Climate Crisis Adaptation – Strategies Towards Resilience
Urban and Architectural Interventions in Milan and Vienna

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Abstract
Most large cities worldwide have recently experienced the dramatic effects of the climate crisis. The focus of this paper lies on illustrating different scenarios for cities on a 1.5-degree pathway, which means a 50-55% net emissions reduction by 2030 compared to 2010 levels. The two selected cities, Milan and Vienna, are comparable in size, social makeup and geographic position. Both cities have experienced the impact of climate change regarding the increase of heat in the city, have already invested in environmental issues and want to become carbon neutral by 2040. These commonalities form the base for a comparison of current strategies, urban and architectural interventions, as well as future initiatives in both cities, i.e., more innovative ones that go beyond the status quo. The COVID-19 outbreak and the lockdowns in Vienna and Milan have acted as game-changers. Closed streets facilitated pedestrian and bicycle movement and allowed temporary closures. Now that public investment in environmental transition has become feasible...
in the framework of recovery and resilience plans, these interventions will be transformed and upscaled as cities have to reduce individual mobility in order to lower emissions. Vienna suffers from a severe lack of green spaces in the densely built-up inner districts. High pollution levels in Milan have negatively affected the population for years. Despite the visible effects of cleaner air and skies, climate change has not slowed down, since CO₂ stays long in the atmosphere, which constitutes the main environmental factor. There is growing scientific evidence of a connection between environmental pollution and COVID-19-related mortality rates. Environmental factors like the pre-outbreak level of air pollution — especially nitrogen dioxide (NO₂) — play a role. Cities are key contributors to climate change and at the same time their residents experience the consequences most directly through the negative impact on urban life. Cities have to start implementing radical measures in order to achieve visible results: transform the sources of energy provision, apply innovative planning solutions that avoid further sprawl leading to densification, promote a sustainable way of building and renovating the existing building stock following the principles of a circular economy, secure the provision of CO₂-neutral public transportation and transform mobility behavioral patterns. These enormous tasks are difficult to carry out alone. Cities with similar challenges and comparable resources like Milan and Vienna can therefore support each other and act together. Environmental agendas have gained significant support in the population and new behavioral patterns were rapidly adopted. Most importantly, though, the ambitious goals and new guidelines of the EU, combined with “green transformation” requirements for the Recovery Fund, form the foundation for a successful advancement towards carbon neutrality.

1. International Context

1.1. Cities on a 1.5-Degree Pathway
Most large cities worldwide have recently experienced the dramatic effects of the climate crisis. The 1.5-degree pathway means a 50-55% net emissions reduction by 2030 versus 2010 levels. The necessary investments for reaching that goal will most likely not deliver positive economic returns. Therefore, regulatory incentives are necessary. Five major business, economic, and societal shifts would underlie a transition to a 1.5-degree pathway:
1. Industry
2. Transport
3. Power
4. Buildings
5. Avoided Deforestation & Agriculture

Depending on the economic, R&D, cultural, livability and environmental backgrounds of cities, best defined by their position on the Global Power City Index (GPCI), different conditions arise as starting points for potential interventions.

1.2 Environmental Strategies in Two Cities in Comparison
The two selected cities, Milan and Vienna, are comparable in size and social set-up. In the 2019 GPCI, Northern European and Australian cities received high environmental scores. Vienna scored # 21 in the comprehensive ranking, Milan was # 36. Obviously, the COVID-19 crisis is not yet factored into the 2019 report. Current strategies and future initiatives in both cities will be evaluated and augmented along with more innovative ones that go beyond the status quo, which always tries to strike a balance between economic, private and public interests. This was not a level playing field in the past, since economic and private interests outweigh public ones, e.g., in traffic-calming aspects. In Vienna, it is a severe lack of green spaces in the densely built-up inner districts, in Milan high pollution levels that negatively affect the population. Urban and architectural interventions are researched and evaluated to share knowledge.
2. Background and Status Quo

2.1 Linkage of Environmental and Economic Crisis in Recent Decades
In the last seven decades, the focus of governments has lain on stimulating continuous economic growth for the sake of job creation and social security, while environmental concerns were relegated to the background. Brief phases of reconsideration were caused by the oil crisis in the 1970s and the financial crisis in 2009, which led to more austerity and inadvertently helped the environment. As soon as the crisis was overcome, economic growth once again dominated politicians’ agendas and the budgets of their respective ministries. In the past, politicians were not willing to risk the anger of the businesses, automotive clubs and drivers as voters, who had better lobbying than the pedestrians and cyclists. This has changed considerably for several reasons. Over the last five years, cities have been experiencing dramatic effects of the climate crisis. The refugee crisis demonstrated that unbearable living situations drive people to risk their lives just to save themselves and their families. Although the refugee wave in 2015 was primarily caused by the war in Syria, the same could occur as a result of the climate crisis. In August 2018, the New York Times published “Losing Earth: The Decade We Almost Stopped Climate Change,” an explicit chronicle of all the ignored warnings based on scientific evidence and the missed opportunities to counteract global heating when it was still comparatively easy to do so. While the reader was contemplating why on earth politicians did not take action back then, fires were raging in California; in the summer of 2018 not a single day went by without stories about the fires dominating the front page of the Los Angeles Times. Unfortunately, the year 2020 has not brought relief with regard to fires and the Governor of California attributed the large number of fires to hotter temperatures and less precipitation as a result of the climate crisis.
In Europe, the summer of 2018 broke all previous heat records and the numbers of tropical nights surged. The combination of hot summers and mild winters continued into 2020. The year 2021 brought many extreme weather conditions, from unprecedented deadly flooding in Germany in July to the out-of-control fires in southern Europe, Turkey, the western USA and Australia. After a spring and summer characterized by these catastrophes, as well as long dry periods and short heavy rainfalls, scientists’ predictions about the consequences of climate change were proven right.

2.2. Recent Change in Attitude – Sense of Urgency – Role Models
Thinking has changed – Ursula von der Leyen, as the newly elected President of the European Commission, has declared that combating climate change is a major goal for her presidency and the EU. Greta Thunberg has reached the young generation and brought the climate crisis debate to every household and helped to bring a renewed sense of urgency into the political debates. Regrettably, apart from certain pioneering countries and cities, where prime ministers and mayors chose sustainability for their political agenda, even the enormous publicity of Greta Thunberg did not accelerate the necessary measures and expenditures to combat climate change. Anne Hidalgo won her reelection in Paris based on the promise for a sweeping transformation of Paris into a carbon-neutral city. In October 2020, Jacinda Ardern was re-elected as New Zealand’s prime minister with a landslide victory not only on account of her successful overcoming of the pandemic in her country, but also because of her ambitious environmental agenda. Now she plans to use the experiences and the skills she has gained from dealing with the COVID-19 crisis to tackle the climate crisis and the loss of biodiversity. Anne Hidalgo kept her promises to transform Paris and by summer 2021 she had already taken bold decisions, e.g., installing a maximum speed limit of 30 km/h in the whole city and eliminating street parking.
3. COVID-19 and Its Impact on Climate Change

3.1. The Impact in Two Cities

The COVID-19 outbreak and the severe lockdown in Vienna and Milan have acted as game-changers. Suddenly, the streets were traffic-free and people were circulating only in their immediate vicinity by bike or on foot. Streets and squares were suddenly frequented in much higher numbers due to park closures. The impossible became possible: closed streets and reduced driving lanes to facilitate pedestrian and cycle movement in adequate and safe distances. As of summer 2021 some interventions in the public realm remained, others were reverted; especially individual transport returned to pre-COVID levels as people still avoid public transport. There are good reasons to hope for permanent change — politically and scientifically. For one, the political landscape has changed and political parties and politicians with an environmental agenda have gained significant support. This goes beyond the classic green parties, as the major parties have also realized the importance of this topic for voters. More important, though, is the new
respect for scientists due to COVID-19. The public had to quickly learn how to understand the complicated math curves, e.g., the basic reproduction number, and the genetic and phenotypic structure of the novel COVID-19 virus. New behavioral patterns were adopted rapidly and without many complaints. If it weren’t for the detrimental economic consequences and the many cases of individual suffering, one could see some benefits. Clearly, lockdowns are not a measure to stop climate change despite the highly visible effects of cleaner air and clear skies, as well as the audible ones resulting from less noise pollution. Since CO₂ stays in the atmosphere so long, the main environmental factor, climate change, is not slowed down because of temporarily cleaner air. There is growing scientific evidence of a connection between environmental pollution and mortality rates due to COVID-19. Environmental factors such as the air pollution level before the outbreak, especially the nitrogen dioxide (NO₂) level, and car, plane and industrial emissions all play a role. Another factor is the geography of the regions: Teheran, Northern Italy and Madrid are surrounded by mountains which enclose the area, keeping cold air and the pollutants close to the ground and preventing their dispersal. Although the negative health consequences of constant exposure to air pollution, especially for the lungs, were known before, addressing them has now gained additional weight. Concluding, governments are well-advised to use the strategies they developed for fighting COVID-19 also for making serious efforts in fighting climate change.

3.2 Corona Crisis Versus Climate Crisis

In February 2020, the Corona crisis became increasingly apparent and started to push the climate crisis into the background. As central and local governments around the world continued to struggle with this new threat, in the absence of more technologically advanced and efficient measures, they all resorted to a drastic lockdown as their only solution. For months to follow, the Corona crisis massively impeded our lives and forced us to change our daily habits and routines. Even if people did not fall ill, this contagious virus affected them quite differently. For some, it completely changed their ways of living, working and earning a livelihood. But as the crisis dragged on and weeks became months, the struggle for economic survival was at the forefront of many people’s mind. Environmental concern became less apparent and politicians no longer felt the pressure of their electorate. Nevertheless, several organizations as well as elected politicians realized that all the public spending to combat the economic crisis in the aftermath of the COVID crisis could be tied to either sustainable development or ecological improvements, and therefore have additional benefits, namely reducing CO₂ levels and stimulating the green economy.

In his lecture “Sustainability at the heart of COVID-19 recovery,” Dr. Arunabha Ghosh from the UN Committee for Development Policy found clear words to express his concern that action in many countries has not been followed by the promises made under the global blueprint for sustainability and that these countries have to take earnest efforts to make the promise of Paris real, because scientific analysis shows that the global community has barely made a dent in the accelerating triple planetary crisis of climate change, nature loss and pollution. As the events of 2020 and 2021 have demonstrated all too clearly, problems caused by the climate crisis are mounting globally: forest fires, extreme heat waves, devastating droughts and terrifying floods.

Without large-scale, structural interventions that permanently wean the world from its addiction to fossil fuels, the rise in temperature will not be reduced. Humanity’s best bet is to minimize the risks and impacts of such crises by putting sustainability at the heart of COVID-19 recovery. New research on COVID-19, for example, suggests that a series of measures to protect the natural world and ecosystem services would cost a mere 2% of the post-COVID-19 recovery bill.

3.3 The Triple Planetary Crisis of Climate, Nature, Pollution and Waste
Air pollution is the world’s single largest environmental health risk. Data from the WHO shows that 9 out of 10 people breathe air containing high levels of pollutants, and that around 7 million people die every year from exposure to polluted air. Even before the COVID-19 outbreak, cities with high levels of air pollution were “hotspot” locations for lung diseases, e.g., pneumonia. In 2018, Italian health authorities were concerned by frequent outbreaks of pneumonia in Lombardy caused by water pollution. Having previously suffered from pulmonary diseases results in higher vulnerability to COVID-19. Therefore, one thesis is that the high outbreaks in Lombardy are also a result of earlier illnesses caused by environmental pollution. The high pollution levels in Lombardy, Madrid, Teheran and China, with high concentrations of particulate matter PM10, led to the hypothesis of virus airborne diffusion, based on PM10 as a vector. While further studies are ongoing, it has become clear that the impacts of COVID-19 have demonstrated that measures for cleaner air can no longer be delayed. Gratifyingly, as of September 2021, one can still observe cleaner air in Milan.

“To address the triple crisis, we must reboot our way of life.”

4. Call for Action in the Cities

4.1 A Chance for Change
Cities are key contributors to climate change and at the same time their residents experience the consequences most directly through the negative impact on urban life due to heat waves. In the wake of the suffering cause by the COVID-19 pandemic, there is a chance to transform cities and particularly address environmental pollution in the hardest hit cities to make them more resilient in the future. Even before COVID-19, as a result of negative impacts due to climate change, not only many European mayors, but also their North American and Asian counterparts declared a state of climate emergency and started to counteract.
As Jeremy Rifkin pointed out, the time for demonstration projects has run out and a mainstream transformation has to take place, leading us away from fossil fuels towards a CO2-neutral society. On one hand, the documentation of best practice examples in different cities is still valid, but cities have to simultaneously start implementing unpopular and quite radical measures if they want to achieve visible results and deliver major emission cuts to reduce warming, on one hand, and mitigate its effects, on the other hand. They have to transform energy provision sources, apply innovative planning solutions that avoid further sprawl leading to densification, promote a sustainable way of building and renovating the existing building stock, secure the provision of CO2-neutral public transportation and achieve the change of mobility behavioral patterns. These enormous challenges are difficult to meet alone.

4.2 Act Together – Cities Combine Strategies under C40
Cities with similar challenges and comparable resources can therefore support each other and act together. C40 mayors, supported by climate experts, business leaders, youth climate activists and trade unions, have launched the Agenda for a Green and Just Recovery. They published a report that outlines ambitious steps for delivering an equitable and sustainable future for all when recovering from the COVID-19 crisis. Los Angeles Mayor and C40 Chair Eric Garcetti and Milan Mayor Giuseppe Sala established the C40 Global Mayors COVID-19 Recovery Task Force, bringing together mayors from around the world to create a plan for a green and just recovery. They envision a strong recovery based on the principles of a Global Green New Deal. They plan to lead in building a just transition to an inclusive economy founded on the swift creation of new and good green jobs, as well as the training and upskilling of workers.
The C40 mayors want to continue to drive greater resilience and equity throughout their cities and society. By providing fundamental public services for all, like delivering safe mass transit and access to clean water, food, sanitation and affordable, healthy housing, they want to ensure the foundation for a fair society and strong economy that can safely weather future shocks. They plan to lead in making cities safer and healthier places by creating “15-minute cities,” where residents can meet their needs via a short walk or bicycle ride. They will permanently reallocate road space to pedestrians and cyclists, and will invest in nature-based solutions, like parks, green roofs and permeable pavements, to reduce the risks of extreme heat, drought and flooding. Another new term is “hyper-localism,” which describes a new orientation towards the local context as a consequence of lockdown and staying within the neighborhood. It has also been interpreted as a revival of the “Biedermeier” period, where staying indoors in familiar surroundings was valued higher than exploring the unknown and visiting foreign places. As positive as the ecological benefits of a smaller radius of movement are, as risky this renewed localism is in strengthening conservative thinking due to a lack of diversity.

4.3. Paris Courageously Transforms Urban Life Towards Sustainability
The “15-minute city” concept is based on long-time, previous research into how far city inhabitants are willing to walk to the next public transport stop, shopping and entertainment facilities and cultural locations, before they choose to drive. Planners around the globe have been advocating accessibility to services within a 15-minute walk and drawing circles with a radius of 5, 10 and 15 minutes on city maps. The renunciation of the car would improve both living conditions and the environment in the neighborhood. Professor Carlos Moreno of the Sorbonne in Paris developed the most up-to-date interpretation with the concept of “la ville du quart d’heure” for Paris, in which daily urban necessities work, home, shops, entertainment, education and healthcare are all within a 15-minute reach on foot or by bike. He is advising Paris Mayor Anne Hidalgo, who plans to replace 60,000 on-street parking spaces with green spaces and install a cycling lane on every street by 2024. During the lockdown, Paris created 50 km of cycling lanes. In summer 2021 one could already see impressive transformations of formerly busy streets towards soft mobility, e.g. Rue Rivoli.

4.4. Milan Uses the Momentum of Change to Make a Car-Friendly City More Pedestrian-Friendly
Having asked itself which society and community it wants to become after the crisis, the City of Milan decided that the objective was not just to return to life as it had been before, but rather preserve some of the positive outcomes of the current development and integrate them with a turn towards environmental consciousness. The city is currently creating 35 kilometers of new bike lanes and pedestrianizing several
school streets. Milan is running a 15-minute pilot in Lazzaretto, a densely built-up area around the former hospital, as a scheme for “rethinking the rhythms” of the Lombard capital.

It plans to increase the number of streets with a moderate speed of 30 km/h, an especially important move for pedestrian safety in a city where drivers like to drive fast! An increase in residential streets where pedestrians and cyclists have priority, and free outside space for bars and restaurants in “Piazze Aperte” (“Open Squares”) are measures that will activate public life dramatically. “Strade Aperte” (“Open Streets”) is the plan of the Comune to rethink mobility and public spaces in the months to come (as of April 30, 2020) to transform Milan into a more livable and sustainable city. An array of measures in the public realm should allocate space in the streets and offer it to different user groups and generations. Cycling and walking shall complement public transport and offer an alternative to the private car.

Figure 5: Via Caposile, a typical Milanese street with ample space for cars, photo: S. Tillner, 09/2020
Time, Space and Services
The City plans to rethink the times, schedules and rhythms of the city to distribute the demand for mobility throughout the entire day by applying queue management and heat-mapping tools. Public infrastructures and urban spaces are to be adapted to the new distancing measures, favoring a different use of public space. By ensuring the proximity of essential services within a 15-minute walk to reduce travel, the City wants to seize the moment of discontinuity represented by the health emergency to rethink the organizational methods of services and break established practices and patterns.

Sustainability
The economic revival shall focus on pursuing the objectives linked to the environmental transition: equity, decarbonization and renaturalization that lead to climatic resilience and clean energy. The improvement of the air quality has to be seen as a precautionary measure for the policies of health and well-being and consolidate the development of sustainable mobility by drastically increasing individual means of mobility, such as bicycles, scooters and electric motorcycles, including sharing options. The return to local production shall be encouraged, the development of newly integrated short supply chains and the management of resources according to the principles of circular economy promoted.

Immediate Actions
Mobility measures include updated rules and policies on car use (Area C, Area B and parking) depending on actual traffic flows and travel times, favoring people in need and off-peak hours. The “Open Roads Program” shall encourage widespread cycling through the creation of a pedestrian and cycle network starting from the main axes such as San Babila – Corso Buenos Aires – Viale Monza – Sesto Marelli.

Public Space and Wellness
The plan is to regain space for physical activities by adapting the sidewalks to the measures of physical distancing, expanding the provision of public space to complement the parks, providing for temporary pedestrianization in the neighborhoods with few green areas to allow children to play and exercise on so-called “Play Streets.” The facilitation of the placement of tables for bars and restaurants on public spaces shall help to recover part of the lost capacity. The use of public space for outdoor cultural and sporting events is encouraged by providing facilities and concessions and simplified procedures. “Piazze Aperte,”
open squares, shall exist in each district. Tactical urbanism has been a tested and successful intervention in Milan with the aim to restore urban quality and encourage new uses of the streets; in post-COVID times it will facilitate pedestrianization, especially near schools and in neighborhoods with few green areas, and encourage physical activity and play for children. The maximum speed limit of 30 km/h will be introduced in a far-reaching manner in the city.⁷)

5. C40 Network of Cities – Reinventing Cities

5.1 Meeting the Challenge of Achieving Sustainability and Energy-Efficiency in Existing Buildings

As part of the C40 network, Milan is one of the cities participating in the Reinventing Cities Competition,⁸) which aims at enabling demonstration projects that can act as showcases for the future sustainable development of large sites, new development, as well as redevelopment and renovation. The Palazzine Liberty site is one of seven sites in Milan which are offered for sale or for long-term leasing to participating teams of investors, architects and environmental experts. The site is particular interesting as it hosts six historic buildings, “Palazzi,” of extraordinary architectural value. Energy-efficiency, autarky and on-site waste management are all topics of the competition and present an enormous challenge when working within the existing built fabric, especially with architectural monuments. The requirements of energy-efficiency are much easier to fulfill in new buildings than in existing ones, especially when they are protected monuments. Therefore, the focus worldwide has to lie on improving the existing building stock so that buildings can contribute their share to meeting the Paris goals for limiting the global warming to maximum 2 degrees.

Vienna and Milan have been impacted by Urban Heat Islands (UHI) phenomena, which are particularly critical in densely populated residential districts. UHI challenges housing in several ways: the construction of new buildings as well as the operation of these structures significantly contribute to CO₂ emissions. As one of the major causes of UHI, buildings constitute a crucial field of action for mitigation and future reduction. Buildings of average architectural value are commonly renovated by adding thermal insulation on the outside, thereby changing the appearance in materiality and proportion. This measure cannot be applied to buildings of architectural value; therefore potential solutions are much more complex and require an integrated interdisciplinary approach. Worldwide, far too few best-practice examples exist; the EU will especially focus on supporting these types of projects in the coming years. In addition to these challenges, the City of Milan expects to make profit from the land-lease and is asking for market-rate prices. In spite of these obstacles, the Écoquipe team developed innovative solutions and was successful in the first round of the competition.⁹)
Sustainable approaches for the challenges of Reinventing Cities: No. 1) Energy efficiency and low-carbon energy consumption; No. 2) Life cycle assessment and sustainable construction materials; no. 3) Low-carbon mobility; No. 4) Climate resilience and adaptation; No. 6) Sustainable water management; No. 8) Urban re-vegetation and agriculture. The team proposes an integrated solution for the aforementioned challenges. In particular, the interaction between the challenges will lead to more effective and synergistic solutions for an optimization of the final result.

The first integrated approach concerns the optimal use of the surface, both ground areas and vertical areas made up of building facades and roofs. The urban surface becomes a means of achieving various objectives in energy, climate resilience and mitigation, water management, urban re-vegetation and agriculture with the following functions: green solutions, solutions for water management, urban agriculture, energy production from renewable sources and a greening concept for all the surfaces, horizontally and vertically. The set of solutions is then systematized in relation to objectives of resilience and sustainability: microclimate regulation, habitat and biodiversity preservation, rainwater management, energy self-sufficiency, food safety and water availability. In relation to the challenge of urban re-vegetation and agriculture, the proposed approach aims to use both external and internal (underground) surfaces for agricultural production. The use of circular economy systems allows the use of resources collected on site (from rainwater to the byproducts of primary activities – such as coffee grounds and plastic waste – to produce other products.) This approach will also create green jobs and stimulate community engagement around urban gardens.

The second integrated approach concerns energy efficiency and low-carbon energy consumption for urban design and low-carbon mobility. The sustainable energy approach learns from the concept of Sustainable Energy Performances of Urban Morphologies developed by Vettorato in 2011. According to this concept, the three main strategies to transform a neighborhood in a carbon-neutral one are:

- **Saving and conserving energy** to reduce the energy needs
- **Energy efficiency** of the infrastructures
- **On-site energy production by renewable energy sources**

The three pillars are connected to the urban design aspects through:
a) the modification of the spatial organization by reducing those energy-demanding functions (i.e., insulation of the buildings, but also reduction of need of transport to reach the site);
b) the modification of the infrastructures: changing those that consume more energy because they are old or damaged or inefficient, with new and more efficient ones (e.g., the heating systems);  
c) human behaviors: making users more conscious in relation to their daily roles in consuming less energy by adopting sustainable solutions (from the mean of transport to the selection of proper sources of energy like PV electricity). In summary, the proposals relating to energy sustainability solutions see:
- Internal insulation of the walls
- Use of greening solutions on the facade, also as external insulation
- Internal insulation of roofs
- Renewal of the heating system, replacement of the system from diesel to heat pumps and geothermal probes operated by photovoltaic systems
- Use of heat pumps and geothermal probes also for summer cooling
- Installation of internal fan coils
- Installation of up to 85 kWp of photovoltaic (preserving the architectural integration in the prestigious site)
- Installation of a monitoring and feedback system to users (through displays that make users aware of the use of energy and internal comfort).

The results on building energy uses suggests the potential to reduce the external energy needs of the built site by 53%.10)

5.2 Mobility
In relation to mobility, the proposal has developed a “reduction” approach to the need for mobility by working on attractors and therefore on the functions allocated on the site, in turn according to the number of users estimated annually and the means available to reach the site. In this way, the impact that the site will have on the generation of CO₂ emissions (and primary energy needed) during its operation can be easily calculated. Below is a graph showing the isochrones, or the areas that can be reached in the same period of time by means of walking or cycling.

Figure 8: Nature-based solutions for greening cities, source: Federal Ministry Republic of Austria, Climate Action, Environment, Energy, Mobility, Innovation and Technology
6. Vienna

6.1 Vienna and Milan – Similarities
Milan and Vienna have a lot in common, as they are comparable in size, population, social set-up and geographic position, and experience the impact of climate change with regard to the increase of heat in the city. They benefit from the proximity to surrounding natural resources and attractive open green spaces. Most importantly though, both cities have already invested in environmental issues and want to become carbon neutral.

6.2 Smart City Vienna
Vienna has integrated all its sustainability goals into the Smart City Concept and has been showcased as one of the most advanced “Smart Cities” and has adhered to its principles for a decade, leading to tangible results, such as the recurring title “most livable city of the World” by The Economist, the Mercer Study, etc.

Smart City Wien defines the development of a city that assigns priority to, and interlinks the issues of energy, mobility, buildings and infrastructure. 13)

In this, the following premises apply:
• radical resource preservation
• development and productive use of innovations/new technologies
• high and socially balanced quality of living

This is to safeguard the city’s ability to withstand future challenges in a comprehensive fashion. The elementary trait of Smart City Wien lies in the holistic approach, which comprises novel mechanisms of action and coordination in politics and administration, as well as a wider leeway of action assigned to citizens. In 2020, Vienna was the city with the highest quality of life and life satisfaction in Europe.

Social Inclusion
Vienna is a city of diversity with affordable housing for all income groups and an attractive living environment and plenty of green space.
Greening concepts have been applied to facades and roofs of new buildings, but rarely to existing ones. Innovative and lightweight greening concepts represent alternatives to the unecological use of polystyrene (XPS) for insulation.

**Health**

The city ensures healthcare provision of the highest standard, with outpatient treatment given preference over hospital admission: care is to be provided in structures close to patients’ homes for as long as possible.

**Environment**

The percentage share of green space is to be maintained at 50% up until 2030 by safeguarding of recreation areas.

**Resources: Mobility Concept**

Priority is given to environment-friendly modes of transport.

The modal split in Vienna is 20% motorized traffic, 40% pedestrians/cyclists, 40% public transport.

The early completion of the U2 underground/metro link before opening new living quarters in the Seestadt assures the use of public transport from day one after new residents move in.

Walkability and cyclability are key criteria for the layout of public spaces.

The obligation to build safe and spacious bike parking in each building facilitates the daily use of the bicycle. Reduced parking provision on streets and garages and communal garages for equidistance of car and public transport make car usage less attractive and create a level playing field for public transport.

A local shopping street to meet daily needs “around the corner” also in newly-built quarters shall prevent residents from driving for daily necessities.

**Quality of Life: City of Diversity**

Jobs, housing, recreation, social infrastructure (local amenities, social provision, healthcare, cultural activities) in the neighbourhood assure work-life balance.

**Quality of Life: City of Short Distances**

When local amenities with a mix of segments are in place from the outset as in Seestadt, the 15-minute city is reality.
During the COVID-19 pandemic, the City of Vienna has intervened quickly by facilitating soft mobility and enlarging usable open spaces. Measures included the installation of pop-up bicycle lanes on streets without enough space for cyclists, the permission to walk on the driving lanes on narrow 2nd category streets, eliminating on-street parking and allocating the space to outdoor seating for restaurants. These measures were welcomed by the population, which has exceedingly started to use the open spaces for all kinds of activities and turned towards cycling in large numbers since March 2020. The pop-up bicycle lanes and swimming pool were removed after half a year in fall 2020. The increased number of cyclists and pedal-scooters has remained and bicycle lanes were added, but most importantly, drivers have become accustomed to sharing the street with slower-moving riders.

7. Research and Action Plan for Future Investigation
The strategies and activities in both cities are just a starting point and will be intensified and developed further as both cities, like many others worldwide, are committed to becoming CO2-neutral by 2040. In particular, concrete urban and architectural interventions that make the cities more ecological, livable and greener will be further researched, categorized and evaluated. Based on knowledge sharing, a strategy consisting of guidelines, regulations and patterns applicable in both cities will be formulated. The documentation of this work could help the measures to receive broader application so that the target of CO2 neutrality can be reached.
8. References


10) Écoquipe, contribution by Daniele Vettorato, EURAC.


13) Fuchs P., Vienna City Admin. (2014), Smart City Wien Framework Strategy, Vienna, Austria.