Briefing
/ April 2020

ENERGYCITIES

“Carbon City budget” or “Climate-proofed municipal budgets”?

What’s the difference, and how to implement them in my city.

“We cannot set the right priorities with the wrong compass”

Carbon budget”, “Climate-proofed municipal budgets”, “science-based targets”” are some of many different approaches offered to cities when they want to align their short, medium and long-term policies with the Paris Agreement. These instruments, measuring and monitoring tools, can be complementary. They, in any case, need to be adapted to the local context and to the local available data. Science-based targets can support cities in defining their strategy by identifying and leveraging on their own strengths; on the most impactful actions.

1. CARBON BUDGETS

Carbon budgets emerged as a scientific concept from the IPCC’s 2014 Synthesis Report on Climate Change[1] and relate to the “cumulative amount of CO_2 emissions permitted over a period of time to keep within a certain temperature threshold”[2]. Much like a financial budget, a carbon sets out how much CO_2 can be ‘spent’ over a fixed time period; and once it’s gone, it cannot be replenished (unless new technologies are rolled out at scale to extract CO_2 from the atmosphere). This framing is used to inform local and national climate strategies using the 1.5°C or 2°C temperature targets as enshrined in international goals. Figure 1 tracks different interpretations given by different institutions.

[1] Anderson et al. (2017). ‘Carbon budget and pathways to a fossil-free future in Järfälla Municipality’
[2] https://www.carbontracker.org/carbon-budgets-explained/

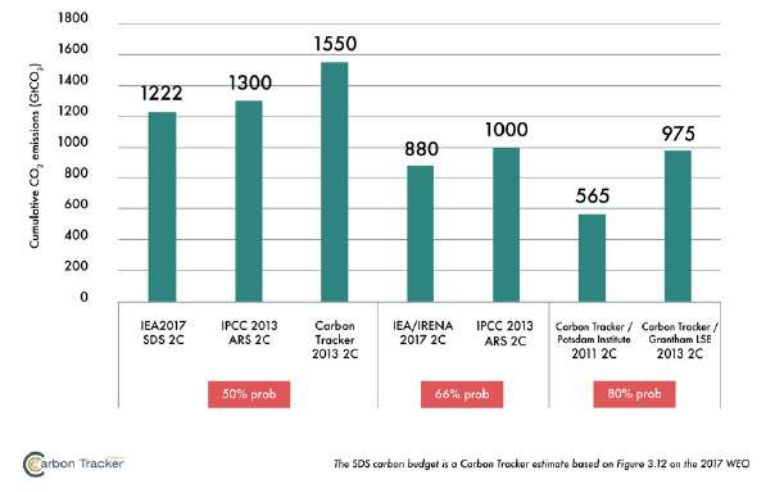


Figure 1.
"A number of differences lie beneath 2°C budgets published by different institutions"[3]

At national level, there are two States who have adopted carbon budgets. One such example is France, which has determined three carbon budgets over the 2015-2028 timeframe in its Stratégie Nationale Bas-Carbone (SNBC)[4]. France's carbon budget limits the country's overall CO_2 emissions to 442 $MtCO_2e$ between 2015 and 2018, gradually reducing the budget to 399 $MtCO_2e$ between 2019 and 2023, and 358 $MtCO_2e$ between 2024 and 2028.[5] The French SNBC also sets carbon budgets for the various emitting sectors, such as transport, buildings, agriculture, the energy industry etc.

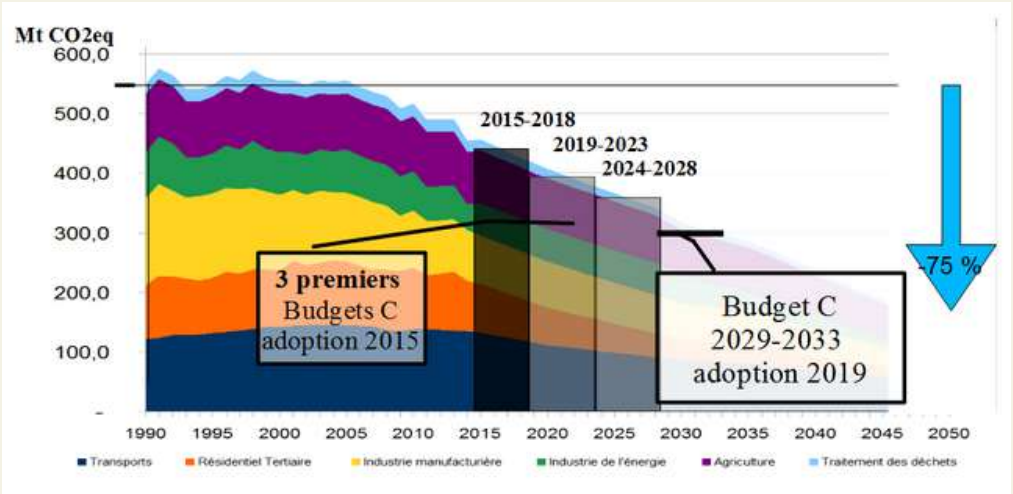


Figure 2.
Overview of the French national carbon budgets[6]

[3] https://www.carbontracker.org/carbon-budgets-explained/
[4] https://www.ecologique-solidaire.gouv.fr/strategie-nationale-bas-carbone-snbc
[5] https://www.citepa.org/fr/air-et-climat/la-france-face-a-ses-objectifs
[6] https://www.ecologique-solidaire.gouv.fr/strategie-nationale-bas-carbone-snbc

Starting even earlier, the United Kingdom calculates legally binding carbon budgets every five years since the 2008 Climate Change Act.

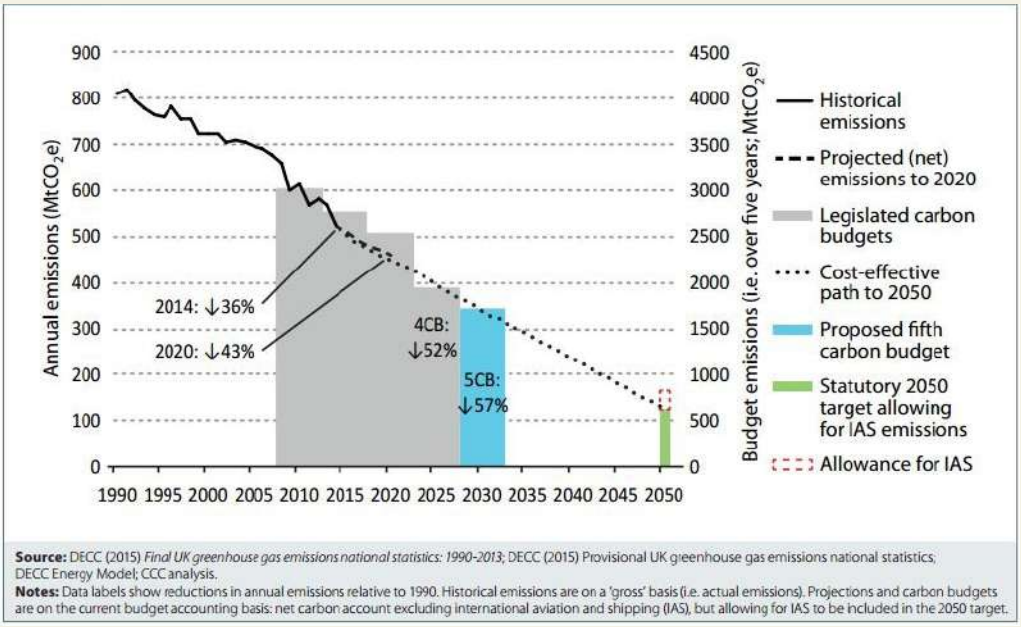


Figure 3.
Past carbon budgets for the United Kingdom and the proposed fifth carbon budget by the Committee on Climate Change in 2015, adopted in 2016[7]

These two examples of carbon budgets on a national level demonstrate two major problems: Firstly, even though the carbon budgets are supposed to be "legally binding", there are no consequences when they are not respected, and the yearly cap fixed by the French carbon budget was already exceeded by 3.6% in 2016. Secondly, these carbon budgets are not necessarily in line with the Paris Agreement commitments, notably concerning the allocation of emissions between OECD and non-OECD countries on the basis of equity.

The Tyndall Centre for Climate Change Research at the University of Manchester has criticised the fact that "UK budgets under-represent equity, which is a guiding principle of the Paris Agreement, by setting a UK path that delays annual global emissions parity until 2050, despite historic responsibility[8]".

[7] https://carboncredentials.com/uk-government-approves-5th-carbon-budget/
[8] Kuriakose et al. (2018). 'Quantifying the implications of the Paris Agreement for Greater Manchester'. Tyndall Centre Manchester.

Case study: State of California (USA)

A first tentative approach towards carbon budgets at the local level was made by the State of California in 2008, in the form of California's Senate Bill 375 which imposed GHG emission targets on regional governments, focusing on emissions from vehicle travel[9]. The targets were developed with the help of a Regional Targets Advisory Committee including city and county officials, and local authorities were required to prepare 'Sustainable Community Strategies' as part of their transportation planning, identifying a set of actions to reduce local emissions.

In the Californian case, implementation of the action plan was not mandatory. However, what is interesting are the tools which the State provided to its regional authorities: The first step that the local administrations had to take was to calculate the GHG emission inventory of their city or county. In order to transform the targets into concrete measures, emissions were forecast under a business-as-usual scenario, to see what reductions had to be made to reach the targets. The different modelling and calculation tools are still available at: https://coolcalifornia.arb.ca.gov/local-government/toolkit

While the case of California is an example of how emissions can be calculated and reduction objectives set at the local level, it does not follow the carbon budgeting approach described above. Rather than just setting local targets, a carbon budget sets comprehensive CO_2 emission boundaries which should not be exceeded inside a certain territory or administrative boundary. The carbon budget must be set in relation to the global carbon budget which is broken down first at the national and then at the sub-national level. Since that time, both carbon budgeting methodologies and cities' ambitions have evolved considerably and recently there has been a push for local carbon budgets in a number of European cities, which are often much more ambitious than national objectives.

CARBON BUDGET AT THE CITY LEVEL

There are currently still only few examples of carbon budgets broken down at the city level. Nevertheless, the idea of using carbon budgets as a local policy tool has gained support in academic circles and amongst more ambitious local authorities.

"The city carbon budgets approach would make local governments accountable for greenhouse gas emissions that are under their control – either directly through city operations or indirectly through land use and other locally held powers. Under city carbon budgets, local governments would be assigned an annual emissions 'budget' and would be required to keep local transport and buildings emissions within this budget."[10]

Researchers from the University of Uppsala in Sweden have come up with a model on how to break down Sweden's carbon budget at the municipal level.

[9] Salon et al. (2010). 'City carbon budgets: A proposal to align incentives for climate-friendly communities'. *Energy Policy*, Vol. 38, pp. 2032–2041.
[10] Salon et al. (2010). 'City carbon budgets: A proposal to align incentives for climate-friendly communities'. *Energy Policy*, Vol. 38, pp. 2032–2041.

Using a similar methodology, the French branch of WWF has calculated carbon budgets for the 10 biggest French Metropolitan areas, both under a 1.5°C and a 2°C scenario, in its most recent report entitled "Cities' Climate Challenges"[11]. The report begins with a detailed analysis of the climate action plans of these 10 cities and clearly shows how their current political ambitions are far from sufficient to maintain them on the reduction trajectories proposed in line with the Paris Agreement commitments. Unless they immediately begin making radical yearly cuts in emissions, their entire carbon budget allocation until 2100 will have been used up within the next 13 years.

	1.5°C Scenario (50% probability)		2°C Scenario (66% probability)	
	Carbon budget (MTCO2e) 2016-2100	Number of emission years at the corresponding annual pace	Carbon budget (MTCO2e) 2016-2100	Number of emission years at the corresponding annual pace
Métropole du Grand Paris	250	3	682	9
Métropole Aix Marseille Provence	72	2	197	5
Métropole de Lyon	51	5	139	14
Métropole Européenne de Lille	47	5	128	13
Bordeaux Métropole	37	7	101	18
Toulouse Métropole	34	8	94	21
Nantes Métropole	26	7	70	20
Métropole Nice Côte d'Azur	20	6	55	16
Eurométropole de Strasbourg	19	6	53	16
Métropole Rouen Normandie	19	4	52	11
Total	577	5	1571	13

Table 1.
Carbon budgets calculated by WWF France for the 10 biggest French Metropolitan areas[12]
(Translated from French)

[11] WWF France. (2018). 'Le défi climatique des villes'.
[12] WWF France. (2018). 'Le défi climatique des villes'. https://www.wwf.fr/sites/default/files/doc-2018-07/20180704_Etude-defi-climatique-villes.pdf

Carbon budget: the case of Manchester

Following the example of the National UK government (see above figure 3), Manchester took the decision to develop their own carbon budget.

Committing to stay below a 2° temperature increase, as stated in the Paris agreement, can be translated into a number of maximum tonnes of GHG (Carbon) to be emitted before the end of the century. This amount can be then divided into maximum tonnes of GHG for each country and further down, be split into "local carbon budgets".

Figure 4
The pieces of the carbon pie

The concept: The local carbon budgets correspond to the maximum GHG volumes that can be emitted by a territory. The cumulative total is the key parameter, not the zero carbon / carbon neutral end-date.

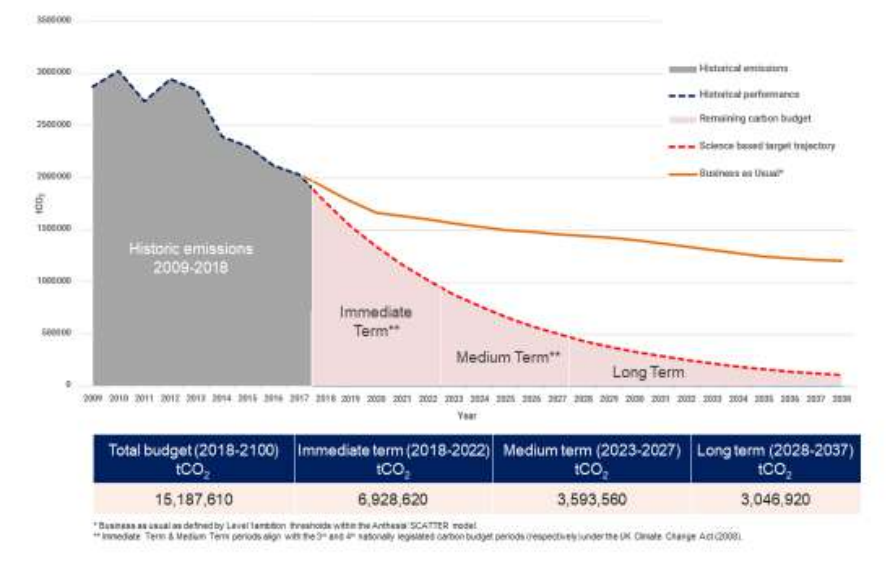
The timescale advised by the Tyndall Centre is to 2100, taking into account the persistence of CO_2 in the atmosphere and the need for a long-term perspective; once emitted CO_2 stays for many decades, adding to the cumulative total of emissions emitted beforehand. Once the local carbon budget has been established work is then required to determine the pathway for staying within the budget: spend it all in the short-term with a view to radical and unprecedented cuts in the medium term; deep cuts in the short-term to leave budget for later years; and other scenarios may be considered. However, it is important to note that scientific consensus is not to delay action to later years in anticipation of a yet-to-be-invented technological solution; the recommended approach is to take urgent and immediate action now. In Manchester's example, figures are provided by the Tyndall Centre

The total carbon budget remaining for Manchester is 15 million tonnes for 2018-2100. If Manchester keeps its current emissions levels, it means that after 7 years of emitting at the same rate, Manchester would use all of its budget, by 2025, rather than the required 2100.

In their action plan for climate and energy, the potential impact of different actions was measured via the SCATTER tool developed by Anthesis. On that basis, Manchester has chosen to reach carbon neutrality by 2038, at the latest. They will have spent 95% of their carbon budget by then, leaving 5% for the remainder of the century. Whilst not fully carbon neutral by 2038, this is the definition adopted by the Tyndall Centre.

However, as above, the key parameter is the total carbon budget – 15 million tonnes CO_2 for 2018-2100 – not the end date.

The carbon budget approach can be useful to raise awareness, but should really be an instrument that helps well-informed decision-making and urgent action, rather than providing "panic button". This can be the case, as seen with some of the French cities' carbon budgets, which have already been entirely "spent" (within the time the study was published). Nevertheless, the advantage of the approach is to clearly show the rapid change required.



Total budget (2018-2100) tCO_2	Immediate term (2018-2022) tCO_2	Medium term (2023-2027) tCO_2	Long term (2028-2037) tCO_2
15,187,610	6,928,620	3,593,560	3,046,920

Figure 5
Manchester's current, medium and long term budgets

Manchester's carbon budget requires UK aviation emissions to also stay within a limited carbon budget; the Tyndall Centre recommend a budget of 1,200 tonnes CO_2 for 2020-2100. The distribution of this budget requires UK Government to work with UK airports to develop a Paris Agreement-aligned aviation strategy for the UK. The Tyndall Centre do not recommend taking unilateral action at Manchester or any other UK airports, rather a coordinated national approach is required. However, it is possible for cities to develop a clear position on aviation based on actions that are within their local control and influence (including influencing citizens and businesses) and to make a clear commitment to work with national government. The Manchester Climate Change Framework 2020-25 and the Bristol Climate Change Strategy 2020-30 both include commitments on aviation. Barcelona city has also started a campaign to ask their port and airport to be more accountable to climate targets, assessing that together the port and the airport are emitting 4 times more than the entire city of Barcelona.[13]

[13] https://www.elperiodico.com/es/barcelona/20200114/medidas-reducir-contaminacion-puerto-y-aeropuerto-barcelonna-7805670

As a conclusion, we can take inspiration from the "City Carbon budget challenge" of the Uppsalla University. They have proposed, with support from the Swedish government, to calculate the carbon budget of different cities or groups of stakeholders. Thus it is not only a municipal council that can start the exercise, but the carbon budget can also be a tool for civil society to pressure their council/ regional leaders.

Example of a Swedish City carbon budget challenge:

Södermanland is a county located South-West of Stockholm with a population of roughly 300 000 people. It is also one of the counties for which Uppsalla University calculated a carbon budget in 2018. In this report, the county's allocated budget was 14Mt C02, roughly 5% of Sweden's total budget. If emissions continue at 2016 levels, Södermanland will break this budget by mid next decade. Hence, Uppsalla University recommend an emissions reduction curve of 16% per year[14].

[14] https://uppsala.app.box.com/v/Koldioxidbudgetar-2020-2040/file/365900065079 (in Swedish)

2. CLIMATE- PROOFING OF MUNICIPAL BUDGETS

At State level, some countries have started another exercise which can be complementary to the carbon budgeting approach. They assess their national budget with a "climate compass". In France, a first report was attached to the finance law for the 2020 budget and it has been promised that the next budget proposal for 2021 will include climate impact information (including a wider approach on resources, not only GHG) within the proposals (not as an annex).

Measuring and following up on the evolution of the city's GHG emissions is essential to identify the most polluting sectors and the most efficient mitigation measures. This helps prioritise investments and ensures that the city's money is being spent in accordance with its commitments. Several cities have developed their own budgeting and reporting mechanisms with the objective of calculating CO_2 emissions and putting climate-related data at the centre of the city's strategic planning – aligning their investments and actions around the reduction of CO_2 emissions.

Climate budget of City of Oslo (Norway)

Oslo City Council adopted its first Climate Budget in 2016, under the motto "we'll count carbon dioxide the same way we count money"[15]. Under the responsibility of the Department of Finance and the City Council for Environment and Transport, the updated second generation of the Climate Budget provides an overview of 36 measures that the City Government is planning to implement within the period covered by its current economic plan in order to achieve Oslo's climate goals. The Climate Budget includes measures under municipal control and measures implemented or funded by the national government that have a direct impact on GHG emissions in Oslo.

One drawback of this approach that should be noted is that the emissions included in the Climate Budget only relate to Oslo's scope 1 emissions, i.e. emissions from sources under direct control of the administration, and do not include scope 2 and 3 emissions[16]. Consequently, emissions related to oil and gas extraction are not included, even though they represent a significant share of revenue for most Norwegian municipalities.

CO_2 emissions and the costs of reducing them are reported at the same time as the regular budget report, the Climate Budget "being an integral component of the overall city budget"; thus "the city's CO_2 emissions are presented and budgeted in a similar manner to the city's finances"[17].

For this reason, reports on the Climate Budget are presented during the three key steps of the budget cycle. The first report is issued in March to April between the first strategic conference and the assembling

[15] https://www.oslo.kommune.no/english/politics-and-administration/green-oslo/best-practices/climate-budget/#gref

[16] Scope 2: Emissions from electricity consumed by the organisation, though emissions may be produced elsewhere; Scope 3: Upstream emissions associated with extraction, production, transportation of products, or services used by the organisation (World Bank. (2010). 'Part III: Cities' Contribution to Climate Change' in 'Cities and Climate Change: An Urgent Agenda'. Available at: http://siteresources.worldbank.org/INTUWM/Resources/340232-1205330656272/4768406-1291309208465/PartIII.pdf

[17] http://ec.europa.eu/environment/europeangreencapital/wp-content/uploads/2018/05/Oslo_Climate_Budget.pdf

conference of the budget planning. A second report is then presented in August/September at the same time as the final budget conference and the budget proposition of the City Council. Finally, a third report is issued at the end of the year after the budget resolution and before the strategic conference for the next cycle.

Morten Nordskag from Oslo's Department of Environment and Transport highlights that this system of reporting has the advantage of identifying gaps between the measures planned and the city's objectives. It immediately triggers a need to take action to close these gaps. Most recently Oslo has identified such a gap, realising that the measures currently comprising the Climate Budget are insufficient to attain the goals set for 2020 and 2030.

An important aspect is that the Climate Budget assigns responsibility for reaching the goals to the various departments thereby not only involving the staff of the environmental department. By specifying the costs and timeframe for all the measures, there is greater transparency on what the city is doing to achieve its objectives.

The main steps and components for setting up the Oslo's Climate Budget are the following (on the basis of the 2018 Climate Budget):

1. Set targets for CO_2 reduction
   - Reduction of 50% of emissions by 2020
   - Reduction of 95% of emissions by 2030
2. Quantify the amounts of CO_2 emissions that have to be reduced to attain the target
   - GHG emissions from 2015 to 2020 must be reduced by approximately 460 000 tonnes CO2eq
   - The City Government has set goals to reduce the city's emissions to 1 054 000 tonnes CO2eq by 2018 and 765 000 tonnes CO_2eq by 2020 (1 226 000 tonnes CO2eq in 2015)
3. Identify measures with the biggest CO_2 impact and implement measures to reduce the emissions of the sectors concerned in the long and the short terms
4. Quantify the estimated CO_2 emission reduction for each measure (and the timeframe in which they will do so) as well as the overall reduction of all measures and compare the numbers to the targets
   - Measures for which CO_2 emission reductions can be estimated (12 measures with an approximate effect of 360 000 tonnes CO_2eq)
   - Measures with unallocated CO_2 emission reductions, as they are not easily quantifiable (measures with an anticipated overall effect of well over 100 000 tonnes CO_2eq)
5. Specify how these measures will be financed and who will be responsible for their implementation and reporting

MEASURES	Responsibility for implementation (Responsibility for reporting in parentheses)	Estimated effect of measure, 2015-2020 (tonnes CO_2e)
Phase out the use of heating oil in municipal buildings and undertakings	Undertakings that use heating oil (KLI)	121 450
Phase out the use of fossil fuel in privately owned buildings by 2020 through a combination of bans and subsidies (Climate and Energy Fund and Enova)	KLI	
Reduced emissions of landfill gas from Grønmo and Rommen	EGE and EBY	6 900
Phase out the use of fossil fuel and gas in district heating (peak load)	NOE	5 600
Increase material recycling of household waste and boost re-use	REN	4 300
Conclude documentation of nitrous oxide volumes in wastewater, with the aim of correcting figures supplied by Statistics Norway'	VAV	20 500
Introduce a new toll-ring payment system, including new toll stations, in 2019. Note that the effect assumes the implementation of the measures listed below in italics:	MOS	93 300
Installation of new charging stations for passenger and commercial vehicles, including a pilot project for car-sharing schemes	BYM	
Increase public transport capacity to cope with population growth and reduction in private vehicle traffic	Ruter	

Table 2.

Measures with estimated emission-reducing effect (Oslo's Climate Budget, 2018)

Read the European Commission's factsheet on Oslo's Climate Budget here: http://ec.europa.eu/environment/europeangreencapital/wp-content/uploads/2018/05/Oslo_Climate_Budget.pdf

The links between Carbon Budget, Climate-proofed budgets and SECAPs

The first two approaches are compatible with the current commitments and can be complementary, but require new tools. The Sustainable Energy and Climate Action Plans (SECAPs), currently required when a city is committing to the Covenant of Mayors, is another approach that is less strategic as it is linked to medium-term planning of energy and climate related policies. Nevertheless, SECAPs can also be considered to be founded on a "science-based targets" approach. For their commitment to 2030 targets, cities are required to develop their 5 to 10 years' action plans, representing thus a translation of the Paris agreement into local climate strategies.

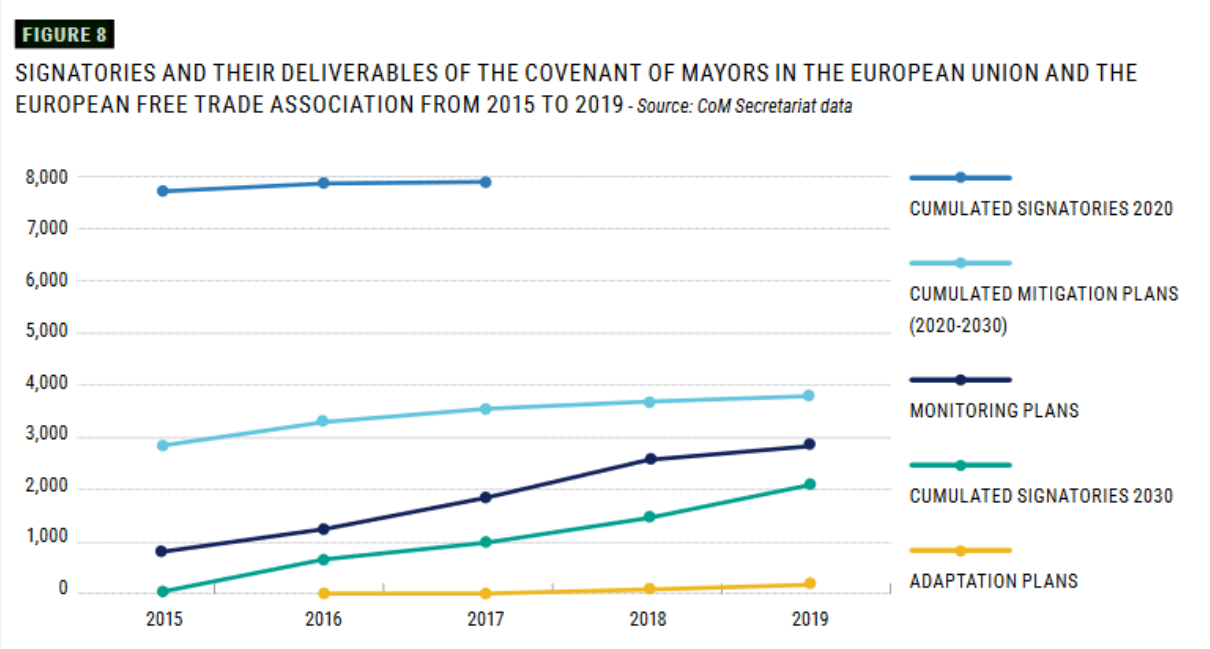


Figure 6-
graph from the Climate chance 2019 global status report[18]

However, the approach is still guided by the 2030 energy and climate policy framework as the Covenant signatory cities commit to the following targets: reaching a 40% GHG reduction by 2030 (from 1990 levels), at least 32% increase in energy efficiency and 32.5% of renewable energy production. Thus the Covenant Signatories commit to increase their resilience to the impacts of climate change and provide secured access to sustainable and affordable energy by 2030. The action plans submitted to the Covenant of Mayors 2030 are divided into measures by sectors (transport, building, energy). This currently constitutes the backbone of any local energy and climate strategy. Climate neutrality will not be reached if these main sectors are not decarbonising; however, it misses the more strategic approach of embodied CO_2 emissions (for instance in the construction sector, consumption, food systems, water-energy nexus etc.). It misses the untold objective of sufficiency (we will only reach the Paris objective IF we reduce at least by half our needs) and the need to re-localise our economy. Its misses the necessary change in systems or energy transition and thus does not prepare local leaders to support it.

To conclude this chapter, and leaving the SECAP approach which is the backbone of any local strategy on which we can built on the next generation of action plans, we can summarise the two "main approaches" as follows:

[18] *https://www.climate-chance.org/wp-content/uploads/2019/11/en_c2_complet_def.pdf*

CARBON BUDGETING	CLIMATE-PROOFED BUDGETS
Translate the Paris agreement to reach a maximum of 2° increase in temperature levels into a maximum volume of GHG that can be emitted. Then break down this maximum CO_2 emissions into a local budget (maximum CO_2 to be emitted till the end of the century by the given territory)	Translate all budget lines, expenditures and resources, expressed in € into its positive or negative impact on CO_2 emissions. Implement the "climate budget" within the same process than the financial laws/budget decisions.
"place based" approach allows each place to choose its landing point and landing date. Then the trajectory will be abrupt or gradual.	"Competency based" approach; each budget line is translated when relevant. Applying both to investment and to annual spending
Because it requires actions by many stakeholders, the carbon budget approach governance can be attached to the municipal council but cannot rely only on it. Different governance models need to be invented to match the stakeholders.	Involving all departments of the city council (or any administration involved). Embedded into the process of the budget's decision. Each department is responsible for its part; clear "burden-sharing" mechanism.
Periodicity: to be determined by the body/governance in charge	Annual periodicity
Possible at all territorial levels. Already exists at national level in France, UK….	Possible at all territorial levels (e.g. already in place in Finland) An assessment of the EU budget is planned
++++ It is based on a territory, thus, it shows the efforts needed by all economic actors, and allows the involvement of civil society into a joint commitment. Very powerful to create synergies and alliances of local actors.	++++ It is a powerful instrument to share the responsibility and show to all departments and agencies of the city that they can also have an impact. It increases the transparency of the decisions and shows their impact. It is a powerful accountability tool. It can be binding.
----- Impossible to make it a binding instrument outside the administrative boundaries. The governance model has to be allocated proper resources to ensure that the mobilisation of all actors takes place in the long-run.	------ Limited in scope (cannot be used really for scope 3 emissions) Not always easy to translate every budget line into climate impact. It can also be counter-productive to embark some departments if their actions are limited. Less interesting to mobilise all stakeholders (apart to check on accountability of city's commitments)

3. Other approaches for local authorities to align their finances with a 2°C scenario?

In addition to the examples used to explain the carbon budget and the climate budgeting concepts, other case studies, best practices and tools can help local authorities to align their strategies, spending and investments with the Paris Agreement objective of limiting global warming well below 2°C by fully integrating energy and climate issues into their budgetary and financial planning.

These strategies are developed around five main axes:

1. Environmental reporting and budgeting: there is a necessity to change the way municipal budgets are presented in order to account for climate impacts and the costs necessary to attain cities' climate goals. Combining environmental and financial reporting leads to better informed decision-making about investments and fund allocation, and engages financial staff when climate and energy data is presented in a form they are familiar with.
2. Green public procurement: Municipal procurement budgets represent a significant leverage for development towards sustainable and innovative market practices. City staff have to engage with the local economic actors in order to assure that its ecological standards are being met, but also to better understand what is already possible on the market today. Setting high standards triggers innovation.
3. Fossil fuel divestment of municipal funds: Cities may not even know what companies and projects the money they store in funds and saving accounts is being invested in. Local authorities need to be demanding towards their banks and fund managers, asking for transparency about how these financial service providers manage the city's money in terms of environmental investment criteria and climate risk.
4. Green municipal bonds: Not simply a source of financing for energy and climate projects, green bonds also present an opportunity for the city's administration to develop capacity building of environmental staff, cooperation between silos, as well as detailed monitoring and reporting mechanisms, which force the city to stay on top of the climate impacts of their investment projects. The opposite is also true, meaning that cities with a sophisticated environmental reporting system, as well as high degrees of cooperation between financial and environmental departments, can access finance for energy and climate projects easier.
5. Earmarking local revenues and other financial instruments: Several cities have established funds for energy efficiency or sustainable transport projects financed by environmental taxes. Through such taxes or even more innovative financial tools such as carbon-offsetting, local authorities seek to raise awareness among citizens and companies to change their behaviour, but also to mobilise their resources to invest in energy and climate projects.

Two case studies below illustrate some of the tools and complement the examples already provided to climate mainstreaming the municipal budget and Carbon budgeting.

The first one is the approach used so far by the city of Paris whereby it is mainstreaming climate objectives into the normal budget procedure. The second is the approach of the City of Växjö in Sweden which is going a step further by looking not only to the GHG accounting, but also to other resources; all included into a framework strategy to reach a fossil-free city by 2029.

Case Study: City of Paris (France) – Bleu Climat Energie

The *'Bleu Climat Energie'* is an annual report adopted by the City Council every December at the same time as the preliminary annual budget. Its objective is to follow up the various actions decided in the city's Climate and Energy Plan and to indicate budgetary, energy and emission savings that have been achieved thanks to these actions.

A similar logic to Oslo's, linking extensive environmental reporting to the budget planning phase, is used to align investment decisions with the state of advancement of climate and energy actions, as well as to account for the additional costs and savings these actions entail, while distributing responsibility across relevant sectors and actors.

A team of five members from Paris' Climate and Energy department is responsible for the reporting operations. However, all of the city's agencies and departments have coordinators who must contribute by providing data inputs about their respective activities and services.

In this sense the annual preparation of the *'Bleu Climat Energie'* is a collective responsibility involving both internal actors and external partners of the city. In order to share the financial and energy data collected by these different actors, an online dashboard has been created making it easy to upload information regarding various sectors of activity present in the city. The information is collected by the Climate and Energy department and is evaluated by a cross-sectoral team with competences in terms of climate, energy, adaptation/vulnerability and GHG emissions[19]. The dashboard is updated every three months, allowing for a realistic representation of the state of advancement of the different actions and measures carried out by the city's partners. It also ensures that extensive and up-to-date data is available when it comes to preparing the city's budget plan.

Due to the fact that so many different people are involved in the reporting, it is important to increase awareness in departments which are not directly concerned by the environmental impacts of their activities (construction of social housing, tertiary sector, public catering and other procurement activities) and to ensure that they collect data on energy consumption and CO_2 emissions. While this entails a great amount of work, the reporting has the positive side effect of raising awareness among staff and partners on the objectives and actions defined by the Paris Climate and Energy Plan, coordinating the city's approach to climate and energy across all fields of its activity.

The *'Bleu Climat Energie'* includes information about the city's energy consumption and costs, CO_2 emissions, the share of green public procurement, energy efficiency renovations, the share of renewable energy, air quality, use of public transportation, waste and water consumption.

[19] http://observatoire.pcet-ademe.fr/action/fiche/88/bleu-climat and https://energy-cities.eu/publication/climate-mainstreaming-municipal-budgets/

CONSOMMATIONS ÉNERGÉTIQUES

CARBURANTS

CONSOMMATION CARBURANTS DPE

	Litre	€	GES 2016	Évolution GES 2015-2016
Gazole	2 123 791	2 437 701	6 726	↘ 12%
Essence	269 802	358 957	757	↗ 2%
GPL	1 451	1 057	3	↘ 25%
Diester 30	471 890	575 693	1 352	↘ 15%
GNV (NM^3)	2 014 995	2 035 147	2 212	↘ 52%
Total	**4 881 929**	**5 408 555**	**10 050**	↘ **22%**

CONSOMMATION CARBURANTS TAM

	Litres	€	GES 2016	Évolution GES 2015-2016
Gazole	850 421	873 383	2 693	↘ 9%
Essence	1 185 633	1 416 832	3 328	↗ 14%
GPL	20 415	14 291	38	↘ 19%
Diester 30	24 994	25 919	72	↘ 45%
Total	**2 081 463**	**2 330 425**	**6 131**	↗ 1%

FLUIDES BATIMENTS

	Fioul	Vapeur	Gaz	Électricité chauffage	Chauffage seul	Électricité autres usages	Consommation totale	Facture
Consommation réelle (GWh)	1,9	173,2	189,5	25,0	389,6	222,1	**611,7**	**58,65 M€**
Consommation normal (GWh DJU)	1,9	175,6	192,0	25,3	394,8		**616,9**	
Évolution 2015-2016	↘ 14%	↘ 7%	↘ 9%	↗ 30%	↘ 6%	↗ 4%	↘ 3%	↗ 1%

Image 2.
Overview of energy consumption, 'Bleu Climat Energie' (2017) of the City of Paris

Some categories, such as social housing or the development of public transportation, cannot be reduced to their energy dimension and in these cases, the report measures the additional costs necessary for the city to include climate and energy related considerations into projects. Activities which originate exclusively from the implementation of the Climate Plan, such as the energy refurbishments of the building stock, are evaluated in terms of their gross cost.[20]

As for Oslo's Climate budget, GHG emissions generated by the city's activities are quantified and their evolution measured in comparison to the objectives of the Paris Agreement. The information about the city's emissions is provided by the energy operators, the city's internal services in contact with the French energy companies EDF and ENGIE and by the individual departments and agencies[21].

For every indicator used in the report –qualitative and quantitative (financial and human resources, emission reductions, etc.) – there is a set updating frequency, a target value, an initial value, as well as an indicated data source[22].

[20] http://observatoire.pcet-ademe.fr/action/fiche/88/bleu-climat
[21] http://observatoire.pcet-ademe.fr/action/fiche/88/bleu-climat
[22] http://observatoire.pcet-ademe.fr/action/fiche/88/bleu-climat

Case Study: City of Växjö (Sweden) – ecoBudget

Växjö began working on the development and implementation of the ecoBudget in 2003. It was the first time that the city had defined clear environmental targets, an initial challenge but a necessary first step in developing an environmental programme for the municipality's territory. The targets developed within the ecoBudget system were for a long-term timeframe, up to 2010 (and more recently up to 2020) and covered Växjö as both a geographical entity and a municipal organisation.

In 2006, Växjö replaced its Local Agenda 21 strategy and environmental policy with a new Environmental Programme including only measurable, long-term targets covering three areas: Living Life (focusing on consumption and waste issues), Our Nature (focusing on water and conservation issues) and Fossil Fuel Free Växjö (focusing on transportation and energy issues)[23]. EcoBudget was used to follow up and steer progress towards the programme's targets.

In the initial phase when ecoBudget was implemented, a specific Växjö ecoBudget manager was appointed, who presented a report to the City Council every six months thus allowing for the possibility to take "appropriate measures in case a target might be missed, dealing with events not budgeted for and keeping elected representatives informed about budget implementation"[24]. The annual targets were approved by the City Council at the same time as the budget and also reported simultaneously alongside the annual financial report. In 2008, the environmental and the financial budgets and reports were integrated into a single document. Symbols such as smileys and arrows were developed to monitor the progress of the ecoBudget, and soon this reporting style was expanded beyond solely ecological concerns, towards more general sustainability targets, including democracy, equality and health.

Today, Växjö has a long experience in environmental reporting and its methodology has evolved. The city identified the elements of the ecoBudget which have proved to be most relevant and useful in the context of the city's administration. Växjö is currently developing a Sustainability Programme with a 2030 horizon in order to have a common methodology for ecological, social and governance issues, instead of focusing on just one of these aspects. "In the most recent environmental budgets and reports, stronger emphasis has been laid on indicators and their development, without specifying how much they should change, but if the change is not sufficient, we clearly mark it with red symbols, and then we take action", Henrik Johannson, Växjö's former environmental coordinator explains.

For him, the main result the municipality achieved through its use of the ecoBudget was the involvement of the various departments following the target breakdown, as they had to take concrete actions to reach the CO_2 emission budget which was assigned to them. Targets for Växjö as a municipal organisation were easier to follow up on and assign to departments, unlike the geographical targets which most departments could not easily influence. Departments had to report regularly what actions they were taking to reach their individual targets. As Johannson puts it, for Växjö "ecoBudget was simply a way of following up the environmental programme – making sure that there was progress" and that all the work would not have to be done later. By reassessing the relationship between economic and environmental data, Växjö was able to realise how successful the city had been in decoupling CO_2 emissions from economic growth.

[23] UN-HABITAT, UNEP, ICLEI. (2008). 'ecoBudget: Introduction for Mayors and Municipal Councillors'
[24] UN-HABITAT, UNEP, ICLEI. (2008). 'ecoBudget: Introduction for Mayors and Municipal Councillors'

4. TOOLS AND RESEARCH CENTRES TO TRACK CLIMATE IMPACT AND COMMUNICATE

Below is a list of tools and research centres used by Z cities that could be the backbone to design and support local strategies.

FUTUREPROOFED IN VILVOORDE

Futureproofed is a web-based tool for cities to track the impact in CO_2 emissions of each individual action the city is undertaking. It helps to forecast potential and to track records. It is also a tool to involve citizens and create a community around the climate strategy. Used in more than 100 cities in Belgium, it is very valuable to create a peer-practice club between cities. Currently the tool is being tested in Spain, Macedonia, Serbia with good results; therefore, it could also be tested by other cities in the URBACT ZCC network.
https://www.futureproofed.com/futureproofedcities

SCATTER IN MANCHESTER

SCATTER is a web-based tool that helps local authorities to assess, report on and reduce the amount of greenhouse gas emissions that their area produces. It is free for cities located in the UK. SCATTER generates an emissions inventory, in line with what is required to produce a SECAP. SCATTER can be used to develop a credible decarbonisation pathway for a local authority to implement in line with their emissions targets. Outputs can then be used for engagement to create a collaborative carbon reduction approach.
https://scattercities.com/

TYNDALL CENTRE IN MANCHESTER

The Tyndall Centre developed for the Manchester Climate Change Partnership the city's carbon budget and are able to refine with complementary research the need to adapt the carbon reduction path, according to newest data. The Tyndall Centre have now created a free-to-use online tool to enable UK local authorities to calculate a science-based carbon budget, five-year carbon budgets, a pathway for staying within the budget and average annual reduction targets.
https://carbonbudget.manchester.ac.uk/reports/
Other tools and research centres mentioned in the case studies presented in this chapter:

CICERO

This Norwegian research institute is focussing on climate budgeting approaches and on assessing climate municipal bonds. They have followed the Swedish climate budget challenges and are working with municipal banks.
https://cicero.oslo.no/en/cicero-climate-finance

OURCITY OURENERGY

A special application developed by a Spanish NGO to help municipalities visualise their impact on energy efficiency measures and their carbon footprint. The advantage of the tool is that it is directed to increase

transparency and involve citizens by giving access to simple data. It is the basis for involving schools in more than 50 Spanish towns and cities. It also shows the co-benefits in euros of the energy savings.
http://ourcityourenergy.com/en/

CLIMATEVIEW

Some Swedish cities are using the tool Climate view. It breaks down your city's climate goal into transition targets.

- Drive action by dividing the climate goal into specific transition targets.
- Get access to 79 ready developed targets such as transport modal shift, electrification, behavioural change and other leading indicators for CO2 impact.
- Set these targets jointly and create engagement among all stakeholders, including political support

https://www.climateview.global/

5. Using the science-based targets to involve citizens, build local action groups, communicate impact

You can find specific resources on mobilisation of citizen on Energy Cities website, here is a snapshot of some of the most relevant examples linked to target settings.
A number of good practices exist, the first one being implemented by the Manchester Climate Change Partnership. The Partnership is made up of 60 organisations from across 10 sectors. They have direct responsibility for approximately 20% of Manchester's direct CO_2 emissions and the ability to engage, support and influence some of the remaining 80% through their networks, partnerships, supply chains, and customers. This includes football fans at Manchester City Football Club, theatre and gallery visitors to the city's arts and culture venues, the tenants of the 15 social housing companies in the Manchester Housing Providers Partnership, 75,000 students and 30,000 staff at the two universities and the staff and patients in Manchester's health system.
http://manchesterclimate.com/involved/key-partners

Methods to involve citizens are highly variable. There are some examples when it comes to full energy transition planning, but for the moment it is very rare to find examples linked to a long term Zero Carbon objective. The most comprehensive exercise, in addition to the example of Manchester, is the Leuven2030 partnership.

More examples can be found in Energy Cities' publication (in FR only so far): https://energy-cities.eu/fr/publication/fabrique-de-transition-democratique/

CONCLUSIONS

In order to plan the next decade of local transformation, cities need to know what the correct objectives to be used are. Local leaders are convinced about the long-term objective of climate neutrality. They do however lack tools to ensure that local commitments are in line with the Paris Agreement, that progress can be monitored and that innovative models for local governance and delivery are put in place.

A carbon budget-based approach to setting local targets will typically result in the setting of more ambitious targets than following current EU or national level commitments. For some political leaders this may be daunting. However, this project will ensure that politicians, policy-makers and wider stakeholders are supported to understand the approach, its strength and the challenges. The most compelling argument for adopting this approach is the message from the streets: "listen to the science". A carbon budget-based approach provides an honest and transparent way of responding to this call.

The application of this approach in practice will require sensitivity to the local context and political situation, ensuring that it can gain traction and be positively embraced, rather than seen as the imposition of another major challenge for local government to respond to. The presentation of the wider case for action, focused on the socio-economic benefits of ambitious climate action, will likely be a key ingredient in the decision-making processes in our seven cities and the project's wider networks.

Cities are keen to monitor their impact in order to be ambitious enough, and most importantly to have a real benchmark of their actions and "keep on the right track". In addition, "tracking" tools can provide great support for cities to communicate internally as well as externally with the stakeholders and citizens in order to better explain the opportunities offered by the transition and create vibrant local communities. Any new monitoring system will need to be designed to align with the system in place for reporting to the Covenant of Mayors.

If you want to stay tuned and learn from other cities which have started to implement science based target approaches, contact us ! Till 2022, we will pilot approaches in 7 cities and share our experience !

References

Part of this briefing is based on previous research and publication done at Energy Cities

In particular

Climate-mainstreaming municipal budgets "Taking from fossil fuel economy to reinvest in local sustainable communities"

This guidebook aims to show innovative examples and forerunners in the field of climateproofed local finances to demonstrate what can be done and achieved, it also wishes to show what first steps cities with more limited capacities can take to initiate similar processes even under more restrictive conditions, contributing to capacity building of environmental staff, as well as of the administration as a whole.

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https://energy-cities.eu/publication/climate-mainstreaming-municipal-budgets/

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Energy Cities is a network of 1,000 local governments in 30 countries. We believe that the energy transition is about more than renewable energy or great technologies: It is about a wise use of resources while strengthening local participation and well-being in a democratic Europe. *www.energy-cities.eu*

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