Tt Transition Targets™

Transition Targets

& Mission-Driven Climate Planning

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ClimateView

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Abstract

Climate change is a grand-scale problem that requires a comprehensive, visualized, and shared approach. Our Transition Target model has been constructed to measure the CO_2 abatement effects of a Mission-Oriented Approach: recommended for large-scale challenges and suggested by initiatives such as Horizon Europe 2020 and Viable Cities. The Transition Target model formally defines the transition from the starting state (the high-carbon status quo) to the desired, lower-carbon, state over a defined period (the Mission time frame).

Transition Targets (Tt) will enable cities to make qualified decisions based on leading indicators, which will reveal the effectiveness and velocity of the CO_2 reduction for any suggested target within the Mission time frame. We will also explain how cities can use Transition Targets to accomplish more effective strategic planning, which we call Mission-Driven Planning.

The Transition Targets are presented in a visualized framework, driven by underlying data, which enables both the top-down and bottom-up orientations necessary for city transition planning. This data-driven framework collects and harmonizes open data, and encourages collective learning and best-practice sharing between cities over time.

Contents

About ClimateView

ClimateView's journey started in late 2017 to accelerate the world's transition to carbon neutrality. The team consists of senior experts in governance, climate research, software development, and process methodology.

Although wide-scale transition won't happen overnight, there are three beneficial circumstances that convince us that we can still achieve the UN's CO_2 goals in time:

- a clear, common goal;
- symmetrical challenges and missions across the globe; and
- an increased motivation to succeed.

ClimateView advances these objectives using a unique software tool with an open-data and open-model initiative — creating a common language to share knowledge and best practices globally.

Step I

Accepting the Climate Challenge

1
Background

The importance of the transition to carbon-neutral smart cities

More than half of the world's population now live in urban areas, and this is expected to reach 80% by 2050. Cities and metropolitan areas are the centers of transformation – concentrating power, financial resources, innovation, and new technology.

The Transition Targets (Tt) are created to meet the goals set in international policy frameworks such as the COP21 Paris Agreement, the UN Sustainable Development Goals (especially SDG11), the Urban Agenda for the EU, and the Habitat III New Urban Agenda.

Cities play a key role in all of them. Creating smart and sustainable cities is therefore a priority area - not just throughout the EU, but most of the developed world.

2
Mission-Oriented Approach

Although we have the knowledge, political will, and solutions in front of us, we have not managed to sufficiently accelerate carbon reduction as of today – in part due to a lack of mission-orientation.

Partly inspired by the Apollo Mission to put a man on the moon, a Mission-Oriented Approach [1] has been suggested by the EU commission and Horizon Europe 2020 to prioritize the complex challenge of helping cities reach carbon neutrality.

[1] Mariana Mazzucato. "Mission-Oriented Innovation Policy: Challenges and Opportunities". In: (2017)

A Mission-Oriented Approach tackles this significant challenge with bold and ambitious goals in a top-down fashion. In this way, solutions emerge bottom-up – thus driving cross-sector, cross-disciplinary, and citizen-engaged innovation. A Mission-Oriented Approach sparks creativity by being definitive in the end-goal, and then encouraging the creativity and innovation necessary to determine how best to get there.

City Targets are the key to the Paris Agreement

Applying a Mission-Oriented Approach for cities' climate transitions requires a planning model that breaks down the Paris agreement into an engaging Mission with relevant sub-targets for every city (see figure 2.1.)

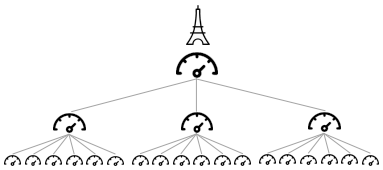


Figure 2.1: The Paris Agreement needs to be broken down into a Mission for every city with actionable sub-targets in every sector, to meet the overall Challenge.

Targets need to be as ambitious as – and have all the qualities of – the Mission, because the cities will be at the heart of the transition. Every target and every city is mission critical: if our cities fail, the world fails.

Targets are keys to missions, but for them to be relevant, they must be tied to the Mission and have the following inherent qualities:

- By definition, be measurable and timed.
- Have a direct impact on the overall Challenge and Mission. In the case of the Paris Agreement, it is to keep us well below a 2 degree global temperature increase over pre-industrial levels.
- Be inspirational to activate and engage all actors, and help us stretch what we think is possible.
- Be clear and easy to communicate so that actors can act independently on them.

The role of data and monitoring when seeking impact

The cities of the world have made one thing clear: they want to see real and effective actions being taken to stem climate change. But how will they know if their actions will have the desired impact? How should they prioritise between investments? Ultimately this boils down to monitoring, measuring and estimating; what and how we choose to measure is critical in decision-making so as to ensure that our investments will have the greatest impact.

Do we need perfect data?

As climate advocates, we sometimes have found ourselves on a fruitless hunt for ever-better data on greenhouse gas emissions. This has not only lead well-intentioned policymakers astray, but it has also created obstacles to innovation and meaningful carbon reduction. Many are still waiting for better data to be able to make informed decisions, struggling for more precise emissions estimates, and searching tirelessly for a better prognosis of future changes in the energy mix.

Instead, we need to determine what data precision is good enough to make informed decisions, while also clearly differentiating between different types of data, and what data has operational value.

The difference between absolute and relative change

In fact, it is entirely possible to achieve emissions impact without any emissions data at all. Consider the following: a person wants to reduce her carbon footprint, so she intends to reduce her commercial air travel by 50 percent. Does she need to know the exact emissions incurred by flying to do this? No – it is sufficient to cut her airline miles traveled by half. If she wants to reach zero emissions from flying, she could simply stop flying, requiring even less data analysis.

The same logic applies to cities using emissions from personal transport as an example, we can either measure the emissions from existing cars, or measure the rate of change by which we replace these cars with more sustainable options. It is easier to count the number of electric vehicles in the city than to measure city-wide emissions from existing fossil-fuelled cars. The growing share of electric cars is a relative change - illustrating that emissions data should not be the primary focus when monitoring the rate of change.

This is not to say that we don't need GHG emissions data at all. In fact, GHG inventories are necessary for knowing where to prioritise our efforts; however, they are not helpful when measuring the rate of change.

Measuring what matters

The quest for better data with trailing indicators – such as emissions – leaves us constantly one step behind because they focus on the near-term problem and not the way forward. To meet the climate change challenge, we need a process that guides where we focus and how we measure the change for which we strive – which will in turn lead to CO_2 abatement. In summary, we need a fundamental change in how we measure and target the transition.

3
A model that measures what matters

Transitioning starts with planning concrete and measurable changes in consumption behaviour and production. Cities wanting to lead the transition need to start focusing less on emissions data and more on the causal sources of the emissions.

By analysing bottom-up from emissions sources, we have derived a standard model for transition: the carbon causal chain (CCC). The CCC consists of four distinct levels of classification: activity, work, resources and emissions, as shown in figure 3.1 below.

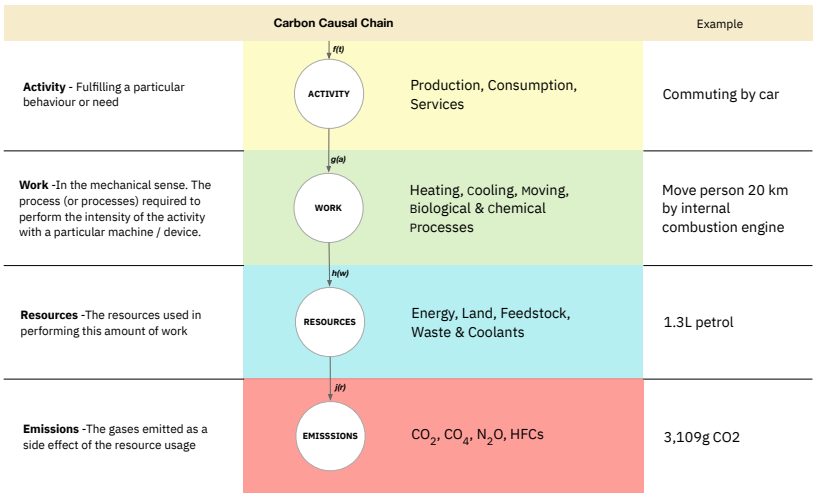


Figure 3.1: The carbon causal chain - a building block for Transition Targets.

The arrows (or edges) in figure 3.1 represent *link functions* that model the causal relationships between the levels - allowing us to effectively compute emissions as a function of activity.

The carbon causal chain describes the causal flow from activities to emissions. Each source of GHG emissions is directly caused by the side-effects of using resources, to perform work, to accomplish a specific activity.

Since anthropogenic GHG emissions for any given activity can be defined in terms of these four levels and their relationships (link functions), this framework serves as a sufficiently well-defined simplification of the real-world - a model that measures what matters, and makes high impact planning possible.

In short, if we want to reduce CO_2, there are only 4 basic levers of change, shown in figure 3.2. CO_2 emissions are just a consequence of what we do, how we do it, and which resources we use.

It is only through concrete changes in behaviours such as;

- changed consumption or usage (e.g. alternative means of transport);
- streamlining of activities (e.g. more energy-efficient housing);
- exchanging resources (e.g. replacing legacy energy sources with renewable fuels); or
- or capturing CO_2 (e.g. with CCS or nature-based solutions);

that we can reduce CO_2.

With the exception of CCS, these measures have an indirect effect on the reduction of CO_2. Meaningful CO_2 reduction is therefore a consequence of taking measures higher up in the CCC.

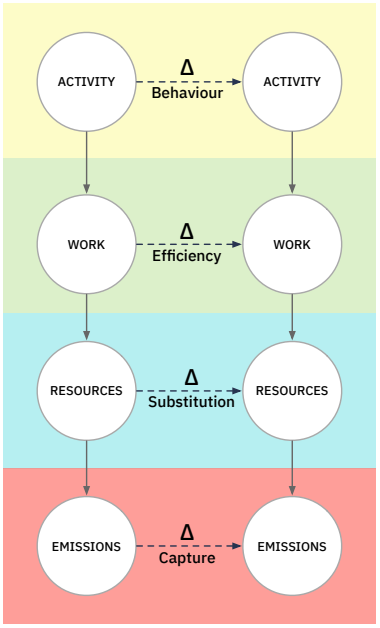


Figure 3.2: Mapping a current CCC on the left to a carbon-neutral alternative CCC on the right. The four levers of change are: behaviour, efficiency, substitution and capture.

4
The Transition model

Targets are measurable goals in the pursuit of which we pull one or more control levers (one at each level) in order to achieve a change in behaviour, or a change in our activities and resource use, that leads to CO_2 abatement.

The Transition Target model encapsulates the planned transition for an activity, i.e. how to move away from the "business as usual", high-carbon emission state towards a low-carbon (or even carbon-neutral) state for a given source of GHG emissions. [1]

The climate challenge can be subdivided into well-defined Transition Targets that span the five generally accepted sectors of emissions: transport, industry, agriculture, energy and "other" (e.g. waste).

Each Transition Target can be modelled in isolation; however, a set of Transition Targets can reveal how CCCs and Transition Targets interrelate.

[1] For mathematical completeness we model a Transition Target with three carbon causal chains. An example of this is shown in figure 4.1. For a more detailed explanation of the model and the three chains, see appendix.

Transition Target sets

The set of Transition Targets does not attempt to be a complete and contiguous coverage of a city's GHG emissions – this would be an impractical goal given the time constraints in achieving carbon neutrality.

The set of Transition Targets is a formalization of a number of best practices for climate transition that can be used in a Mission-Oriented Approach to address the climate challenge. Such an approach gives enough coverage of a region's total emissions so as to be effective in delivering sufficient solutions given the time frame available, without needing to know exact baseline emissions.

By modelling the entire set of Transition Targets using the same building blocks, we can also compute and extrapolate metadata from the set, e.g. we can extract the total bio-fuel or electricity requirements for a city for each year during the transition.

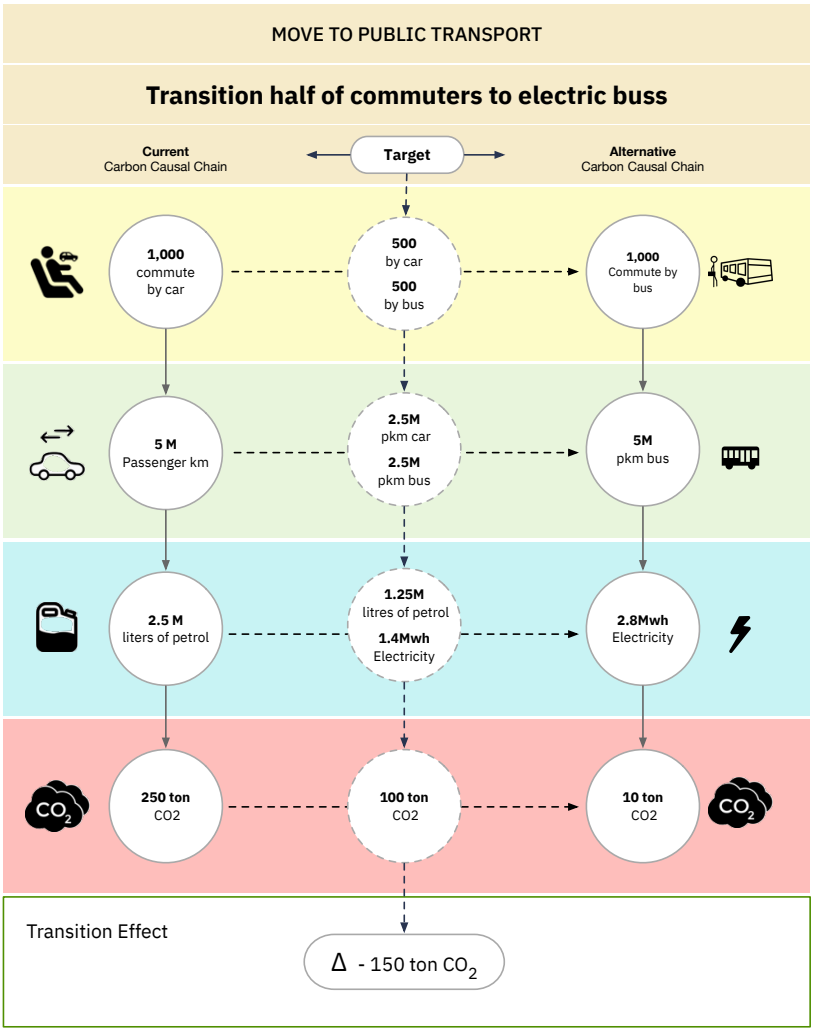


Figure 4.1: Setting a Transition Target is defining a horizontal scale how far we are aiming to transition from current to alternative carbon causal chains.

A Paradigm Shift Occurs

At first, this refocusing away from measurement of baseline emissions and toward relativistic solution previewing may seem subtle however, at its core, it is the *fundamental paradigm shift necessary for Mission-Driven Planning and successful carbon abatement*.

Step II

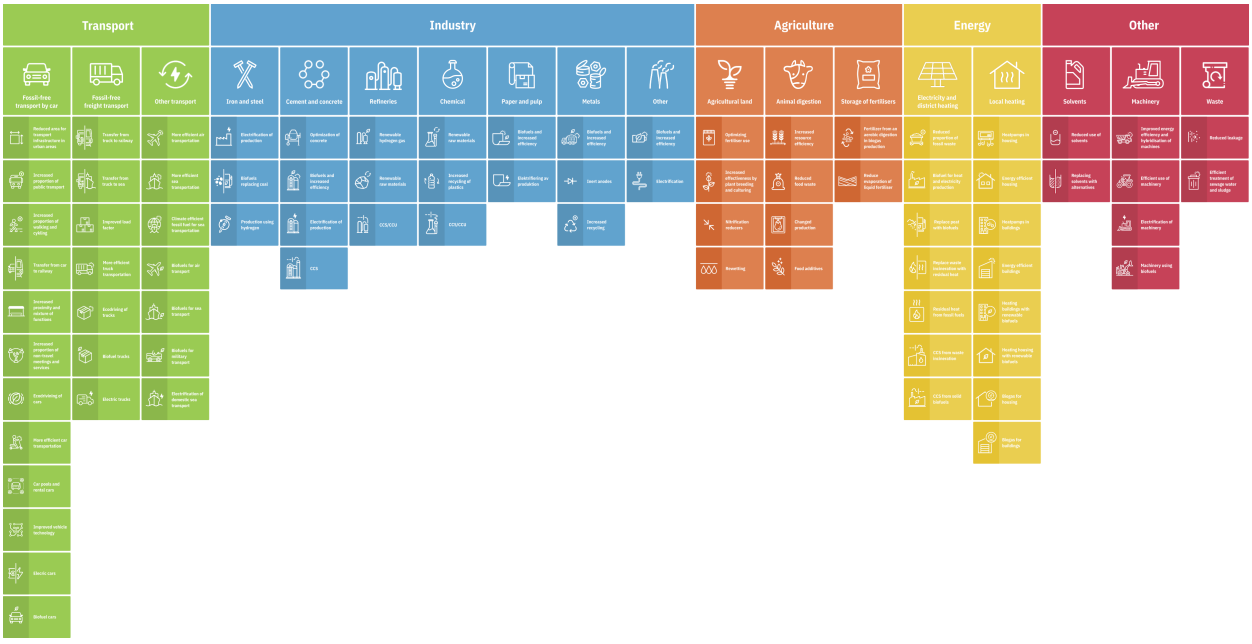
Exploring Targets

5
Turnkeys to City Transition

The world needs to work with mission-critical targets in a new way, and cities are in an optimal position to take the lead. Since cities are similar in their structure, they also share many of the same challenges. Transition Targets (Tt) have been designed so that they can be applied to any city, regardless of size or geography. The Transition Targets are built on open data, and their open structure makes it possible to share and improve targets, best practices, and solutions - globally, continuously, and with a common framework.

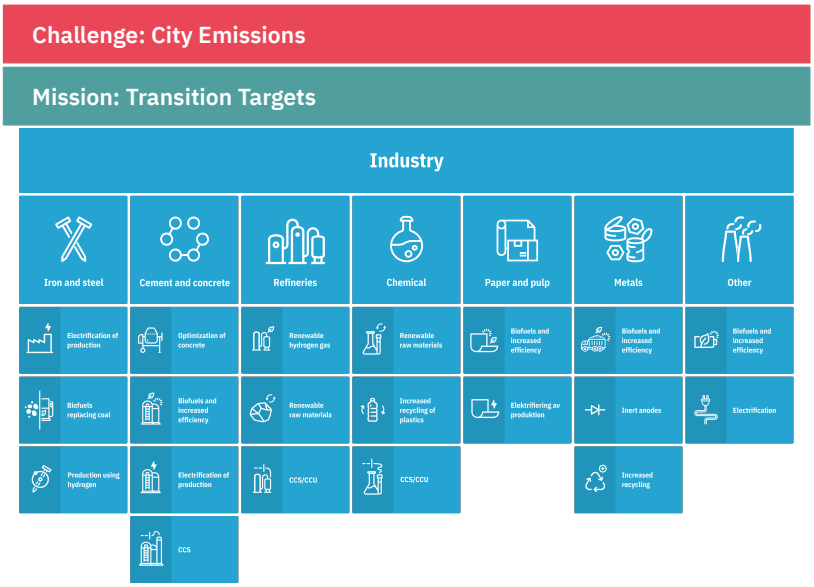
Transition Targets provide a framework with 79 turnkey transitions[1] to meet the comprehensive local climate challenge of a city — sector by sector. The transitions are defined so that they focus on what drives change in behavior, streamlines activities, and re-evaluates resource use. Transition Targets have the potential to involve and unite all stakeholders in a community as the Targets are constantly adapted, locally focused, and linked to various solutions from the bottom-up.

[1] Initially 79 transitions at the time of writing, this will grow over time as part of the open data initiative.



6
The Transition Target (Tt) system

You can compare each Transition Target (Tt) with an element in the standard periodic table. Here, the CO_2 equivalent (CO_2-eq) is the unifier binding the elements together. The total set of targets add up to address the entire climate challenge across all of the different sectors of a city.



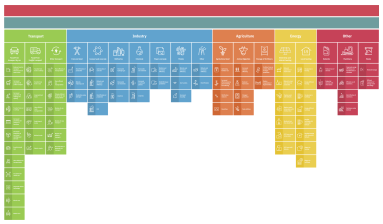


Figure 6.1: The total sum of all the targets' effects is the total sum of the Challenge, sector by sector.

7
Transition Targets: The elements of change planning

Recalling that the Transition Target is a self-contained model encapsulating the planned transition for one area of the climate challenge Mission, each individual target addresses a proportion of the city's total carbon reduction. They can therefore be compared based on carbon abatement impacts, and since all targets are translated in terms of their effect on CO_2 mitigation, targets in completely different sectors become comparable based on their impact.

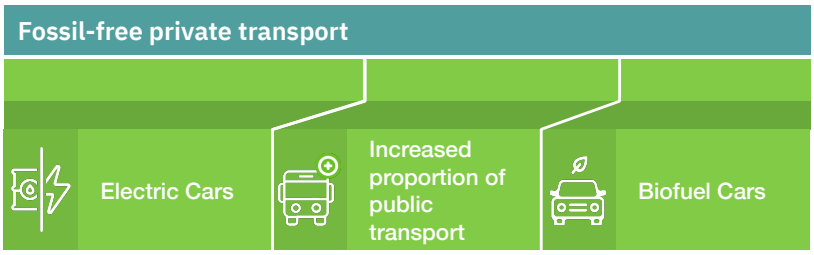


Figure 7.1: The widths of the targets show their climate effect in CO_2-eq and thereby provide an intuitive understanding of their magnitude

A target is a question

A target is clearly separated from its necessary actions and policies. Targets answer the question of what a city has decided to achieve. Actions and policies answer the questions about how the targets are achieved.

By constructing each target in this bottom-up manner, we create momentum in which various stakeholders can contribute regarding how to reach the selected (top-down) city targets. The targets are set so as to involve all stakeholders, and they can be propelled by citizens at every level.

Transition Targets and their timelines

Using a Transition Target, cities can calculate an estimated carbon abatement curve without the need to know exact baseline emissions. Transition Targets are a function over time, showing the change of the Activity, the Work, the Resources, and the change in Emissions. The Transition can be linear, or it can follow any curve.

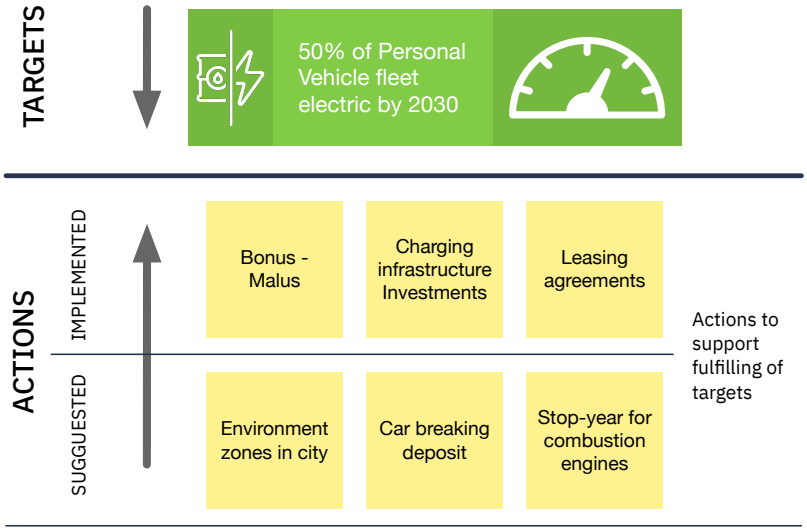


Figure 7.2: **What** do we want to achieve (targets)? **How** do we do it (actions)?

The summary of the Transition can be shown in a Transition Carbon Abatement Diagram (figure 7.3), with the Transition Target (X-axis 1) shown against carbon abatement (X-axis 2). Thus, it directly shows how the transition to carbon abatement is portrayed over the projected Mission time-frame (Y-axis).

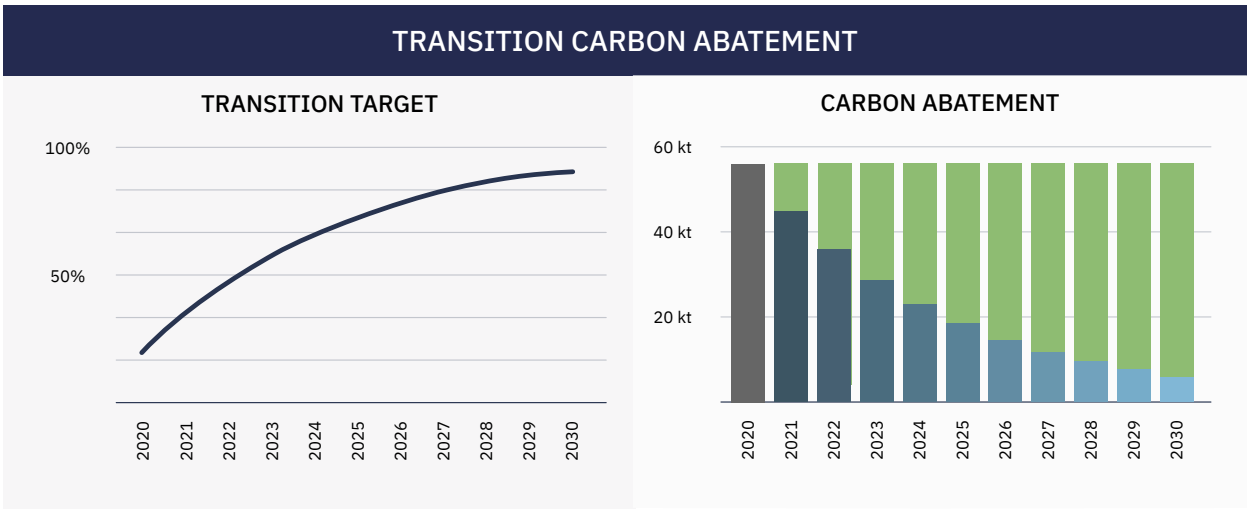


Figure 7.3: Transition Carbon Abatement Diagram showing the effect of a Transition Target on carbon abatement, over time.

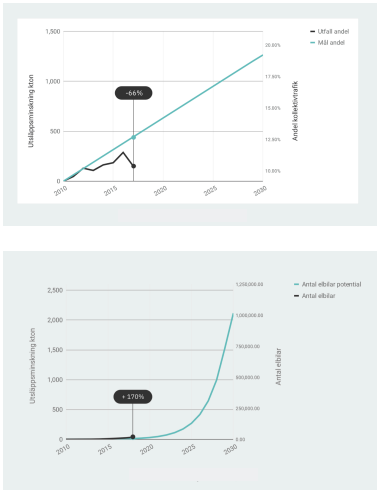


Figure 7.4: Keeping track of cumulative effects.

A target can be measured and viewed on a timeline, showing CO_2-eq as a cumulative effect. The faster the implementation of the action, the greater the cumulative effects will be (figure 7.5). It is therefore important to keep track of the total reduction over time. This is particularly useful when comparing two Transition Targets, as one may reveal a quick but less significant cumulative effect, while another yields a greater cumulative impact over time.

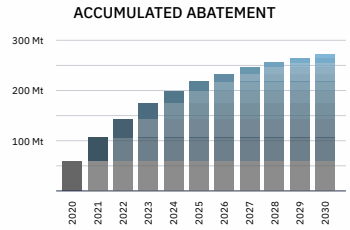


Figure 7.5: The accumulated abatement graph showing total emissions over time.

Transition Targets and CO_2 allocations

The carbon reduction provided by a Transition Target will often point to a specific field in the CO_2 plan allotments. For example, the Target of Electric Vehicles and its CO_2 abatement will in most circumstances correlate strongly to the number and operation of Personal Vehicles. However, there are other targets, such as Plant-Based Diet implementation, that are less tightly correlated. The CO_2 abatement of that specific effect chain might be easily assessed on a global level, but a city could find it difficult to account for this GHG abatement in the proper allocation bucket — e.g., is the meat produced locally or imported using fossil fuels? Fortunately, Transition Targets follow the principle of CO_2 abatement first, carbon accounting second. As a result, Transition Targets are first defined from a global perspective on CO_2 abatement, followed by a secondary perspective which is mapped to the local city's GHG allocations.

8
The Transition City – Your initial strategic plan

Since cities share the same basic Challenge, we don't need to start from scratch. By giving cities a blueprint from a standard city Mission plan, we can jump-start the Mission-Driven Planning without getting mired in models, definitions, and the hunt for perfect data.

The Transition City is the first comprehensive picture of the Mission. Here, city officials receive a basic emission Challenge for their city, including a set of Targets that add up to the total Mission.

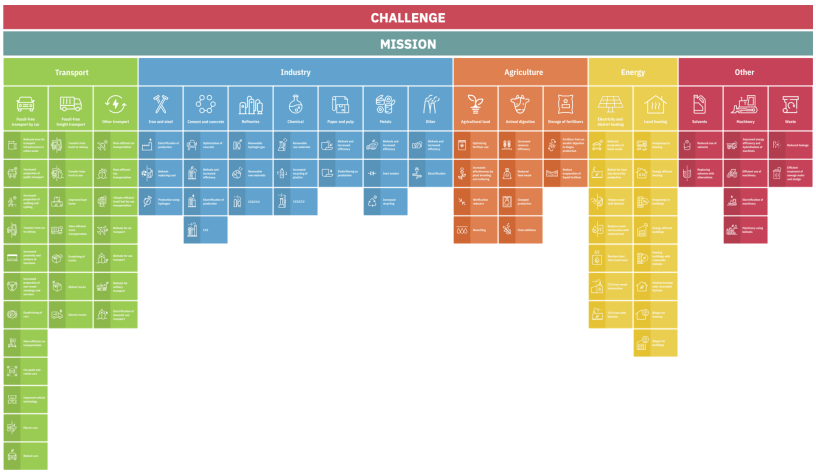


Figure 8.1: 79 Transition Targets define the Mission.

Identifying and adapting the Challenge

The preset city Challenge is an approximation of a city's current emissions (including future emissions according to a projected BAU scenario). This can be extrapolated either from national statistics or from bottom-up calculations. Depending on local political decisions, the city can define the Challenge as its own territory, as a portion of the nation's emissions, or as a part of the global CO_2 budget (see figure 8.2). If the city already has extensive GHG reporting, this can be used to define the Mission. Every city sets its pace and adapts and sets the *Mission* and *Targets* as it creates a local city plan.

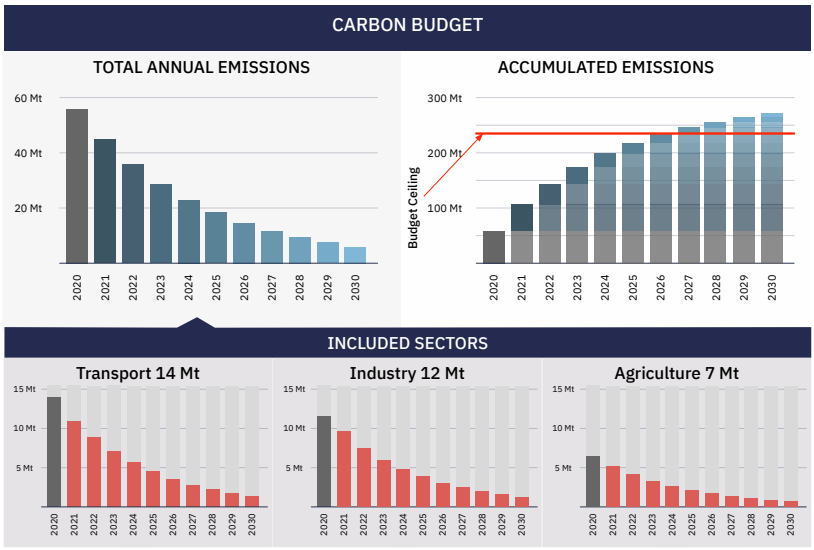


Figure 8.2: Calculating CO_2 budget from Transition Targets and the Mission.

Creating the first pathway

Based on the city's Mission and Transition Targets, a standard pathway is generated from the model city. Each target in this model city has preset widths. The widths are based on input from other cites and open data. This is not intended to be a perfect pathway for every city, but it provides a reasonable starting point based on data from similar cities. When cities receive this initial model, they can focus on adapting it by setting local sub-targets built on a coherent data structure that enables full comparability between various cities.

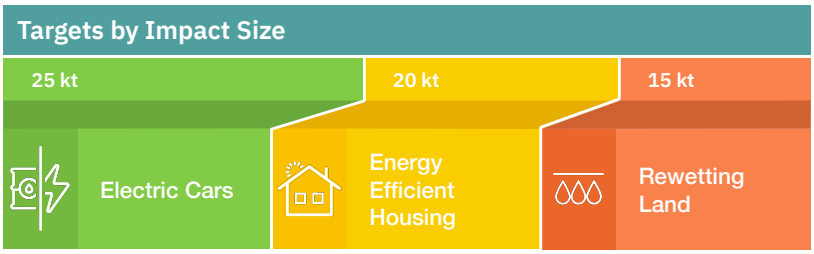


Figure 8.3: Comparing Transition Targets by size of carbon abatement impact.

Step III

Refining Targets

9
Mission-Driven Planning

Even when the Mission is clear, the path can be difficult to find, as various unknowns such as future technological innovation, new business models, and societal shifts can alter even the best-laid plans. The emerging pathway towards the Mission is going to be dependent upon on various actors, innovations, and cross-disciplinary solutions.

Mission-Driven Planning is used for keeping pace and focusing on the Mission, while constantly adapting the plan, as necessary. To initiate and maintain this momentum, the city needs to unleash the local power of innovation by engaging all sectors — cross-disciplinary and cross-sector - which is accomplished by processing the Transition Targets (Tt) locally into sub-targets, local actions, and policies.

Mission-Driven Planning is built upon three pillars:

- Setting strong local targets
- Separating targets from actions
- Engaging stakeholders to drive innovation

10
Setting strong local targets

Mission-Driven Planning for cities' climate transitions requires a planning model that breaks down the Paris Agreement into relevant and engaging targets for every city. These targets need to be as ambitious as (and have all the qualities of) the Mission. Every city and every target is mission-critical. Targets are the keys to the Mission and, for them to be relevant, all Targets must be tied to the Mission and share the following inherent qualities:

- be measurable and timed;
- be inspirational so as to activate and engage all actors, to stretch what seems possible; and
- be clear and easy to communicate, so that actors can act independently on them.

Local targets are measurable and timed

Every Transition Target (Tt) describes a *CO2 abatement* - between the "current state" and the "target state" at any given time – that we call the "Transition Effect."

Example: in the Transition "Increase proportion of public transport" a region may set a Transition Target (Tt) of: *car journeys replaced by bus*. This has the calculated Transition Effect (Te) of e.g. 40,000 kt CO_2-eq in abatement. (For how to calculate Transition Effect from Transition Target, see "Transition Targets – A computational framework for climate transition".)

The Transition Targets (Tt) and their local sub-targets allow us to prototype local actions and solutions, and estimate their carbon abatement effect over time.

The art of setting good targets

The local targets must be clear and easy to communicate so that society can understand, be inspired by, and act independently towards achieving them. When setting targets related to behavioral change, it is important to provide meaningful descriptions of the targets so

that they are easy to understand and communicate. For example a Target describing a relative change, such as halving or doubling, is easier to relate to than a percentage.

Relative, measurable, local effects allow compelling stories to be easily created, shared and embraced. A good target includes a "current state" to the "target state" journey. There is an inherent power in a *halving* Mission that is inspiring. Shooting for a 100% change in a single step is generally perceived as unrealistic and demotivating. But a completed half-marathon will provide inspiration for a longer race.

Setting good targets takes time, but well-formulated targets are the key to unlocking behavioral change. In our Open Data Initiative, we invite all cities to share their targets and their solutions.

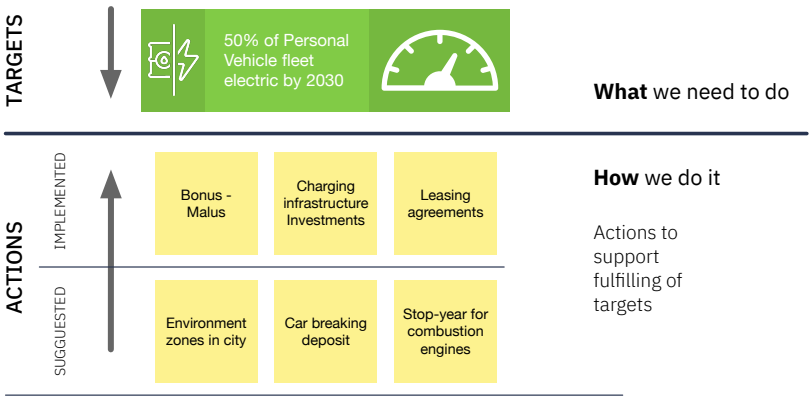
This document does not detail the psychology of target setting; instead, it emphasizes the power of Transition Targets for connecting a pedagogical or inspiring target to its actual climate impact.

TRANSITION TARGETS (TT) are set such that methods for reaching them aren't initially contemplated. We know that incremental solutions and business-as-usual solutions are insufficient. Meaningful abatement requires flexibility and creativity at the local level, where we must support innovation while setting our sub-targets and planning their related actions and policies.

11
Separating targets from actions

Mission-Driven Planning requires clear separation between the mission, targets, and actions. This trifurcation is a pre-requisite for bottom-up implementation so that a multitude of actors—from all sectors and disciplines—can contribute on all three levels after the mission has been set top-down.

Another reason to keep them separate is clear; targets and actions / policies answer different questions, despite their interrelation.



In discussions about Challenge, Mission and targets, it is very common to stray off course as inter-dependencies and overall complexities make discussions difficult. Therefore, when setting a strategic plan, it's essential to separate – yet, at the same time, recall connections to – these discussions of different parts of the plan in order to be able to see both the inter-dependencies and the bigger picture.

Only a visualised plan allows users to zoom in and out, shift between details and overview, and work both within silos and across sectors to identify inter-dependencies. Additionally, a structured visualization makes it possible to relate targets to the Challenge and the Mission without confusing them, which is necessary to enable discussions without getting lost in complexities.

Figure 11.1:
Bottom-up, Top-down

Figure 11.2:
Across Sectors & Silos

Figure 11.3:
Zoom out & Zoom in

12
Engaging stakeholders to drive innovation

Targets spark innovation not only by being definitive about where they want to go (the Mission and Targets), but also by being open about the best way to get there (actions and policies). The Transition Target framework encourages stakeholders to work beyond our silos and across sectors (where dependencies arise), and also in cross-disciplinary teams to solve complex problems together.

Viewing solutions and policies within the same model, language and networking enables accelerated cross-learning. It is increasingly necessary to engage stakeholders from civil society, academia, and business, since some hold onto knowledge while others have the power to release them via actions and policies.

Clear targets enable focus on calculations and effective discussions around CO_2 abatement.

- Quantifying Transition Targets permits carbon abatement estimates for strategic city policies and projects. Decision makers will therefore more fully understand the full impacts of their decisions, and may tweak the projects and policies to better contribute to the city's overall climate goals.
- New policies and actions can be prototyped and multiple scenarios can be compared.
- Jointly solving the climate challenge is rewarding and harnesses cross-sector synergies, in turn mitigating trade-offs between contradicting policies. The various stakeholders can also support the climate strategy/strategists with necessary feedback loops.

The targets connect to actions and policies and provide a comprehensive overview of the overall climate Mission of a city. The Transition model can be integrated into all decisions that have a climate effect, creating an effective emission analysis just about everywhere. Most policies that have an impact on GHG emissions are developed and decided upon in other city departments (e.g. city development, building standards, utilities, road construction, transport, etc.).

13
Developing your strategic plan in practice

A detailed description of Mission-Driven Planning using ClimateView is provided in our "Handbook for the Climate Strategist." The following is a brief overview of the support our digital tool can provide when planning, finding gaps in, and stretching targets.

When working with strategic targets within the Mission, gaps will arise in relation to the Challenge. Where the targets don't measure up to their proportion of the Challenge, the visualization provides a clear overview of the city's gaps.

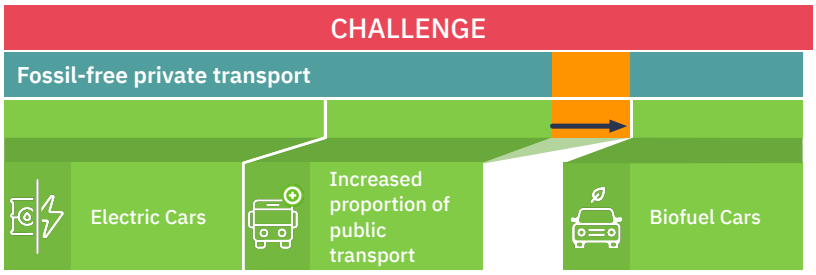
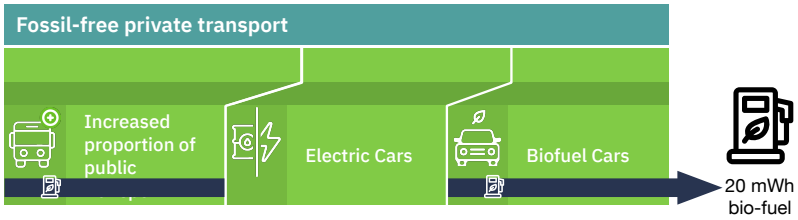


Figure 13.1: Gaps between the Mission targets and the Challenge.

When such gaps arise, it may become necessary to "stretch" a Target, find more potential within targets, or find new actions or innovations. As a last resort, the total Mission can be adjusted below the Challenge.

Target dependencies

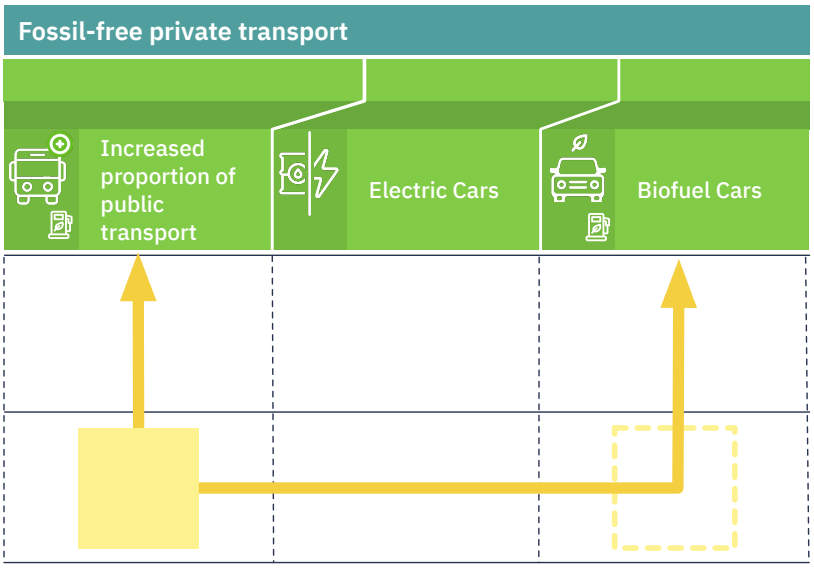
The *overview* allows us to see dependencies between targets, actions, and policies.



Example: Targets can share the need for bio-fuel with many other sectors and Targets. Here, all the estimated bio-fuel needs across all city Targets are tracked. If the need exceeds the estimated supply of resources, it could be worthwhile to rethink solutions or how to meet the demand.

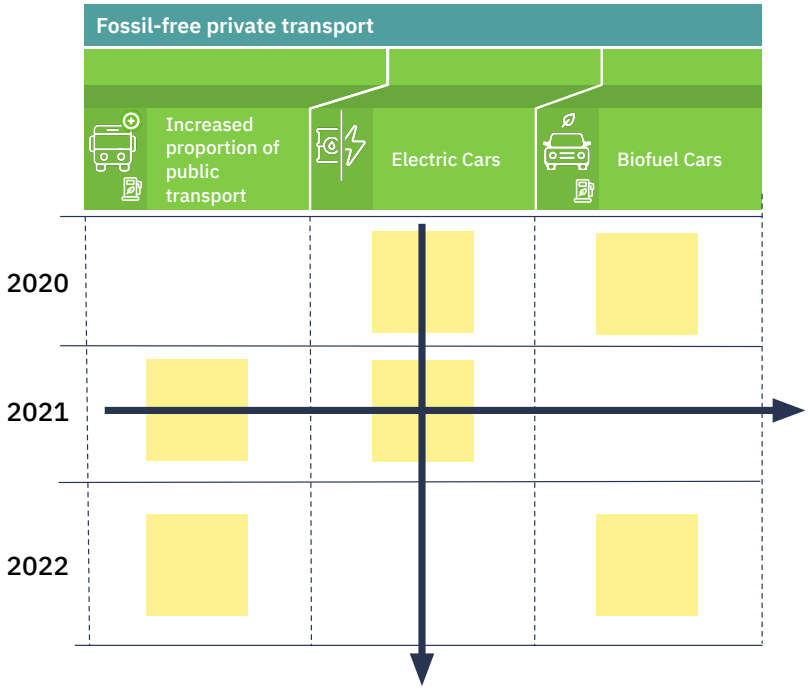
Connecting actions to targets

Sorting and linking actions to the Mission is critical in strategic planning. Sorting is necessary to discern where in the plan a measure delivers the quickest impact. The same action can be connected to many targets. Actions can have both negative and positive effects on a target's prospect of fulfilment.



Connecting actions to a timeline

The action view allows us to see timelines and a plan for long and short-term goal realization. It also shows us where we have dependencies across the timeline.



Step IV

Collaborating with Targets

14
The Transition Target initiative

Open Data and Open Model

ClimateView was created to accelerate the world's carbon abatement transition. We are convinced that there are three crucial elements to meeting the Paris Agreement objectives:

1. A focus on Cities
2. Adoption of a Mission-Oriented Approach
3. Community sharing of best practices

We are equally convinced that the only viable way to meet these objectives is through the combination of open data and open models – by utilizing the full potential of society in order to solve this universal problem. The Transition Target (Tt) Project strives to be the definitive hub for this crucial community-sharing.

The goal of the project is to study GHG emissions methodically in order to identify a comprehensive set (figure 14.1) of carbon causal chains for the activities that are commonly accepted as the mosts significant contributors to global warming.

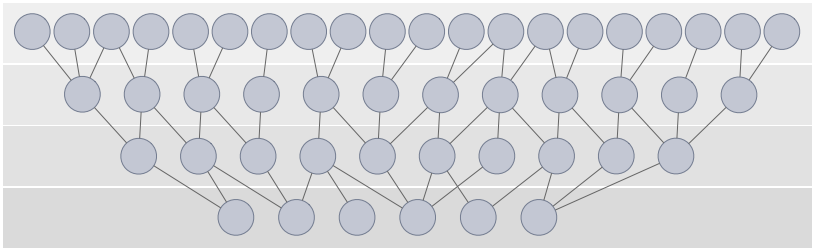


Figure 14.1: Comprehensive and interconnected model of the world's GHG emissions as carbon causality chains.

By collaboratively publishing Transition models for every Carbon Causal Chain (exemplified in figure 14.2), we will identify, describe, and model the "best-practices" *alternative* Carbon Causal Chain. This pair of CCCs are complemented with constants, variables and parameters as well as link functions forming a computational model that can then be used for setting Transition Targets. An example of how such a complete model can be communicated is shown in figure 14.3.

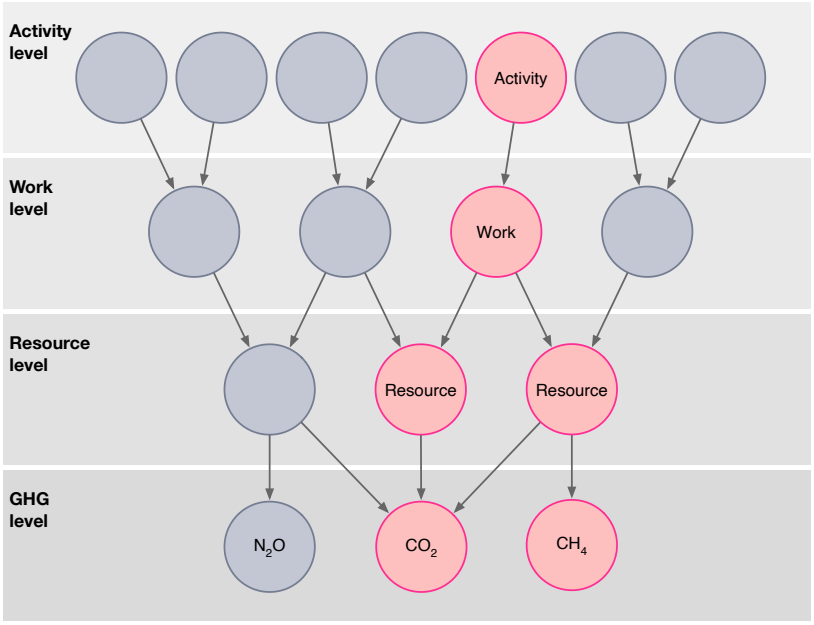


Figure 14.2: Identifying and formally describing individual carbon causal chains by following activities; an example of an activity causing CO_2 and CH_4 emissions is highlighted red.

The set of 79 Transition Targets

Our initial framework consists of a set of 79 Transition Targets that have been identified and developed as part of the Panorama project[1] in collaboration with the Swedish Climate Policy Council, Environmental Protection Agency and Energy Agency.

We are working actively to iterate and expand this set of Transition Targets by publishing each Transition as it is formalized, together with examples and real-world data from our collaborating cities. Publishing will occur on a wiki-style platform so as to encourage scientific discussion and collaboration around each model. In this way, each Transition Target in the project will both describe the model and parameters, and act as a platform for sharing real-world information.

[1] Environmental Protection Agency Swedish Climate Policy Council and Energy Agency. *Panorama Sweden*. `www.klimatpolitiskaradet.se/en`

This open data initiative will be published at **`www.transitiontargets.org`**. We anticipate this will form the starting point for collaboration within and across corporate, scientific, and political communities, with an eye toward establishing a growing collection of generally-accepted best climate practices for cities through well-defined Transition Targets.

With the public release of Transition Targets, we hope to present the foundation for more effective climate planning. But our work won't stop there. Transition Targets will operate as an ongoing platform that will evolve over time as new data, insights, and best practices emerge from the collective efforts of dedicated people and organizations from around the world.

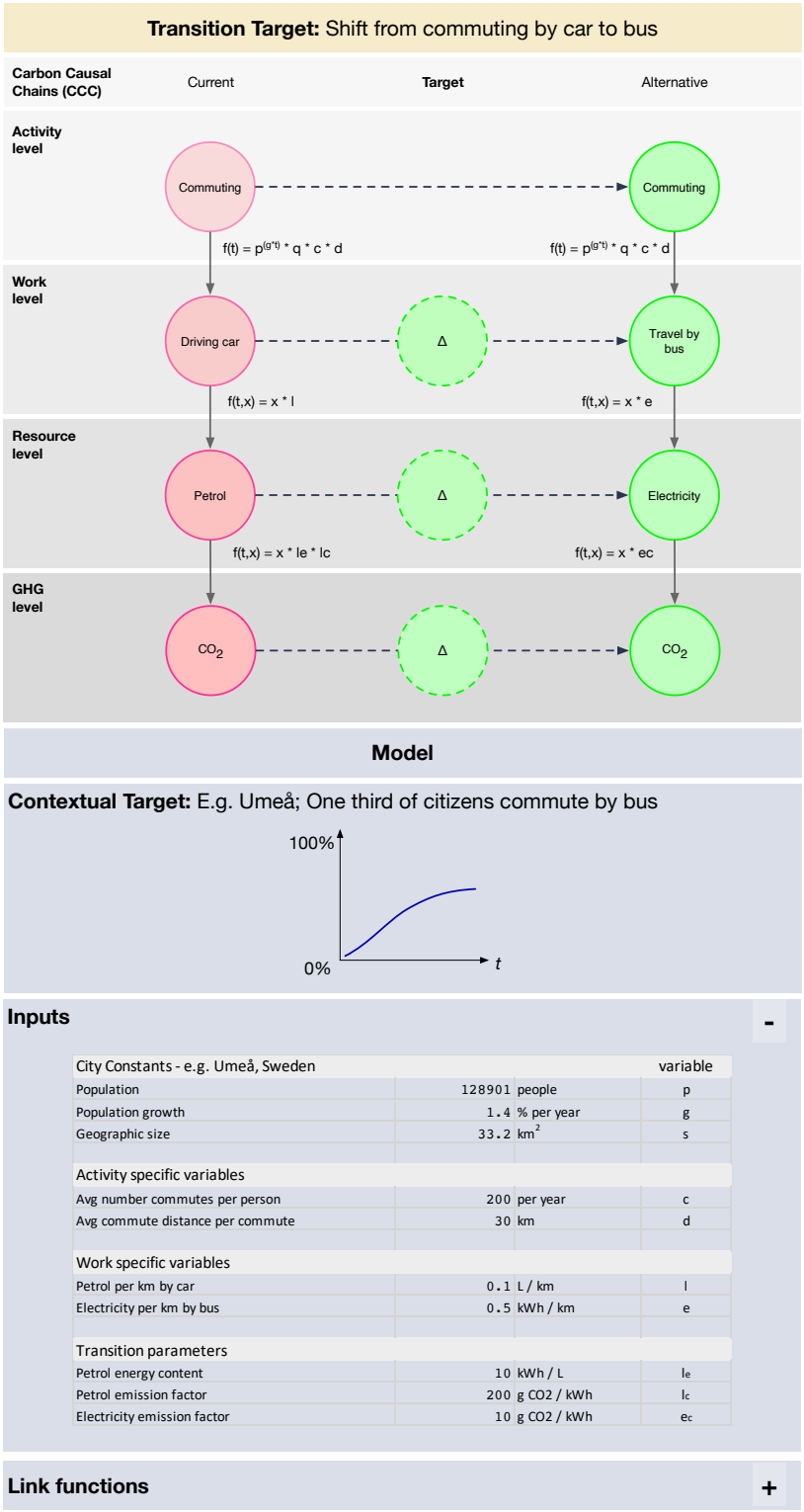


Figure 14.3: A simple example of a complete definition of a Transition Target. Many Targets will be more complex but still follow the same structure.

In this example there is no targeted change to the size of the activity (people still commute) but the work changes (from car to bus) and thus the resource and emission links have different equations.

Step V

Achieving Targets

15
Call to city action

ClimateView isn't just a framework for carbon reduction planning – it is also a window into where success is being achieved. Tracking progress against the target is critical to determining whether progress is on track, and sharing the success stories builds momentum among stakeholders who can literally see the reductions taking place.

Invitation to The Transition Target project

ClimateView will make global carbon abatement not just possible, but also forecastable and shareable in your city. Beginning with our launch in May 2020, we are welcoming partners from academia, NGOs, corporations, and governments to review and contribute to specific Transition Target models. Cities are also invited to join as pilot users. If you represent any of these entities and would like to be a part of this solution, please contact us at:

ttreview@climateview.global

Appendices

The model

For mathematical completeness we model a Transition Target with three carbon causal chains (also shown in figure 1):

`Current CCC` - models how the activity is performed today.

`Alternative CCC` - models a (theoretical) best possible scenario (e.g. how would a near-zero emission carbon causal chain would look according to best practices).

`Target CCC` - a point midway between the current and alternative chains (how far to the left or right identifies target ambitiousness).

The Target CCC is never explicitly defined in the model; in practice, a target is a weighting between the current and alternative models (e.g. transition from 90% commuting by car and 10% by bus today, to 40% by car and 60% by bus by 2030). As a result the target chain exists only implicitly, as an interpolation between current and alternative chains.

In this way, Transition Target-setting is not only practical and efficient, but it also helps decision makers understand how aggressively to pursue a particular target within a given time-frame.

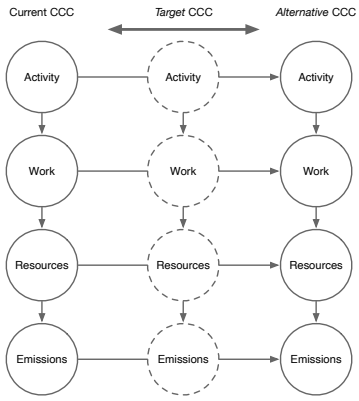


Figure 1: Setting a Transition Target is defining where on the horizontal axis how far we are aiming to transition in a direction towards the alternative carbon causal chain.

About link functions

Edges in the model, called link functions, define the causal relationship mathematically. This can be described more concretely as a set of functions where the result of each function is the input to the next function in the chain.

$$j(t, h(t, g(t, f(t))))$$

or:

$$j \circ h \circ g \circ f(t)$$

Where the link functions map over time to activity (f), from activity to work (g), from work to resources (h), and finally from resources to emissions (j). Transition Targets with more complex Carbon Causal Chains have a naturally more complicated function - a complexity handled by always working with individual link functions in the chain and not the chain as a whole.

About constants, parameters and variables

The link functions in each carbon causal chain are mathematical functions that rely on a set of inputs, some of which are global for a particular chain - while others are specific to a particular region or country. These inputs are either variables, parameters, or constants.

A variable is a changeable. A constant is a value that once set, should rarely change during modelling of a particular Transition for a city. Parameters are variables that should be considered fixed during the study of a particular problem and, for our purposes, rarely change.

There are four types of inputs used in the model:

`City` **`constants`** - unique for each city, such as population, population growth rate, geographical size, etc.

`Activity-specific` **`variables`** - describe the amount of a particular activity in a city and these are typically measured per-capita or as an absolute value (e.g. how many commutes per person per year, how many paper mills in the city, etc.)

`Work-specific` **`variables`** - map activity to work (e.g. average distance driven per commute, average production per paper mill, etc.).

`Chain` **`parameters`** - map work to resources or resource to emissions (e.g. how much CO_2 is emitted from the combustion of a litre of a petroleum product.)

Complete model description

Our second paper[1], discusses the mathematical and computational logic at a deeper level than this paper.

[1] Mark Dixon and Tomer Shalit. *Transition Targets - A computational framework for climate transition*. 2020