengths and weaknesses of each territory to design and implement appropriate climate strategies, in making informed and ethical choices about technology and data usage to improve urban management and planning, and in mobilising and engaging all local players to co-construct the solutions.

While the target of the transition is fairly clear, we are yet to trace the pathways and develop the tools that will take us there. Environmental measurement is central among these tools since we can only manage what we can measure. However, measuring the carbon footprint of activities and territories remains a sensitive and complex issue in terms of methodology and data availability.

For example, scope 3 upstream and downstream emissions are only imperfectly assessed, and we might be "exporting" our impact, even though the impact will always be global when it comes to climate change. In addition, the ideological aspects and measuring standards of the carbon neutrality framework are currently too loosely defined. Indeed, they overly focus on carbon offsetting and sequestration rather than a real, drastic, and indispensable reduction in our emissions.

While climate remains the chief concern, we should be wary of environmental policies based mainly (or only) on measuring the tonnes of CO_2 emitted or avoided, leaving out air, water, and soil pollution, noise, as well as the impact on biodiversity and landscape. To ensure that all the aspects of the transition (economic, social, environmental, cross-industrial, spatial, temporal, etc.) are ethical, inclusive, and equitable, the territories will

have to acquire dynamic, multi-criteria measurement capacities and tools so that they can move forward, taking small steps as a part of a coherent overarching strategy.

The stakes are high, and we are still in the starting blocks. This challenge with ESCP Business School and Ecole Polytechnique students was a great opportunity to tackle the issue and to draw a sustainable future!