2050 CliMobCity Newsletter

Newsletter 4 – JULY 2023

(version 30 July 2023)

Welcome to Newsletter 4 of the 2050 CliMobCity project!

We are happy to present to you the process and results of the final stages of our project with their insightful results of the CO_2e emission reduction effects analysis and a recap on our Final Dissemination Event. Also we would like to highlight the successful implementation of the cities' Action Plans and we will give an overview of the Good Practices published on the projects website.
Finally, we will give a reflection on the project: main findings, lessons learnt, way forward and published materials.

The project team,
Ekki Kreutzberger, project coordinator

In this edition:

- The 2050 CliMobCity project goals and approach
- Final Dissemination Event
- Estimation of CO_2e reduction effects in Leipzig, Plymouth, Thessaloniki and Bydgoszcz
- Good Practices published
- Actions implemented
- Reflection on the project: lessons learnt, way forward and published materials

2050 CliMobCity – goals and approach

Background

2050 CliMobCity is about climate mitigation in the field of urban mobility, hence about reducing CO_2e emitted by cars, trucks, public transport and other vehicles in the city. Many cities have ambitious climate goals aiming for substantial reductions of CO_2e emissions like achieving climate-neutrality in 2050 or earlier.

Many of the same cities, however, are uncertain about how the mobility should change in order to reduce CO_2e emissions to the levels of their aims. And because the spatial setting of a city affects the sustainability of mobility the question includes: how must the urban structure change to achieve climate-friendly mobility, and what concrete actions can be taken on the way to CO_2e emission reduction? These questions were taken up by the project partners: the municipalities Bydgoszcz (Poland), Plymouth (UK), Thessaloniki (Greece) and Leipzig (Germany) and the knowledge organisations Potsdam Institute for Climate Impact Research (PIK) and the Delft University of Technology (TUD), the latter being the project leader. The project started in August 2019 and has ended end of July 2023.

The Interreg Europe programme is designed to support **interregional learning** among policy relevant organisations across Europe with a view to improving the delivery of development policies. In 2050 CliMobCity the policy relevant organisations are the four cities. The project's learning is centred around strategic planning to prepare the reduction of CO_2e emissions of mobility in cities. The CO_2e reduction is to respond to the cities' self-stated climate (carbon reduction) aims. The project has **three learning issues**. The first and central learning issue is the identification of long term measure packages suitable to achieve the targeted CO_2e reduction.

Within the measure packages electric mobility and large scale charging, and information and communication systems supporting climate-friendly mobility represent two additional learning issues.

Differently formulated, the **main factors of the change of CO_2e emissions of mobility** are the **vehicle-kms** per mode and in different network parts of a mode, the share of different **powertrains** (fossil fuel powertrains as gasoline or diesel ones; post-fossil fuel powertrains as electric or hydrogen ones) per mode, in particular the share of post-fossil fuel road vehicles, and the kind of energy mix of the **electricity production** (e.g. coal, gas, nuclear, wind/sun/water, cumulating in the question `how green'?). The first two factors determine the energy consumption, the three factors together determine the CO_2e emissions. A shift from car to (electric) public transport or a shift from carbon to e.g. electric road vehicles will not substantially reduce CO_2e emissions if the share of green electricity production is low. And only a combination of substantial mobility, powertrain and energy mix changes can result in sufficient reduction of CO_2e emissions. The challenge is to find relevant combinations of mobility and powertrain changes, given a certain energy mix. Interregional learning was to and has helped in this search process.

Newsletters 2 and 3 informed about the content of mobility measure packages and the change of mobility. This Newsletter presents the main findings with regard to the reduction of CO_2e emissions of the mobility, also taking into account the change of powertrain structure and of energy mix for electricity production. We highlight the relation between these factors and CO_2e emission changes. All is described in more detail in the *Project Summary* and the background reports (*Appendix-Bydgoszcz-Report*, *Appendix-Thessaloniki-Report*, *Appendix-Plymouth-Report*, *Appendix Leipzig-Report*, and the *Appendix-PIK-Report*; for all documents see the Library of the 2050 CliMobCity website).

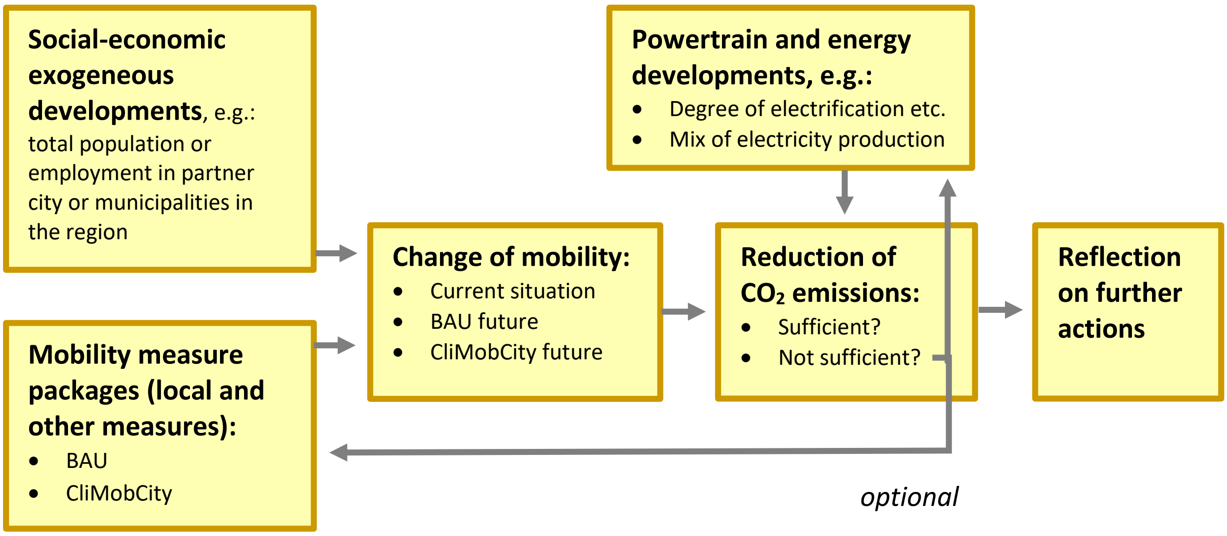
Approach

The interregional learning has taken place by means of **demonstrations**: each partner city demonstrated the carbon reduction effects of explorative policies in their own city. The work and learning steps were:

1) each city defined one or more **CliMobCity measure packages** which expectantly would lead to a reduction of CO_2e emissions from mobility in the city, in comparison to the current situation or the **Business-As-Usual (BAU) measure package**. A BAU package is one that has in the past been formally decided by the municipality, typically being part of a strategic plan or programme.
2) the measure packages were devoted to mobility. Each measure package was defined as part of a broader **scenario** which also describes the structure of powertrains and the energy mix for electricity production. The **scenarios** per partner city were developed for the **base year**, the **BAU future** and the **CliMobCity future**. While the mobility data are city specific, the energy mix was considered to be nation-wide uniform. The latter was also the case for the powertrain structure, for which the so-called EU reference or the more ambitious Tech scenario, published in international journals, gave orientation. If, however, a city had announced an even more ambitious replacement rate to e.g. electric cars, but had not yet decided such at the beginning of the project, these were included in the CliMobcity scenario.
3) each city **predicted the change of mobility** due to the measure packages. For the prediction the cities applied their transport models. The output of the transport models was the mobility pattern including the spatial pattern of trips, mode choice, route choice and average distance. All cumulated in the vehicle-kms of motorised vehicles which for the analysis of CO_2e emissions is the most relevant mobility variable.
4) PIK **analysed the reduction of CO_2e emissions** derived from the change of mobility, change of powertrain structure and change of energy mix for electricity production. For this analysis PIK employed its carbon model.[1] This is a what-if model, to be used by varying the position of different input levers and then observing the change of CO_2e emission. Examples of levers are the *modal share*, *average distance* (represented by *travel time spent*), or *powertrain* lever. For the positioning of the mobility levers the output from the mobility modelling gave orientation. For the positioning of the powertrain and energy mix levers the international publications were consulted or the aims in municipal documents were adopted;

[1] The carbon model, the EUCalc, was first modified from the European and national level to the city level.

5) if the reduction of CO_2e emissions did not sufficiently respond to a city's reduction aim, the city could **revise or supplement its CliMobCity measure package or powertrain input**. In the project such took place in a fully what-if fashion without first again predicting the change of mobility, namely in the so-called forecasting lever exercises or backcasting lever exercises;
6) each city provided **feedback** from to the project, optionally also from stakeholders, by **reflecting** on the meaning of the project findings for future strategic planning (mobility, land use, energy/climate; for instance a sustainable mobility plan, a spatial development plan or a climate action plan) and perhaps for other future activities;
7) the project leader together with the other partners provided a **wrap-up** of all findings and formulated recommendations for future work;
8) the cities in this way learned from the own demonstration and from the demonstrations of the other partner cities, drew conclusions for further policy-making, and in Action plans defined concrete actions to be implemented in the 3rd project year. Some actions formalised the mentioned reflection.



Which CO_2e reduction?

The CO_2e emissions analysed in the project related to the **use** of motorised vehicles in the municipal area of each partner city, including the emissions from **producing fuels or electricity**. More precisely speaking, the analysis focussed on all the emissions caused by motorised vehicles running in the envisaged partner city, starting from the emissions coming from the production of fuels or electric energy (well-to-tank emissions; WTT) and also describing the in-vehicle energy conversion (tank-to-wheel; TTW, where for BEVs 'tank' stands for battery), so in total the 'well to wheel' emissions (WTW) of energy used.
CO_2e emissions emerging from the production, maintenance and recycling of vehicles or infrastructure (lifecycle emissions) lie outside of the scope of the project.

CO_2e reduction aims

Climate aims for the project were climate neutrality in 2050 (Bydgoszcz), 2040 (Leipzig), 2030 (Plymouth), and 42% reduction of the 1990 emissions in 2030 (Thessaloniki). Leipzig and Thessaloniki have in the last year of the project joined the EU Mission of 100 climate-neutral and smart cities in 2030, but these aims were no reference in the project.
The planning periods for the measure packages in the project, as proposed by the municipalities, don't completely match with the climate aims: Bydgoszcz 2021-2050, Plymouth 2015-2034; Thessaloniki 2018-2030, and Leipzig 2015-2035. Thessaloniki would need to reduce CO_2e emissions between 2018 and 2030 by 52%, Leipzig between 2015 and 2035 by 80%.

CO_2e reduction analysed

In favour of a good understanding of CO_2e changes in the many scenarios, the emission dots in the following figures are plotted in a specific way: the x-axis displays the mobility scenarios (some including local powertrain policies), the y-axis displays powertrain and energy mix scenarios. The lines between the base year dot and BAU dots represent alternative developments in time. The lines between BAU and CliMobCity dots serve the comparison, but don't represent developments in time.

The CO_2e analyses showed that the estimated future reduction of CO_2e emissions from passenger and freight mobility in cities as a result of measure packages proposed by the partner cities is significant, especially as seen from the perspective of their scope of influence and against the background of an expected growth in the urban population (Plymouth, Thessaloniki, Leipzig). Nevertheless, the results are not sufficient to meet the cities' reduction targets. The CliMobCity measure packages combined with the best powertrain scenario and assuming the electricity production to be all green (= overall scenario 3 in the following table) leads to CO_2e reductions of 19% (Bydgoszcz), 32% (Plymouth[2]), 21% (Thessaloniki, reference year being 2018) and 41% (Leipzig). The value for Plymouth, however, is less certain due to some limitations in the city's transport modelling. Recalling the **climate targets** of the partner cities for the project, **the gap with the cities' targets then is 81%** (Bydgoszcz)**, 68%** (Plymouth)**, (52%-21%=) 31%** (Thessaloniki with reference year 2018)**, and 23%** (Leipzig) respectively**.**
For this reason the project conducted further explorations, namely four forecasting lever exercises (overall scenarios 4-7 in following table) for each city. The mobility and/or powertrain improvements in these overall scenarios provide up to another 13% (Bydgoszcz, Plymouth), 10% (Leipzig) and 3% (Thessaloniki) reduction. The gap now is respectively 68%, 55%, 28% and 13%.
For Thessaloniki and Leipzig, the two cities not already aiming for climate neutrality at the end of their planning period, also backcasting lever exercises were carried out. These indicate that with more powerful modal shift from car to other modes and shift from fossil fuel to post-fossil fuel cars the cities reduction aims can be achieved. The magnitude of these shifts, however, is far beyond the shift speeds envisaged in current ambitious measure packages.

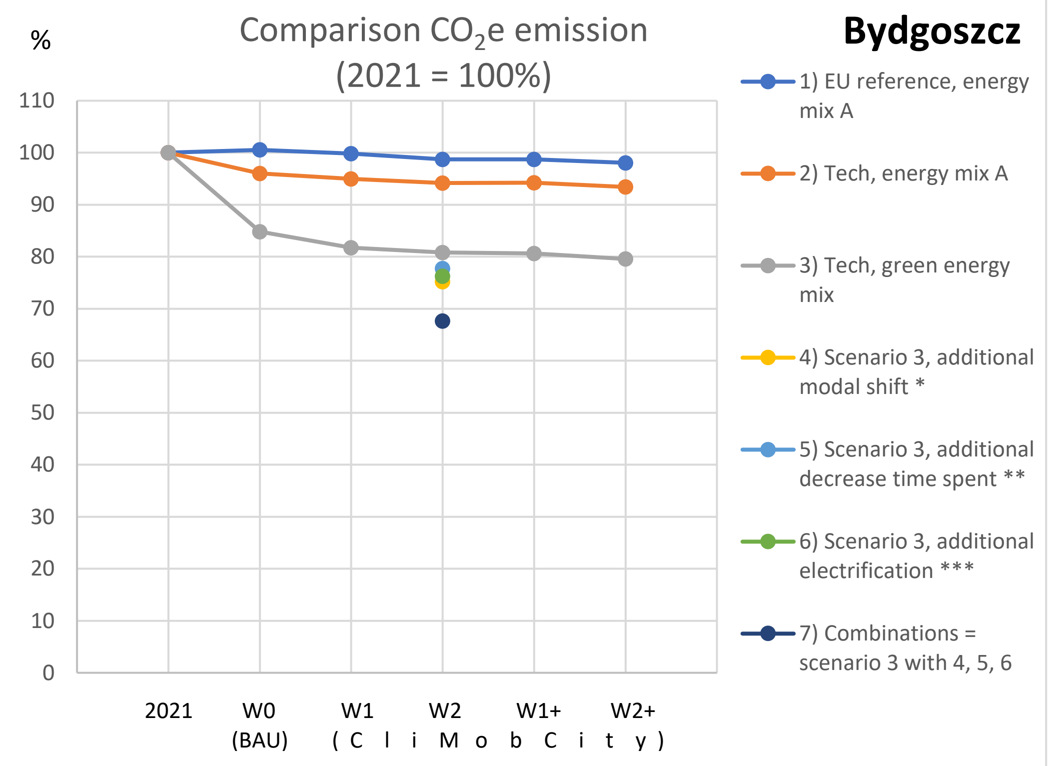
Content of scenarios for the analysis of CO_2e emissions				
Overall scenario		**Mobility and city measure packages**	**Scenario of power-train shares**	**Scenario of energy mix for electricity production**
Name	**Colour line in following figures**			
		Base year	EU ref	Mix base year
1a		BAU scenario	EU ref	Mix A
1	Blue	CliMobCity scenario(s)	EU ref	Mix A
2	Orange	CliMobCity scenario(s)	Tech	Mix A
3	Grey	CliMobCity scenario(s)	Tech	Green
4-7		Forecasting lever exercises, starting from overall scenario 3	Tech	Green
4		10%-points smaller share of cars and other LDVs in favour of other modes		
5		10 % less time spent (essentially = less vehicle-kms)		
6		10%-points larger share of post-fossil fuel vehicles (replacement of fossil fuel vehicles)		
7		Combination of overall scenarios 3, 4, 5 and 6		
8-10		For Thessaloniki and Leipzig: also backcasting lever exercises, starting from overall scenario 3	Tech	Green

Zooming into the reduction patterns of the four cities allows to improve the understanding of the interaction between the three factors of CO_2e reduction in mobility.

[2] The mobility basis for this CO_2e result is to be validated by a multi-modal transport model, in which also all vehicle-kms outside of the municipal area are excluded.

Bydgoszcz' population in the period 2021-2050 changes by -3,5% (-0.1%/y). In the BAU scenario the total number of trips increases by 4%, that of car trips by 8%, while public transport trips decline by 2%. A average travel distance increases by 25% (car and public transport), cumulating in an increase of car-kms by 38%. This development is the consequence of suburbanisation and substantial investments into the road network and takes place despite of an substantial extension of the tram network. Apparently the comparative attractiveness of public transport declines due to which there is much modal shift to car. Nevertheless, because of the expected shift to post-fossil fuel cars and because of the expectation of a substantial greening of the electricity production, there in BAU is only little increase of CO_2e emissions: 1% in the period 2021-2050 (with EU reference powertrain scenario: share of post-fossil fuel cars is 23% in 2050. See blue line in the Bydgoszcz figure).

Bydgoszcz has defined two CliMobCity scenarios (W1, W2) and added two sensitivity analyses scenarios (W1+, W2+). In W1 car-kms increase just as much as in BAU (38%), in W2 a bit less, namely 31%. The improved development in W2 is due to the better balance of push and pull measures. Still, the increase is substantial. Attempts to reduce car-kms look like an up-hill battle against the powerful suburbanisation still in place.
The shift to post-fossil fuel vehicles in the EU reference scenario (blue line in the figure) or Tech scenario (share of post-fossil fuel cars is 43% in 2050; orange line) tempers the increase of emissions which would otherwise have taken place. In addition, there is – just as in the other four cities – little innovation in the freight sector, meaning that the CO_2e emission from lorries etc. doesn't evolve positively. The CO_2e emissions change in CliMobCity W2 change by -1% (blue line; EU reference scenario), -6% (orange line; Tech scenario) and -19% (grey line; Tech scenario and green energy mix). The emissions remaining after overall scenario 7 (CliMobCity package, Tech scenario powertrain, green electricity production, combination of three additional what-if measures) consist of car (54%), freight (35%) and bus (11%) emissions.

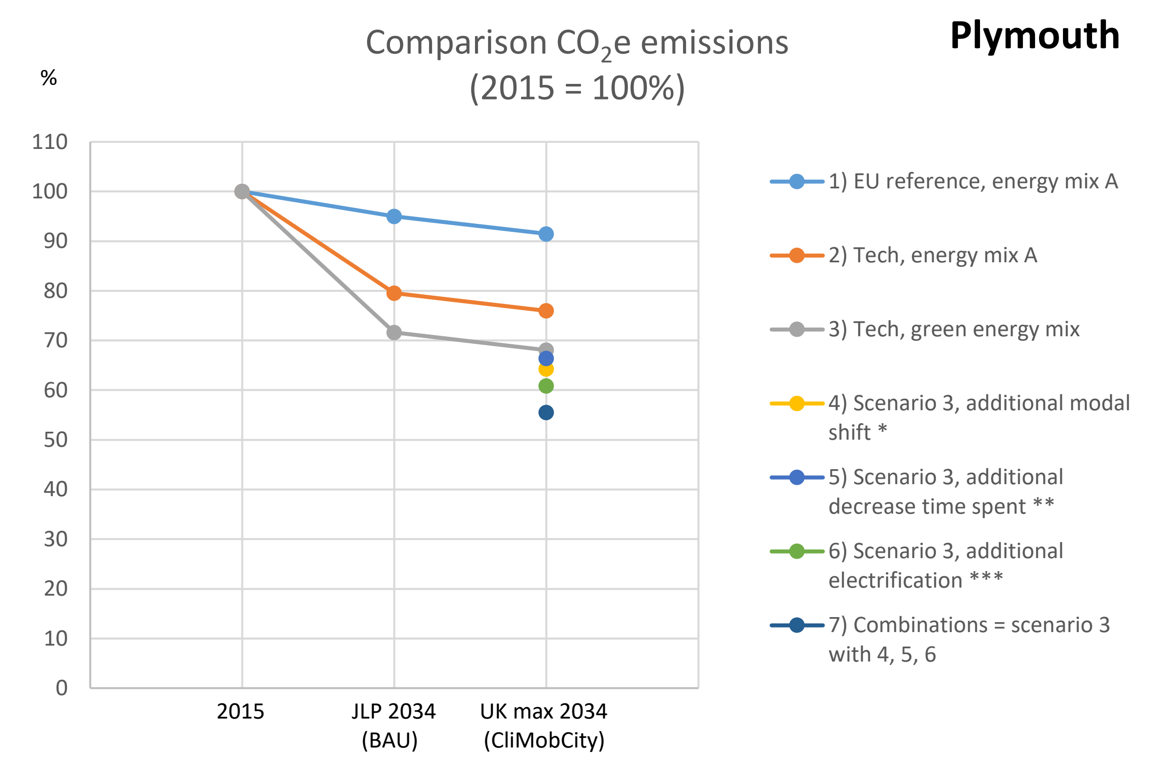


* Share of cars and other LDVs: -10 %-points; of public transport busses and active travel: each +5 %-points.
** 10% less time spent, because of less road vehicle-kms and/or more fluent traffic flow.
*** Share of post-fossil fuel vehicles: +10 %-points.

This type of presentation supports understanding of the relation between different results (dots).
But be aware of that:

- lines between the base year dot and BAU dots represent alternative developments in time;
- lines between BAU and CliMobCity dots serve the comparison, but don't represent developments in time.

In **Plymouth** the population in the period 2014-2034 is projected to grow by 13% (0.7%/y). The number of car-kms in BAU increases substantially (19%). The shift to sustainable cars (the share of post-fossil cars moving up to 18% or 56% post-fossil cars in 2034 in resp. the EU reference or Tech scenario) and a substantial greening of electricity production lets the increase of CO_2e emission that otherwise would derive from the vehicle-kms, turn into a decrease. In the CliMobCity scenario car-kms increase by only 5% instead of 19%, providing a reduction of CO_2e emissions of 9% (blue line; EU reference scenario), 24% (orange line; Tech scenario) and 32% (grey line; Tech scenario and green energy mix) in comparison with the base year. After the forecasting lever exercises (overall scenarios 4-7) the then still remaining emissions come from cars (54%) and freight (46%). The Plymouth mobility results need further validation on the basis of improved transport modelling.



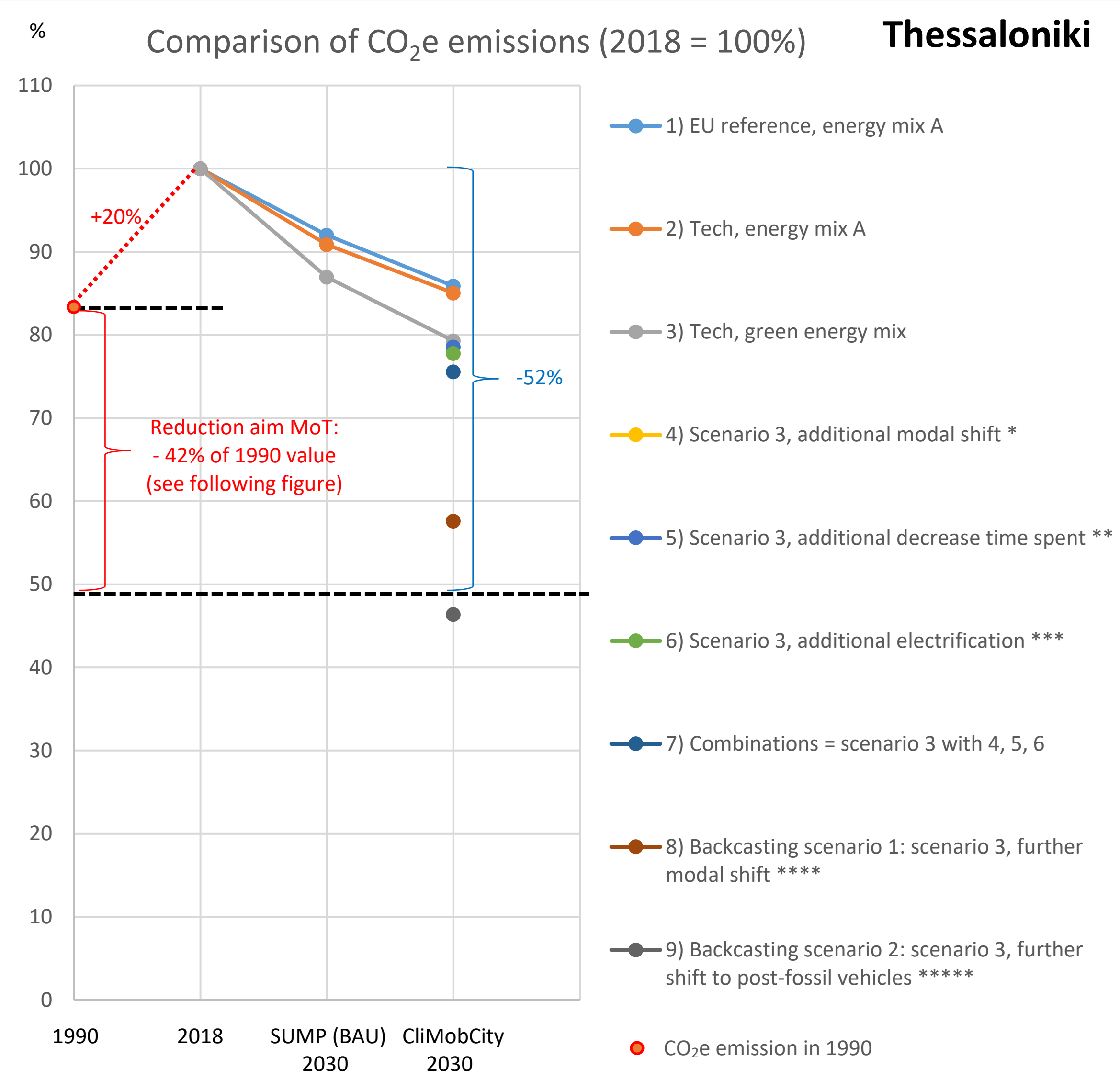
* Share of cars and other LDVs: -10 %-points; of public transport busses and active travel: each +5 %-points.
** 10% less time spent, because of less road vehicle-kms and/or more fluent traffic flow.
*** Share of post-fossil fuel vehicles: +10 %-points.

This type of presentation supports understanding of the relation between different results (dots).
But be aware of that:

- lines between the base year dot and BAU dots represent alternative developments in time;
- lines between BAU and CliMobCity dots serve the comparison, but don't represent developments in time.

The population in the municipality of **Thessaloniki** is projected to grow from 313,000 (2018) to 330,000 (2030) inhabitants ≈ 6% (0.5% per year). The estimated change of car-kms in BAU is -18% and of CO_2e emissions -8% in comparison to 2018. This nominal gap is partly caused by other mobility sectors, especially freight transport, but also 2-wheeler traffic. In addition there is – compared to the other cities – only little shift to post-fossil fuel cars (see table to the right), hence hardly additional CO_2e reduction amongst the remaining car-kms: the share of post-fossil fuel cars in 2030 is expected to be 1.5% (EU reference

	Share (%) of post-fossil fuel cars according to the EU reference scenario
Bydgoszcz 2021	**0.2**
Bydgoszcz 2050	**23**
Plymouth 2015	**1**
Plymouth 2034	**18**
Thessaloniki 2018	**0.2**
Thessaloniki 2030	**1.5**
Leipzig 2015	**1**
Leipzig 2035	**17**



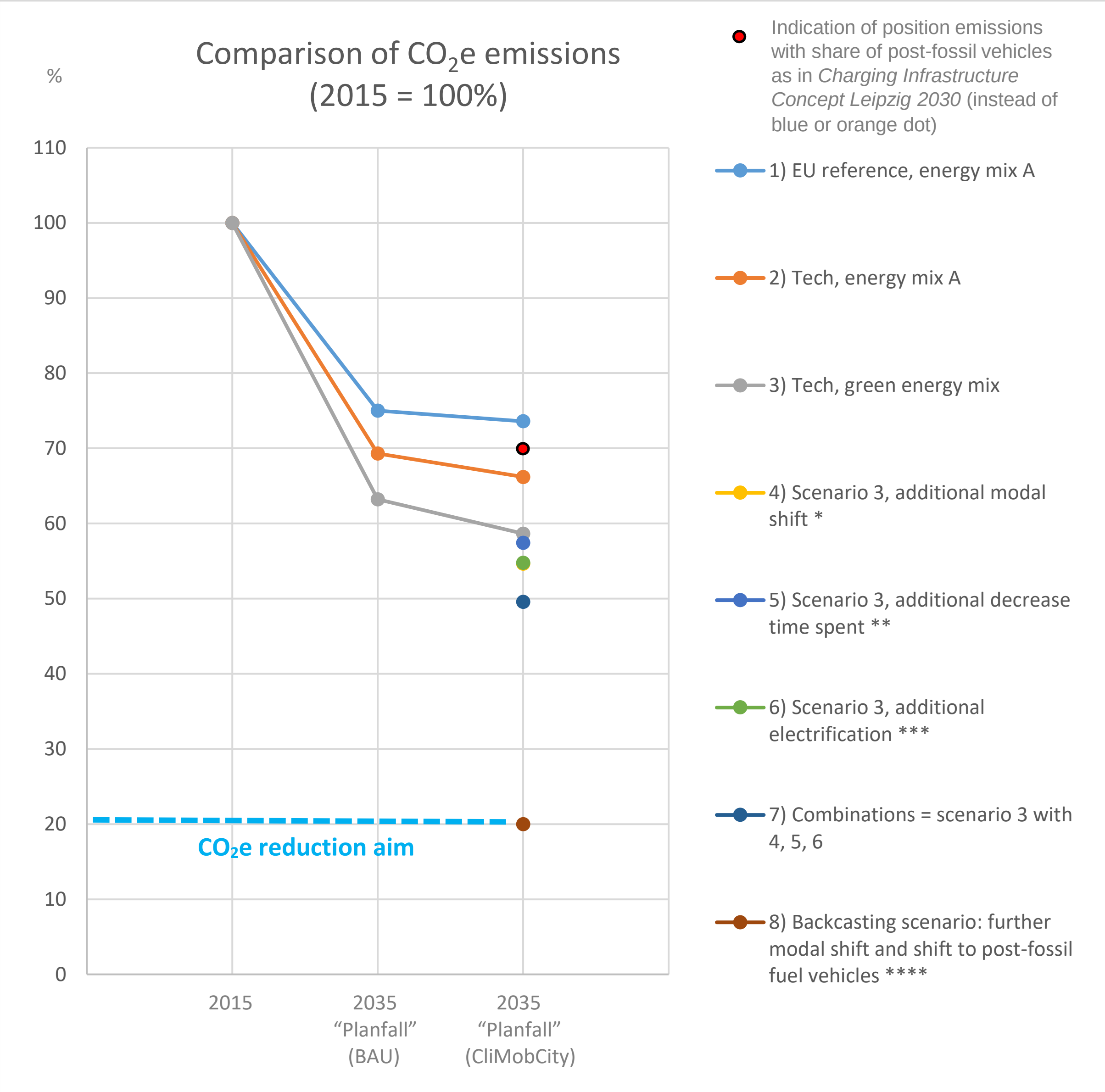
*	Share of cars and other LDVs: -10%-points; of public transport busses and active travel: each +5%-points.
**	10% less time spent, because of less road vehicle-kms and/or more fluent traffic flow.
***	Share of post-fossil fuel vehicles: +10 %-points.
****	Share of cars and other LDVs: -26 %-points; of 2W -5 %-points, of bus +8 %-points, of metro +8 %-points, of rail +3 %-points, of walking +3 %-points, of bicycle +9 %-points.
*****	Share of BEV: + 61 %-points; of diesel: -15 %-points, of gasoline: -46 %-points.

This type of presentation supports understanding of the relation between different results (dots).
But be aware of that:

- lines between the 1990, 2018 and BAU dots represent (alternative) developments in time;
- lines between BAU and CliMobCity dots serve the comparison, but don't represent developments in time.

scenario) to 11% (Tech scenario). In the CliMobCity scenario the planned electrification of public transport busses and other municipal vehicles and the idea of introducing a network of shared electric vehicle points (150 cars) has been included as the CliMobCity input for the carbon modelling. The scenario also envisages a 37% share of electric private cars in 2030 measures. The result is a decline of CO_2e emissions of 14% compared with the base year (blue line; municipal powertrain aim) of 15% (orange line; Tech scenario) and of 21% (grey line; Tech scenario and green energy mix). After the forecasting lever exercises (4-7) the CO_2e reduction is only rather halfway the aims as set. One conclusion from the backcasting lever exercises is that maximal reduction of car-kms (overall scenario 8) does not reduce emissions to the level of Thessaloniki's aim, whereas electrifying all cars does (overall scenario 9). The emissions remaining is mainly caused by HGVs (trucks, non-public transport busses), also by public transport busses (1/3 of them still has diesel propulsion) and by 2-wheelers.

In **Leipzig** population development between 2015 and 2035 is projected to increase by +13% (+0.6%/y). Car-kms in BAU decline by 8%, but the CO_2e red uction is much larger, namely 25% (blue line), as according to the EU reference scenario there is also a significant shift to post-fossil cars, effecting the emissions of the remaining car-kms. Also the modest greening of the electricity production, effecting the emissions of electric road and public transport vehicles, contributes to this reduction. In the CliMobCity scenario there is additional



*	Share of cars and other LDVs: -10 %-points; share of public transport busses and active travel: each +5 %-points.
**	10% less time spent, because of less road vehicle-kms.
***	Share of post-fossil fuel vehicles: +10 %-points at the dispense of the share of fossil fuel vehicles.
****	Share of cars and other LDVs: -10 %-points; increasing share of post-fossil cars and other LDVs to the level of 86%, increasing share of post-fossil trucks and other HDVs to the level of 22%.

This type of presentation supports understanding of the relation between different results (dots).
But be aware of that:

- lines between the base year dot and BAU dots represent alternative developments in time;
- lines between BAU and CliMobCity dots serve the comparison, but don't represent developments in time.

electrification: 100% of the public busses are electric ones in 2034. And all municipal logistic (and other) activities are to become climate-neutral by 2030. The CO_2e reduction is analysed to be 26% (blue line; EU reference scenario), 34% (orange line; Tech scenario) and 41% (grey line; Tech scenario and green energy mix). If instead of the EU reference or Tech powertrain values the current and announced municipal electrification aims had been incorporated, the CO_2e reduction in BAU would be smaller, that in CliMobCity larger, implying a larger difference of reduction between BAU and CliMobCity (blue and other lines). The combination of additional measures in the what if-forecasting lever exercises (overall scenarios 4-7) provides substantial additional reduction, but not sufficient. The backcasting lever scenario shows that an additional reduction of the car share in passenger mobility of 10%-points and additional electrification of cars to the level of 86% and of trucks etc. to the level of 22% would provide a CO_2e reduction of 80%, which is the city's aim.

Spatial dimensions of mobility change and CO_2e reduction

For CO_2e reduction the change of mobility, cumulating in the reduction of road vehicle-kms, is important an important factor. On the other side, in the climate neutral city **all vehicles will need to be post-fossil fuel ones**. Not one running vehicle may then still emit CO_2e anymore. From this angle mobility measures seem to be superfluous. Why then bother with mobility measures?

A major reason is the spatial argument which advocates a broader approach than mitigating CO_2e emissions of mobility mainly by e.g. the electrification of cars: public transport and active travel require less space per passenger-km than the car. This difference is important for compact cities with a relative high density which in many cases can't endlessly facilitate the expected future growth rates of mobility, especially of car traffic. In the compact city the average travel distance is shorter, for which reason more people choose for walking and bicycling, hence providing two advantages for climate-friendly mobility. Last but not least the compact city provides more demand for high(er) frequency public transport and a higher cost coverage in metro, tram or bus systems.

In the cities' demonstrations the spatial dimension of mobility has only partly been elaborated, like in Bydsgoszcz' exploration of the effects of reurbanisation. Next, the relation between car use and lack of space in the city was discussed in each city chapter. The traffic flows observed indicate that CO_2e reduction by mainly electrification of traffic perhaps, if at all, is an option for Plymouth, given the spatial structure of the city, but difficult in Leipzig and to some extent also in Bydgoszcz, and merely impossible in Thessaloniki, a densely populated city also in European comparison, not only in the (large) city centre, but throughout the municipality; at many places Thessaloniki's main roads are not wide and already intensely used, so there is no to very limited space for more road vehicles, whether fossil or post-fossil fuel ones.

Reflection on CO_2e impacts. More needs to be done

As the CO_2e reduction in the CliMobCity scenarios or the overall scenarios 4-7 is not sufficient, the question arose what more could be done. One direction of potential answers related to **novel mobility types** as shared mobility, new types of micro-mobility and mobility hubs in Europe, as these play a role in the partner cities' policies, but couldn't be taken along in the transport modelling. One finding from a brief literature review was that the use of shared vehicles to some extent reduces the sum of private and shared car-kms and therefore – despite of modal shift also taking place from public transport and bicycle to the car – reduces CO_2e emissions. Shared cars also reduce the CO_2e emissions from building, maintaining and recycling vehicles (these lifecycle emissions, however, lie as mentioned before outside of the scope of the project). All CO_2e reductions of novel types of mobility, however, become substantial only if the novel mobility types evolve to a mainstream configuration instead of remaining a niche market. And here seems to be a problem: any mainstream presence of such novel mobility is not in sight, as the share of people willing to change to these mobility types is limited. The novel types do, however, accelerate the electrification of mobility and – although merely analysed – indirectly reduce CO_2e emissions due to a declining parking demand which supports the concepts *compact city* and *city of short distances*. The CO_2e benefit of dockless shared bicycles and scooters is partly cancelled out by the emissions emerging because of needing to reposition them. Shared vehicles with shared scooters deserve attention, as they when also including lifecycle level emissions are not necessarily climate-friendly. Promising for CO_2e reduction are private electric bicycles, given their potential market share because of their typical distances leading to quite some car-km reduction. But also some replacement of non-electric private bicycles on shorter distances must be considered.

Other lines of reflection referred to more of existing types of measures and to new types of measures like new combinations of push, pull, behavioural and technological measures, or like measures in which pricing would become more effective if it would distinguish the degree of climate-friendliness and/or the level of income of the traveller. The new types of measures have in common that new technology has made them possible and/or that new urgencies change travel preferences and behaviour.

The latter leads to another line of reflection, namely the change in mindsets of residents and organisations as this is important for a successful mobility and energy transition. Different studies emphasize that part of the population is interested in innovation and changes like towards climate-friendly mobility, often not the majority, but a substantial part. Policies should mobilise and increase this potential by awareness raising, after checking the performance of envisaged mobility services.
This subject was also the focus point for additional mobility modelling by Bydgoszcz. In most existing transport models the so-called mobility preferences of actors (a preference addresses the question whether a traveller prefers travel alternative A or B, given certain performances and costs per alternative) remain unchanged between the base and the future year, mainly because there is not so much known about future preferences. For long periods as 2021-2050 in the Bydgoszcz case, such constancy of preferences is likely not to be valid. Instead preferences will partly change, and hopefully in a sustainable direction. Bydgoszcz has for its mobility packages W1+ and W2+ simulated such change of preferences by – in the transport model – varying some parameters in a direction in which travellers have more affinity with active travel and public transport and less affinity with car use. Future research needs to validate such assumptions, but the idea is quite relevant for designing climate-friendly mobility policies.

Certainly innovative freight transport and logistics represent another search area for measures to reduce CO_2e emissions. Much transport CO_2e in the four cities is emitted by the freight sector, while the project's measure packages did not incorporate many measures to reduce these emissions. Elements of imaginary reduction strategies are the replacement of diesel trucks and vans in- and outside of the city by e.g. post-fossil fuel ones, the increase of transport scale outside of the city, and the implementation or reorganisation of decoupling points at city edges or at highway exits/entrances, all responding to the change of powertrains and transport scale. Innovative concepts need to be analysed using other models than the macroscopic transport models, but implementing their results into the macroscopic models.

All together the cities demonstrations have provided many new insights enriching the process of interregional learning, as the learning was not limited to past successes and experiences, but extended to the future consequences of city-specific policies regarding climate-friendly mobility.

Final Dissemination Event

The 2050CliMobCity project proudly organised the 'Final Dissemination Event' (FDE) from June 19th to 21st, 2023, in Leipzig with on-site and online participation. During the event the results of the Interregional Learning process, the cities' Action Plans (and the subsequent action implementation) and the 'Demonstration' findings were presented and discussed.
During the event, guest speakers discussed national and European policies that can support municipal goals. Also, site visits to example sustainable mobility projects in Leipzig were organised.
Below, we give an overview of the presentations given during the FDE.

- **2050 CliMobCity Final Dissemination Event – introduction** (by Ekki Kreutzberger, Delft University of Technology; 2050 CliMobCity Project Leader)

The participants of the FDE (both present in the meeting venue in Leipzig and online) were welcomed and the three-day programme was introduced: the first afternoon with introductions from the city of Leipzig presenting the setting of the project in one of the partner cities, followed by a short city visit. The second day of the FDE giving insight in the different activities of the project, including the Action Plans, City Demonstrations and Good Practices. During the third day of the FDE visits were made to interesting examples of measures that are being implemented in Leipzig in their policies to reduce carbon emissions from mobility.

- **"Leipzig bewegt nachhaltig„/"Leipzig moves sustainable"** (by Anja Hähle-Posselt, Kommissarische Amtsleiterin Amt für Wirtschaftsförderung, Stadt Leipzig / Head of department of Economic City Development)
  The city of Leipzig faces multiple challenges, including the consequences of COVID but of course also the carbon issue. In the recent years, the city saw significant changes in population, from about 400,000 to 600,000 inhabitants. This means more homes, facilities, workplaces as well as of course more transport. Leipzig has created an efficient railway system including the S-Bahn (regional train), tram, but also a bus transport system, the latter now also with electric propulsion. So, the city did a lot, but a lot of things still remain to be done. This includes for instance building a new circle tram line and introducing better trams; this is done trying to move people out of their cars, promoting active transport. This all takes time, and a lot of money – the systems are quite expensive.
  Still, cars will remain to be necessary, therefore, the city aims to have much more electric cars, supported by sufficient charging systems.

- **"Leipzig having become one of the 100 EU climate-neutral cities"** (by Simone Ariane Pflaum, Leiterin des Referats für Nachhaltige Entwicklung und Klimaschutz, Stadt Leipzig / head of department of sustainable development and climate protection)
  Leipzig is partner in the '100 climate neutral and smart cities' initiative. A lot of work already has been done in nature protection and climate mitigation, efforts that were, in 2017 and 2021, awarded with a gold European Energy Award. Leipzig now strives for climate neutrality using the matrix of the Climate Alliance, aiming to reduce energy used in mobility, heat and power.
  In total we estimate that about 18 billion Euro has to be spend to achieve this goal. In the Sustainable Energy and Climate Action Plan (SECAP) a pathway to climate neutrality, with intermediate milestones, has been defined. This has been translated in a Mobility Strategy 2030 (70% climate friendly in 2030, 90% in 2040), but also in other strategies including supply and waste disposal activities, strategies for public buildings and facilities, integrated planning and construction concepts, communication and cooperation, and nutrition and agricultural targets.
  Both Leipzig and Thessaloniki are part of the EU Mission on climate-neutral smart cities. This participation results in collaboration and sharing expertise and experiences.
  Via structural programs, Leipzig tries to get sustainable initiatives co-funded. Challenges especially include getting sufficient renewable energy. For mobility, the challenge is to reduce of traffic demand, inter modality and comparable goals, but at the same time guaranteeing that mobility systems are inclusive.

- **Project introduction: Interregional learning, demonstrations, Action Plans, good practices, project meetings and seminars** (by Arjan van Binsbergen, Delft University of Technology, Lead Partner)
  The 2050 CliMobCity project is about climate mitigation in the field of urban mobility, translated in a series of activities including interregional learning (with expert seminars, site visits), city demonstrations, showing 'good practices' and by defining concrete actions in city Action plans.
  The topics addressed in the activities of interregional learning included (novel) policy strategies and modelling as well as practical implementations and pilots.
  In the city demonstrations, policy measures and measure packages proposed by the cities were analysed in terms of their effects on changing mobility and on effectively reducing CO_2e emissions for future years.
  Inspired by and/or on basis of the experiences shared in interregional learning or during the city

demonstrations, cities defined concrete actions, to be implemented and monitored during the project runtime, and addressing regional Policy Instruments.
In 'Good Practices' project partners highlighted example and pilot projects that could function as an example for (other) cities, both within and outside the project.

- **About the Interreg Europe programme** (by Brume Delaunay, Interreg Europe)
  Exchanging experiences and knowledge is the main goal of the Interreg Europe program. 'Projects' (like 2050 CliMobCity) and the 'Policy Learning Platform' are the two main branches of the program. Platforms' services include 'People', 'Knowledge' and 'Expertise', all on specific topics including sustainable mobility. Concrete activities include webinars and publications, which are accessible for partners of Interreg Europe projects and others. During 2014-2020, 4 calls were launched with an overall budget of 322 million Euro and resulting in 258 projects. 23% of these were on low carbon and about 26 sustainable mobility and 4 of them specifically on urban sustainable mobility with 2050 CliMobCity being one of those selected projects.
  The leverage of the programme – i.e. ratio between Interreg Europe subsidies and quantified and monetised effect, is about 4.4. This is excluding the large effect on knowledge and experience exchange and learning.
  Interreg Europe continues with the 2021-2027 program, with an increased budget of 379 million Euro ERDF budget and with the priority on capacity building and with six thematic areas including 'Smart', ' Green', ' Connected', ' Social', 'Citizens' and 'Governance'. The second call for this program recently closed and the proposals are being assessed.

- **City demonstrations**
  The cities' measure packages, the mobility effect estimations and the CO_2 emission reduction estimations were presented and discussed. **See above** in this Newsletter for an elaboration on the city demonstrations.
  - **The measure packages (BAU and 2050 CliMobCity)** (by Arkadiusz Drabicki, Bydgoszcz; Daniel Forster, Plymouth; Rafail Katkadigas, Thessaloniki; Jan Becker, Leipzig);
  - **The change of mobility** (by Ekki Kreutzberger, Delft University of Technology, Lead Partner);
  - **The reduction of CO_2e emissions** (by Fabian Reitemeijer, Potsdam Institute for Climate Impact Research [PIK]);
  - **Feed-back from the partner cities: What are the conclusions from these results for future policy-making?** (by Arkadiusz Darabicki, Bydgoszcz; Daniel Forster, Plymouth; Pinelopi Antoniou and Georgios Papastergios, Thessaloniki, and Jan Becker, Leipzig);
  - **Reflection on demonstration results** (by Ekki Kreutzberger, Delft University of Technology, Lead Partner).

- **Climate-friendly urban and mobility development. Learning from European cities** (by Björn Weber, German Institute of Urban Affairs/Deutsches Institut fur Urbanistik)
  DIFU undertook a comparative international study on what German cities can learn from other cities in Europe on climate-friendly urban mobility development. Regarding CO_2 emissions DIFU observed that overall, CO_2 emission is reduced between 1990-2020, except for mobility and that is related to mobility growth in both passenger and freight transport that couldn't be offset by technological advances. This means that an acceleration is needed to reduce CO_2 emissions from transport, where we can see a predominance of the passenger car in the modal spit (especially in kilometres).
  So, how would or could a Climate Neutral City look like?
  Generally, public transport would function as the main transport mode for longer-distances transport. Further, there would be a large emphasis on walking and biking. Both transport modes ask for higher densities, but also attention for blue and green infrastructures. Most cities now adapted policies for climate adaptation and mitigation, still, acceptance for fundamental changes is perhaps not as high as desired for. Also, time is needed, whilst there is actually no time to lose.
  From the example cities investigated in the report a lot can inspiration can be drawn from, for instance related to combining push and pull measures, and also to have a firm legal foundation for various transitions – re-allocating road space to other uses, financial arrangements, data exchange etc. At the same time, even

these example cities did not always reach the targets yet, and attention is needed for transport flows outside urban centres.

- **Action Plan implementation**
  The cities presented their implementation activities for the actions defined in their Action Plans. See below for an elaboration on these implementations: by Arkadiusz Drabicki (Bydgoszcz), John Green and Daniel Forster (Plymouth), Pinelopi Antoniou and Georgios Papastergios (Thessaloniki), and Jan Becker (Leipzig).

- **Living Lab ThessM@LL** (by Josep Maria Grau Salanova, CERTH/HIT)
  The Thessaloniki Smart Mobility Living Lab (ThessM@LL) is related to Centre for Research and Technology Hellas (CERTH) and its Hellenic Institute of Transport (HIT) and participates in the European Network of Living Labs – ENOLL. The ThessM@LL collects and analyses data to create added value by extracting information and knowledge from it, and providing solutions and services (data portal, big data tools, decision support systems, digital twins). Initially focused on mobility, now also on energy and environmental data on urban and peri-urban areas.
  Citizens' engagement is an important aspect that can be addressed by the instruments available. Further, the available tools include a lot of modelling tools, also on different scale, management, optimisation clustering and for instance a mobility dashboard. Services include traffic status and predictions, routing and navigation, congestion detection, and data portals (National Access Point). Target audience includes governments and authorities, but also for police services.
  The Living Lab has no own, fixed funding. It works via arrangements, fixed in MoU's that define services and finances. Regarding sustainability, the initiative works together with companies to implement traffic management initiatives and advice municipalities and other government levels on measures and strategies.

- **Policy Instrument Bydgoszcz** (by Hanna Lewandowski for Izabela Szczesik Zobek, BZIT)
  Zintegrowanych Inwestycji Terytorialnych (ZIT) is the integrated territorial investment, that is the territorial and financial instrument for the regional operational program. ZIT can help promoting partnerships between local municipalities. In the previous period (2014-2020) a lot of projects on sustainable mobility were cofounded by European funds. For instance in bicycle roads, tram extensions and routes, P+R systems. In the new program the 'functional area' has been reduced to Bydgoszcz, however, a collaboration with other regions has been established. The new regional financial instrument has 112 million Euro and additional 8 million Euro that will be used to invest in low emission rolling stock, improve the urban transportation system, and bicycle paths. The financial instrument can fund up to 80% of rewarded projects. The investments have been pre-selected in the strategy plan; in addition to European money, it is also possible to apply for national funding. Now the pre-selected initiatives can apply for funding, and a selection mechanism is now being developed, but has to be supported by analysis, reports and data.

- **EUCityCalc project** (by Luis Costa, PIK)
  The 'European City Calculator Project' is to have an energy integration tool for CO_2e emissions, that not only includes mobility but also other sectors. It should be reliable, but also with an easy-to-use interface. Being an integrated model, it is not and cannot be not detailed but gives a good overview of the whole of the emission effects on various measures. The model tries to bring insights about potential for CO2e emission reductions to small and medium side city users, without that they have to worry about the modelling issues, and also without the need for consultants. The project is based on 9 pilot cities, with EnergyCities as coordinating partners and 10 other partners, including PIK responsible for the methodologies. The energy model behind EUCityCalc includes all kinds of inputs from activities, demand/energy, food, products and materials, transport and buildings and then the emissions resulting from all this.
  Via 'levers', arranged in specific thematic areas (such as transportation and more specifically modal split), policy and development variants can be introduced to the model. Additional output provides also cost estimations, again based on available data. Everything comes together in a web-interface, at the moment only for the pilot cities. They can see the historical emissions and expectations. Next, they can opt for different types of measures, and from that input calculations are made about future emissions – for a range

of years – as well as an abatement curve/graph. Trainings to use the tool, as well as instruction videos will become available.

Good Practices Published

The 2050 CliMobCity partners defined nine 'Good Practices' that are published on the project website. These good practices can be a source of inspiration for concrete actions that can be taken to move to sustainable mobility. Five of them are "expert approved" and published in the Interreg Europe database.

- **Bydgoszcz Intelligent Transport System (ITS)**
  Bydgoszcz ITS are a wide range of technologies and management used in transport to increase the safety of road users, increase the efficiency of the transport (expert approved).
  The ITS is the combination of a traffic control system, an analytical tool, and a traveller information system. It controls the traffic at intersections, signal lights to green waves, gives priority to the tram at intersections, analyses the travel time of road traffic using license plate recognition, and informs road vehicles about travel times via information panels. In its traffic control room, graphics display the planned and the actual situation, and a "top view" simulation shows the general traffic flow in certain areas. The operators of the ITS system can remotely operate the traffic signals, e.g. for emergency operations, accidents and other special cases. The flow information, like where congestion takes place, can be used for policy-making.
  The main goal of the system is to shorten the travel time by tram transport and motor vehicles. In addition, the system is to increase the capacity of the street network, improve the quality of the natural environment (e.g. by reducing the amount of exhaust fumes), and reduce associated maintenance and renovation costs.
- **Bydgoszcz: reconstruction of tram & road system and the intelligent transport management system**
  Construction of tramline in the city centre with the extension of the road network, reconstruction of transport system and rolling stock purchase in Bydgoszcz.
  A narrow and dangerous Kujawska Street and a missing tram connection to Wojska Polskiego from the centre for years blocked the development of the accessibility in Bydgoszcz. Every day the nearby roads were congested.
  In 2021 the tram network was improved with the construction of 2.2 km of double-track line, separate bus lane, new roads and refurbishment of 1.9 km of double-track line along Wojska Polskiego. The track was connected to the city's intelligent transport system (ITS). In addition, 15 new low-floor trams were purchased. Further work involved installing overhead traction lines and lighting, new tram stops, pavements, pedestrian crossings, bus bays and bicycle paths.
  In addition, a park-and-ride with 134 parking spaces had been built, other 3 parking lots were renovated. 629 trees and 528 shrubs was planted to reduce the noise. The tram network now encompasses 10 lines and about 40 km of track. Kujawska tram and further improvement of the tram network introduced recently have and will improve sustainable mobility in the city.
- **Plymouth, conversion local ferries to electric propulsion, installation of waterside charge points**
  Two local foot passenger ferry operators partnered with Plymouth City Council and Plymouth University to convert two vessels to electric power (expert approved).
  Plymouth Boat Trips and Mount Batten Ferry applied for funding offered by the University of Plymouth in order to convert two diesel-powered vessels to electric power (lithium-ion battery). The e-Voyager and M.V. Copper ferries (both 12 passengers) are the first electric powered sea-going vessels in the UK and can operate for a normal day on a single charge and recharge fully, overnight. Plymouth Boat Trips now plan to convert another, larger boat to electric power and to design and build the first purpose built electric vessel of its type in the UK.
  Plymouth City Council facilitated this project by identifying the funding the operators could apply for and by providing 3 quayside electric charging points (including 2 x 22kW charging points and 1 x 3 phase commando socket) to enable the ferries to operate once converted. The project was also supported by the Marine Business Technology Centre and other partners, and was part of the Action Plan of Plymouth.

- **Plymotion**
  Plymotion is a long-term sustainable mobility brand created by Plymouth City Council in 2012 under which a diverse range of activities provide information and opportunities to overcome barriers and enable people to make more journeys by bike, on foot and by bus (expert approved).
  Based on the COM-B theory of change Plymotion responds to individuals' capabilities and motivations and provides relevant opportunities to enable travel behaviour change. The core Plymotion activity is personalised travel planning. This is delivered to targeted neighbourhoods (Plymotion on Your Doorstep) to businesses (Plymotion at Your Workplace) and at major public events.
  Opportunities provided under Plymotion have included: adult cycle training (1-2-1, group, and disability); e-cargo bike trial loans; Dr Bike checks; bike maintenance; led group walks; activities with schools to encourage children to walk, scoot or cycle to school; and providing free bikes to unemployed people. Some programme elements are provided directly by council staff, while others are provider under contract by private sector partners. All are provided free to the public. Plymotion has been resourced by a succession of government grants for between 1 and 3 years. The range and scale of activities have varied in response to funding levels, but the brand - which has established a high degree of recognition within the city - provides continuity.
- Thessaloniki Smart Mobility Living Lab-THESSM@LL
  THESSM@LL fosters initiatives encouraging transport developments and sustainability of mobility schemes by the provision of novel technologies and innovation.
  THESSM@LL is one of the most important mobility living labs (LLs) in Europe, actively engaged with the end-users and relevant community stakeholders and pursues a co-creation and co-design strategy of innovative technological solutions to improve transport conditions and upgrade mobility services with the final end of a better living experience of the citizens. The first period of activities was mainly dedicated to the development of a suite of data-intensive info-mobility services for the citizens of the Region of Central Macedonia, for instance by real time GPS tracking of taxis and censored detection of road traffic. Since then an extensive ecosystem was created, by attracting data providers, participating in many European/National projects and shouldered by the Region of Central Macedonia, the Municipality of Thessaloniki, public and private transport operators, technology providers, research and academia. The added value of the data collection and analysis is guidance on decision making for new infrastructure, traffic management, traffic lights optimization and citizens' encouragement for sustainable mobility based on real time data on congestion.
  THESSM@LL has become the test bed for new technologies and innovative mobility solutions. It also always responds to actual challenges. During the COVID-era, the more detailed analysis of transport conditions and citizens' behaviour allowed support to decision and policy makers towards better recovering & agile planning.
- **Controlled Parking Management in Thessaloniki & its optimization by the CUTLER project**
  Parking Management in terms of smart cities, sustainable mobility & urban climate change, balancing effectively between economic, environmental & social factors.
  Thessaloniki is a densely populated city with a high demand for parking spaces. In 2017 a new Controlled Parking System (CPS) was installed in the city centre known as THESi. THESi aims to regulate the available on-street parking places, preventing illegal parking and relieving traffic congestion to reduce CO_2 emissions. The available parking spaces are divided into white and blue sectors destined for visitors and permanent residents respectively. Free parking is provided for e-vehicles owners and disabled fellow citizens.
  CPS is supported by a tool, developed in the CUTLER project, the Municipality of Thessaloniki (Mot) being a partner. Its aim is to develop a platform enabling policy design, implementation and evaluation, focusing on urban resilience in order to shift the existing rather intuitive approach of policy making towards an evidence-driven approach enabled by big data, with regard to the management of the established CPS. When deciding which parking spots to change from one category to another, there are multiple factors to be taken into account: Economic, Environmental, Social. Taking into account the aforementioned, concrete evidence must be extracted from data obtained from the Municipal Police, the Economic Dpt. and the Environmental Dpt. of MoT. In case of insignificant change or of deterioration of the environmental

conditions due to the proposed parking policy, next actions are to analyse the possible reasons and propose policy changes.

- **Bi-directional charging cars Utrecht, city-wide roll-out**
  Utrecht is world's first municipality with the citywide roll-out of a bidirectional charging system for electric cars, a very sustainable electricity system (expert approved).
  The municipality of Utrecht has the aim to substantially increase the share of electric cars and of solar electricity. A main line of development concerns electricity exchange between solar panels on buildings, bi-directional batteries (of nearby parking cars), and the electricity grid, all connected via charging points, that not only allow to equalise electricity supply and demand through time, but also provide nearby storage capacity for solar electricity, hence keep the electricity grid balanced (= smart solar charging). The charging point technology has been developed by a consortium under lead of the Utrecht firm LomboXnet. A core element of the concept are bi-directional (car) batteries, allowing charging and discharging. Cars with such batteries in Utrecht are the Renault Zoe and Hyundai Ioniq 5. The bi-directional charging points can also be used by cars with conventional batteries (charging only). This technical concept is combined with mobility innovation, such as providing shared cars. These are operated by "We drive solar" and usable by subscribers. In combination with low(er) parking standards this encourages less own car ownership and more modal shift.
  The city's task is to develop charging policies, define the content of charging concessions, decide on charging locations and conduct local regulation. The bi-directional charging has been tested in pilot areas. Utrecht has started the city wide roll-out of bi-directional charging points (already 500).
- **Amsterdam IJburg 1, high performance light-rail and compact urbanism**
  The residential area Amsterdam IJburg 1 has high densities and is accessed by a fast and high-frequency tramline. The share of car mobility is relative low.
  The city of Amsterdam is booming and continuously in search for sustainable and attractive options to facilitate the growth. Much of the new housing is to be built within the city boundaries, in order to achieve sustainable mobility. The city wants to become climate-neutral by 2050.
  IJburg 1 (1^{st} phase), a group of islands located between 6-8.5 km from Amsterdam's Central Station, is one of the new developments. It contains housing for about 24,000 inhabitants. The building densities are high, the averages of two of the areal sections reaching up to about 80 houses per hectare. The general shape of the islands is longitudinal, making it easy to access the whole area by a tramline. Shops for daily need are located near the tramline. The line connects the area with the city's centre and main station with up to 15 services/hour, and until past midnight. A journey from begin to end of the line lasts 18 minutes. The high speed is the consequence of dedicated infrastructure including bridges and a long tunnel under water, and of the spatial setting (no stops between the islands). IJburg 1 is also accessed by tangential bus lines and has good connections to the national highway system. Cars park indoor and on street. In the vicinity of IJburg 1 four new islands are in development (IJburg 2). The urbanism on the new islands will also be compact, although quite different from IJburg 1, and partly experimental. The tramline will be extended to these new islands.

Action Plans and Actions implemented

An important part of 2050 CliMobCity is for partner cities to define Action Plans with concrete actions, which were to be implemented in Phase 2 of the project, from 1 August 2022 – 31 July 2023. 'Actions', grouped in Action Plans, are activities defined by the partner cities to take concrete steps in the process of achieving the stated emission reduction goals. The defined actions are inspired by or based upon insights gathered from interregional learning and the city demonstrations. All cities identified regional or municipal policy instruments to be addressed in their action plans. These could be Structural Funds operational programmes or regional or local (municipal) strategies, policy plans or operational programmes.

Essentially, four types of concrete actions were defined as actions:

- Analyse the results of demonstrations (measures, measure packages, effects thereof), interregional learning, seminar presentations and good practices to get inspiration for new or additional mobility policy measures and interventions;
- Preparatory steps, including advisory reports, as input for new strategic plans and policies;
- Setting up collaborative arrangements with partners to raise awareness of sustainable mobility, to participate in knowledge exchange initiatives and/or to commence sustainable mobility services;
- Creating infrastructures and facilities for sustainable mobility alternatives such as micro-mobility hubs and electric vehicle charging stations.

Plymouth addressed “European Regional Development Fund England Operational Programme 2014 to 2020 - Investment priority 4e : Promoting low-carbon strategies for all types of territories, in particular for urban areas, including the promotion of sustainable multimodal urban mobility and mitigation-relevant adaptation measures.” and the “Climate Emergency Action Plan for Plymouth” and the related Action Plan 3 (2022).

The first action entails delivering multi-modal Mobility Hubs across Plymouth, including EV Sites with Rapid charge points, Car Club (shared cars, part of the EV sites) and Social Prescribing. Indeed, more hubs than initially intended were realised offering 500 (shared) electric bikes, 300 electric vehicle charging points, a shared electric vehicle system and an electric charging facility for electric boats.
The second action was to assess 2050 CliMobCity projects for inclusion on Climate Emergency Action Plan (CEAP) 4 and the Net zero Action Plans. This analysis has been finalised by identifying 46 learning opportunities with potential for application in Plymouth assessed for the Net Zero Action Plan. Pathways for learning highlighted for the 15+ opportunities that are considered to have potential for application.
A third foreseen action, to leverage findings of CliMobCity to local action plans, couldn’t be finalised yet due to delayed outcome of national planning policy guidance review. Implementation of the action is anticipated during the remainder of 2023 and 2024.

Leipzig addresses the city’s strategy “Leipzig – Stadt für intelligente Mobilität” (Leipzig – City for intelligent mobility”).
The first defined action aimed for installing fast charging infrastructure on commercial properties. Together with various stakeholders and city departments, this action indeed resulted in opening a fast charging station, with 4 more planned to be realised in the near futures.
The second action was to implement net charging points for shared car services. The action resulted in 8 stations with 2 charging point each having been installed and brought into operation.
Both actions resulted in learning experiences that can be used to accelerate the introduction of similar facilities in the coming years.

Bydgoszcz addresses the ERDF policy instrument “The Regional Operational Program for the Kujawsko-Pomorskie Voivodship 2014-2020; Priority 4e Promoting low-carbon strategies for all types of territories, particularly for urban areas, including support for sustainable urban mobility and adaptation measures having a mitigating effect on climate change”, and defined three actions in their Action Plan.
The first action is to compose a 2050 CliMobCity contribution report for the Bydgoszcz Spatial Development Masterplan. The findings report has indeed been submitted, and is awaiting the response of the spatial development unit; one discussion topic was to what extent tentative scenario studies can be used in formal policy making.

The second action is submitting technical specifications for tendering a study for micro mobility and car sharing to the municipality. The report is drafted in collaboration with the Spatial Planning Department of the Bydgoszcz Municipality and the Road and Public Transport Department of the Bydgoszcz Municipality (ZDMiKP), and is in the final draft phase. In will be formally submitted om short notice.
A third action planned was to define technical specifications for a cycle wayfinding system and install a pilot for such a system. This action required a coordinated effort of different departments within the municipality, regional and even national authorities – especially because the innovative nature of the system did not comply

with set regulations. Bydgoszcz has now decided to focus on the design of the system, especially regarding the type of information to be given to the users.

Thessaloniki addresses the Operational Programme of the Region of Central Macedonia and in addition the Operational Programme of the Municipality of Thessaloniki (specifically: Strategic and Operational Plan of the Municipality of Thessaloniki for the years 2019 – 2023). Thessaloniki defined four actions.

The first action was to develop technical Specifications for the elaboration of the "Sustainable Urban Logistics Plan (SULP)" of the Municipality of Thessaloniki. This action has indeed been realised: the framework of Technical specifications developed with the collaboration of HIT, and the specifications has been shared with the team now developing a call for funding or the "Metropolitan Strategic Plan for Sustainable Urban Development of the Region of Central Macedonia."
The second action aimed for developing and signing of the Memorandum of Understanding (MoU) with the Thessaloniki Smart Mobility Living Lab (ThessM@LL) for Real time information services for citizens. This MoU has been developed in consultation with the relevant Thessaloniki departments and is officially accepted by the municipal council; formal signing will take place in September 2023.
The third action is to realise the pilot installation of micro mobility hubs of electric sharing transport schemes in City's public space. This micro mobility hub has been realised, and a kick off promotion of the services to the citizens of Thessaloniki took place within in the framework of the European Mobility Week 2022.
The fourth action aims to .develop and sign a MoU with at least one of the Universities' administration of the City Centre, part of which are targeted awareness raise campaigns for University Students' mode choice and information about its impact in the environment, the city and the individuals. For this action several successful steps have been set to define and formalise the MoU, and already workshops and discussions took place to an increased mode choice awareness for university students. Future Steps to be taken include the signing of the Climate City Contract (CCC) in September 2023 between all stakeholders of MoT ecosystem, including the universities.

Useful experiences – and recommendations - from the implementation process include:
- Formalizing arrangements, aligning actors and (even) departments within municipalities, bringing about changes in policy processes and getting physical facilities 'on the street' can be quite tedious and time consuming; success requires sufficient determination and tenacity;
- An important point of attention in bringing about the needed changes in mobility (and associated energy systems) is the essential role of city administrations in adapting regulation, arranging permits and financial incentive systems; this requires sufficient manpower and expertise;
- During lengthy implementation processes, objectives, conditions, frameworks and financial arrangements can change, asking for agility and flexibility in the plans and processes.

Wrap-up

The partner cities are aware of the urgency of climate mitigation, as documented by their climate aims. In three of the cities the aims have also become sharper in the run of the project.

The partner cities have in the project developed ambitious measure packages, however also discovered that these do not sufficiently reduce CO_2e emissions from mobility. The project work showed that strong municipal interventions lead to relevant mobility changes and CO_2e reductions, and it has provided findings and improved understanding relevant for developing more climate-friendly strategic plans in the field of mobility, land use/spatial development, and energy policies, all the fields potentially contributing to effective CO_2e reduction of mobility in the cities. The cities were able to mutually learn what the potential benefits are of different approaches and measure packages, some with a stronger focus on behavioural/mobility change and others with a stronger technological/powertrain change, and of thinking differently and boldly.

Not reaching the climate aims on time should not lead to (municipal) climate cynicism or climate laisser-faire. The challenge for the cities is to plan transparently and work hard to achieve climate neutrality as soon as possible by deciding effective measure packages in their strategic plans and implementing these, in parallel by seeking maximal cooperation of residents and organisations in the municipality, and also in parallel by communicating to higher policy echelons needed changes of policy frameworks. The project partners found this challenge description appropriate during the discussion on the last Partner meeting of the project, in July 2023. Always should the planning of climate-friendly mobility also focus on other sustainability (like air quality) and liveability to create synergies

Valorisation of the project work will hopefully help to improve future municipal policies.

Reflection on the project findings

Systematically reduce CO_2e emissions of mobility

The partner cities all included measures in their analysis that lead to one or more of the following central energy saving changes in mobility:

- *reduction of mobility demand*;
- *shift to climate-friendly transport modes*, such as public transport and active modes;
- *decrease of average distance* travelled in motorized transport modes;
- *shift from private to shared car use*;
- *substitution of fossil fuel by post-fossil fuel vehicles,* assuming that electricity, hydrogen etc. increasingly come from green sources;
- *increase of occupancy* rates of motorized transport modes;
- *reduction of vehicle weight*;
- *reduce parking demand of cars*;
- *smoothening of traffic flow on roads to reduce energy consumption.*

If none of these central changes emerge, there will probably be no energy saving and hence no reduction of carbon emissions from mobility.

Different cities, different outcomes; still generic lessons to be learnt

The partner cities are quite different in terms of population size, economical structure, geographical setting, transport system as well as the local planning and policy cultures – and the developments therein between now and 2030-2050. So, what generic lessons can be learnt?

Regarding the **mobility** measures:

- In all cities, the demographic, economic and spatial development has a huge impact on expected mobility (growth), both in the business as usual and future scenarios.
- The city structure is an important factor for being able to achieve sustainable mobility. In the compact city, travel distances are shorter, therefore more people choose active travel, and there can be more dense demand for public transport. These are three factors already limiting energy consumption and CO_2e emissions.
- The space requirement per passenger-km is large for private cars, less for public transport and even less for active travel. In dense cities the expected future growth of mobility can't be accommodated spatially if all growth would take place by car mobility. Instead, also mobility change and supportive city development is needed.
- Different (types of) *mobility measures impact each other*, but the overall effects are difficult to imagine. Therefore it really makes sense to use advanced mobility modelling tools to get insight in the these mutual influences as well as in the precise impact of demographic and spatial developments.
- An interesting side-effect of using models is that mobility measures must be elaborated to a quite high level of detail so to be able to translate the measures in model-input. This elaboration already gives a lot of insight in the potential impacts.
- The potential impact of specific measures very much *depends on the precise local conditions*, such as the state of development of a transport system. For instance, introducing a new advanced public transport system from scratch can have a huge impact, further development of an existing system is likely to have a much lesser impact, which nevertheless can still be substantial.
- Measures that aim to boost active modes (walking, bicycling) can result in a significant *modal shift in terms of trips* – contributing to improvement of accessibility and liveability – but have a limited effect on the *modal shift in terms of kilometrage*. The potential of e-bicycling to substitute car-kms is larger, but e-bicycling partly also substitutes non-motorised bicycling.
- Mobility can change due to changing transport supply. It can also change without changing transport supply, but because of changing mobility preferences of travellers, perhaps because of increasing sustainability awareness, partly induced by awareness raising campaigns and other communication of cities and other actors. Change of mobility preferences is likely to take place on the long term, like up to 2040 or 2050. In current transport models of cities mobility preferences of travellers remain unchanged towards the future. In this regard improvement of transport modelling would be highly appropriate.

Different cities, different outcomes; still generic lessons to be learnt

The partner cities are quite different in terms of population size, economical structure, geographical setting, transport system as well as the local planning and policy cultures – and the developments therein between now and 2030-2050. So, what generic lessons can be learnt?

Regarding **CO_2e emissions**:

- The reduction of CO_2e emissions is the result of changing mobility (as a result of policy measures and exogeneous socio-economic developments and cumulating in the reduction of road vehicle-kms), the shift from fossil fuel to post-fossil fuel powertrains and the greening of the electricity production.
- The reduction of car-kms can be supplemented by the shift from fossil fuel (e.g. gasoline cars) to post-fossil fuel (e.g. electric) cars amongst the remaining car-kms. The CO_2e reduction effect of this supplement can range from small to large, dependant on the magnitude of the shift to post-fossil fuel cars and on the magnitude of the shift to green electricity production.
- The reduction of car-kms can be substantial but can nevertheless only provide a limited overall CO_2e reduction if there is little CO_2e reduction in other transport sectors, in particular the freight sector. Emissions from trucks and vans are significant. The volume of HGV-kms is predicted to increase substantially. And each HGV-km has a relative large carbon footprint, also still in future years. So, specific measure packages for freight transport should be developed alongside measures for mobility for people.
- Electrification of (passenger) cars and public transport opens the way for using more renewable energy sources and could have a very substantial effect on CO_2e emission reductions. The overall effect of electrification in mobility is, however, strongly related to the way electric energy is generated (‘energy mix’).
- Developing bicycling and walking infrastructure hardly reduces car-kms and CO_2e emissions, unless it improves the accessibility of public transport and shared cars. E-bicycling takes place for longer distances and can therefore relevantly reduce car-kms and hence CO_2e emissions.
- CO_2e reduction by means of developing public transport tends to require high investments, increase operational costs and have long preparation times.
- CO_2e reduction by means of electrifying road transport or developing other post-fossil fuel options also tends to take long, as the EU reference and Tech scenarios show. Acceleration of the replacement of cars by financial incentives also represents a heavy financial burden for the public hand. In addition, the associated spatial impact which as we described above tends to hamper the development towards climate-friendly mobility.
- New mobility concepts including micro-mobility or shared vehicles – for instance made available via mobility hubs or stations – could help to reduce private car use and therefore CO_2e emissions. They may also help to accelerate the penetration of electric vehicles and then also CO_2e reduction. However, new mobility concepts still represent a niche market. The challenge is to develop them to mainstream markets. Shifts from active modes to electric vehicles can be counter-productive in terms of CO_2e emission reduction.
- When for shared vehicles not limiting the focus to the CO_2e emissions of using them, but including other lifecycle emissions (such as those from the production, maintenance and recycling of vehicles and infrastructure), shared micro-mobility is not necessarily sustainable, as these shared vehicles may have short lifecycles due to careless handling.

2050 CliMobCity publications

In the 2050 CliMobCity website 'Library (https://projects2014-2020.interregeurope.eu/2050climobcity/library/) the following publications have been included:

- Project Summary Report and five Appendix-X-Reports
- Action Plans Implementation Monitoring Report
- Final Dissemination Event presentations
- Action Plans
- Newsletters
- Seminar presentations

Via the Interreg Good Practices website, the initiatives identified by the 2050 CliMobCity partners can be found: https://projects2014-2020.interregeurope.eu/2050climobcity/library/