NET ZERO CITIES
SGA2-NZC

Interim report specifying recommendations for tailor-made investment plans

Deliverable D2.3

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Abbreviations and acronyms

Abbreviation / Acronym	Description
CAP or AP	Climate Action Plan
Capital Hub	Climate City Capital Hub
CFF	City Finance Framework
CFS	City Finance Specialist
CIP or IP	Climate Investment Plan
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
EPC	Energy Performance Contracting
ESCO	Energy Service Company
IRR	Internal Rate of Return
KDO	Kozani Development Organization
Mission	EU's '100 Climate-Neutral and Smart Cities by 2030' Mission
NPV	Net Present Value
NZC	NetZeroCities
PPA	Power Purchase Agreement
PV	Solar Photovoltaic
SPV	Special-Purpose Vehicle

Summary

In 2024 and early 2025, the NetZeroCities Finance Team provided tailored financial support to the cities of Valencia (Spain), Kozani (Greece), Lappeenranta (Finland), and other Finnish cities with the goal of making recommendations that would support implementation of their Climate Investment Plans and the various projects detailed under these plans.

To initiate the engagement, the team developed a "Best Practice Climate Investment Plan" (Appendix 1) based on real but anonymised data from leading cities. This plan served as a reference to help cities structure their investment thinking, refine cost estimates, and identify potential funding pathways.

A new chapter on Investment Planning Guidance has been included to reflect the early evaluation of CCCs and City Investment Plans. This guidance, based on a checklist-driven review, provided a structured foundation before the tailored city support began. While most of this task was delivered under SGA1 Task 1.3.2, it plays an essential contextual role.

In Valencia, support focused on a rooftop solar photovoltaic investment case. In Kozani, the Finance Team worked on district heating and building retrofits. In Lappeenranta, the engagement centred on scaling municipal energy retrofits via energy performance contracting

(EPC). In each case, the support advanced investment readiness and strengthened the financing logic of the city's climate strategy.

Across all cities, the work significantly deepened strategic and financial preparedness, making Climate Investment Plans more implementable, concrete, and fundable.

1. Introduction

In 2024, the NetZeroCities (NZC) Finance Team (for the purpose of the engagements detailed in this report, this generally means Bankers without Boundaries (BwB), South Pole, and Universidad Politécnica de Madrid consortium members) undertook focused engagements with cities under the EU's '100 Climate-Neutral and Smart Cities by 2030' Mission (Mission) to turn their high-level climate plans into actionable investment strategies. As a first step, the team developed a 'Best Practice Climate Investment Plan' – a model blueprint based on validated city plans – to anchor the process (see Appendix 1). This model plan (based on the fictional city 'Terra') illustrates how a municipality can map the costs, benefits, and capital requirements across its entire net-zero transition to complement and support its Climate Action Plan (CAP). It outlines sections on baseline climate spending, future investment needs under various scenarios, and enabling conditions such as policy reforms and stakeholder engagement. This anchored approach gave each city a clear framework to refine their own Climate Investment Plans (CIP).

Building on this foundation, the Finance Team provided each city with **concrete, tailored recommendations** to strengthen their previously submitted CIP. This support focused on digging into detailed cost assumptions, developing project-specific financial models, exploring financing structures, and assessing project feasibility. This report provides a city-by-city account (**Valencia**, **Kozani,** and **Lappeenranta**) of the work conducted in 2024 and early 2025. Each section details the timeline of meetings and workshops, the participants by institution, the deliverables produced, and the depth of support provided. This document also highlights how the Finance Team's expert advice was customised to each city's specific context, and how key challenges such as data gaps and capacity constraints were addressed.

2. Investment Planning Guidance

In parallel to the support activities detailed in this report, the NetZeroCities (NZC) Finance Team provided **investment planning guidance** to all participating cities, structured around the Climate City Contracts (CCC) and City Investment Plans (CIPs). Although most of this support was undertaken under SGA1 Task 1.3.2 and is therefore not accounted under the scope of this deliverable, its inclusion here is important to provide context to the tailored investment support described in subsequent sections.

Following the CCC submissions, the Finance Team undertook a systematic evaluation of each city's CIP and provided structured, written feedback using a checklist. These checklists assessed the completeness, coherence, and financial credibility of the CIPs and offered specific guidance on how to strengthen each section. Cities received one-on-one feedback sessions to clarify the recommendations, helping them refine their investment logic and financing strategy. This initial engagement laid a strong foundation for the deeper, hands-on support described in this report, ensuring that all cities entered the tailored support phase with a shared understanding of investment planning principles and expectations.

Furthermore, cities were introduced to a "Best Practice Investment Plan" as part of their onboarding. This model, based on a fictional city ("Terra"), is presented in Appendix 1 of this report and served as a reference framework to support cities in developing robust and bankable investment plans. The best practice plan outlines a full lifecycle approach to climate investment planning, from establishing a baseline and forecasting capital needs to identifying funding gaps, assessing financial indicators, and ensuring robust stakeholder engagement.

2.1 Best Practice Climate Investment Plan

The **Best Practice Climate Investment Plan** for the fictional city of **Terra** is a fully worked template that any Mission City can adapt to turn a high-level net-zero pledge into a detailed, finance-ready programme. It begins by establishing a firm baseline: since 1990 Terra has cut emissions from 3.1 million to 1.4 million t CO_2-e, mainly through early investments in district-heating renewables, stringent building standards, waste-management reform and a shift to electric mobility. Crucially, those reductions coincided with steady population growth, demonstrating that **well-directed climate spending can decouple prosperity from emissions**. A **transparent governance model** links political orientation goals—such as **"a green and fossil-fuel-free city"**—to departmental missions, annual budgets and key performance indicators, keeping climate action aligned with the wider municipal strategy. Roughly one-fifth of Terra's entire budget is now climate-related, split about 30 percent to municipal committees and 70 percent to city-owned companies.

The plan next explores Terra's **revenue and finance landscape**. The €8.27 billion 2023 budget is funded primarily by local taxes and service income, while large capital projects already tap development-bank loans and EU grants, such as a €242 million European Investment Bank facility for rooftop solar and a €13 million grant for municipal building retrofits. At the same time, the plan is clear about **structural hurdles**: national law prohibits operating deficits, restricts public–private partnerships and limits local-tax autonomy. Identifying these constraints up front allows Terra to craft realistic mitigation strategies and to show potential investors that risks have been acknowledged and managed.

Against that backdrop the plan quantifies what reaching net-zero really costs. Between now and 2030 Terra must invest about €3.6 billion in capital expenditure. Only €219 million falls directly on the municipal administration; €1.255 billion will be spent by the utility TerraSpark, €459 million by the transit operator TerraBus and roughly €1 billion by private property owners. **Four flagship projects anchor the pipeline**. First is TerraTram, a €422 million tramway projected to serve 55 percent of residents; its financing mix blends a national grant, a concessional green loan and a private-equity slice tied to rolling-stock provision. Second is ProjectGreen, an €823 million programme to retrofit public buildings, social housing and private homes, supported by the forthcoming **Municipal Green Bond** and a new **Commercial Energy Efficiency Framework** that sets binding performance standards for private landlords. Third comes a €910 million overhaul of the district-heating system, where Terra is exploring a blended-finance structure combining development-bank lending with private-sector

participation in renewable-heat facilities. Finally, Terra Windfarm envisages €625 million for 500 wind turbines expected to generate 2.5 TWh a year; procurement is under tender, but the project already sits inside the investment roadmap so that funding and permitting can move in parallel.

To fund its own share of expenditure Terra will issue a €250 million, seven-year Green Municipal Bond with an indicative coupon of five to seven percent. Proceeds cover the administration's €197 million capex requirement and create a €50 million reserve for emerging projects and local initiatives. Utility-scale schemes will rely on a blend of EIB or EBRD loans, commercial green lending and potential public-private partnerships, while citizens and SMEs are mobilised through **discounted retrofit loans**, **energy-service-company contracts** for condominiums and prospective **electric-vehicle incentives**.

The plan does more than list projects and funding sources; it embeds a discipline of **measurement, learning and risk control**. Two bespoke metrics track performance: the **Forecast Yield on Climate Capital (FYCC)**, a forward-looking internal-rate-of-return measure now projected at roughly seven percent for bond-financed projects, and the **Emissions Return on Invested Capital (eROIC)**, expected to fall from €0.7 million to €0.55 million per kilotonne of CO_2-e abated by 2030. Terra also publishes **economic targets**—such as shifting seventy percent of heating demand onto district networks, eliminating all fossil-fuel power and reducing private-vehicle kilometres by nearly one-third—and uses a **monthly red–amber–green risk register** to track fiscal, market and delivery threats, triggering immediate escalation when necessary.

Because finance alone cannot deliver net-zero, the plan captures the **enabling environment** as well. Policy proposals include the energy-efficiency framework for commercial buildings and a higher **tourism levy earmarked for climate measures**. Capacity-building actions recruit an **ELENA-funded climate-finance adviser** and a new **corporate-finance officer** who will help design transactions and engage investors. A **stakeholder-engagement map** pinpoints the ministries, development banks, pension funds and civic groups whose buy-in is essential, and sets up structured dialogues so that project design, permitting and funding proceed in tandem.

Viewed as a whole, **Terra's plan offers Mission Cities a complete playbook**. It starts with data-driven diagnosis, quantifies the money required, aligns each project with the right blend of grants, loans, bonds and equity, creates understandable performance metrics, embeds rigorous risk management and shows how governance and policy reforms dovetail with financing. **By following the Terra blueprint, cities can move beyond aspirational climate strategies to produce investment-grade prospectuses that attract external capital at scale and give political leaders confidence in delivering**. In the following chapters, we are going to describe the concrete tailor-made support as examples per city.

3. Valencia

Engagement with Valencia in Spain centred on advancing a flagship **rooftop solar photovoltaic (PV) project** identified in its CIP. The Finance Team worked closely with the city's climate and energy departments – including the *Fundación Valencià Clima i Energia* and innovation agency *Las Naves* – with coordination support from Energy Cities. Experts from BwB and South Pole led the financial analysis, in consultation with a European Investment Bank (EIB) advisor who participated in the process. The collaboration unfolded in several stages:

- **Early March 2024 – Kick-off and Data Gathering:** The first meeting (held virtually on 4 March 2024) brought together Valencia's climate team and the NZC Climate City Capital Hub (Capital Hub) experts to discuss the scope of the rooftop PV project and identify data needs. The Finance Team introduced a **questionnaire** covering technical and financial details (e.g., projected solar capacity, installation costs, expected energy yield) to be completed by the city. Initially, city representatives were **cautious about sharing data. Building trust was therefore a crucial early part of the process.** The Finance Team emphasized that their role was to add value based on what Valencia had already accomplished, not to duplicate it. Based on this reassurance and deeper understanding, Valencia agreed to compile existing studies and data in response to the questionnaire.
- **Mid-March 2024 – Data Review Meeting:** By 14 March 2024, the Valencia team had assembled preliminary data on the PV project (e.g., number of municipal rooftops, total kW potential, previous cost estimates). In a preparatory exchange before a second call, the Finance Team explained that even partial data or previously conducted studies would be useful, and that the city should not be concerned if answering some questions would require more time. A follow-up meeting on 15 March allowed all parties to collectively **review the data**, clarify assumptions, and agree on next steps. This meeting benefitted from a more open dialogue, as the city's initial reservations had eased. Participants included Valencia's climate agency leads and finance officers and BwB and South Pole advisors. One outcome was a mutual understanding of the project's baseline: roughly **12 MW of solar capacity** spread across public buildings, with an estimated total investment in the order of **€12 million** (based on an earlier study by the city).
- **April 2024 – Financial Model Development:** After consolidating the data, the Finance Team developed a **bespoke financial model** for the rooftop PV project. This detailed Excel-based model incorporated Valencia's inputs (e.g., capital costs, operating costs, energy generation) and produced projections of cash flows, payback period, and return on investment. The model allowed scenario analysis. Several input parameters (e.g., cost per kW installed) could be adjusted to instantly see the impact on financial outcomes. The draft model was **delivered to the city in mid-April 2024** via e-mail, accompanied by an overview memo highlighting key results. Notably, the analysis indicated the project could be highly attractive financially: under initial assumptions, the solar programme would yield a high internal rate of return (IRR) and net present value (NPV), based on energy cost savings reinvested into the model. (Exact figures are not disclosed to protect

the city's data.) These promising figures gave the city confidence that investing in rooftop PV could be financially beneficial. The Finance Team invited city feedback and questions, scheduling a dedicated discussion the following week to walk through the model's assumptions, structure, and findings.

- **June 2024 – Financing Strategy Workshop:** After refining the technical projections, the engagement turned to developing a **financing structure**. A workshop was held on 6 June 2024 with a broad set of stakeholders: Valencia's sustainability directorate, representatives from the city's finance department and the local climate observatory, observers from the EIB, BwB capital finance experts, and South Pole project finance specialists. Ahead of this session, the Finance Team circulated a list of **guiding questions** to facilitate discussion of funding options. These questions were tailored to Valencia's context, covering topics such as the city's capacity to co-fund the project and its openness to external investment. For example, the city was asked to consider:
    - *Would the municipality take the project debt onto its balance sheet, or prefer the debt be carried by another entity?*
    - *Does the city have the resources to contribute about 30% equity (approximately €3.6mn) towards the €12mn total cost, and, if not, what amount could it invest?*
    - *How much debt could Valencia feasibly service for this project given its budget?*

  These types of detailed questions helped frame the trade-offs between relying on public financing versus bringing in partners.

- **Tailored Financial Structuring Advice:** During the June workshop, the Finance Team presented **scenarios for financing** the project rollout. One option was a traditional public investment model: the municipality finances the installation (using a mix of its own funds and loans), reaping all energy savings but also bearing all the debt. The Finance Team also explored **public–private partnership (PPP)** structures. They discussed a model where a private investor (or an Energy Service Company (ESCO) could form a special-purpose vehicle (SPV) to finance and install the solar panels, in exchange for a long-term power purchase agreement (PPA) with the city. In this scenario, Valencia would pay the SPV/ESCO for solar power over time, rather than provide upfront capital, shifting the debt off the city's balance sheet. The Finance Team also raised the possibility of **citizen financing**, such as local cooperatives or community bonds, to involve residents in funding the rollout (for example, through an energy community cooperative).

  By comparing these options, the workshop helped Valencia clarify its preferred approach. Given the city's budget constraints, the Finance Team recommended **pursuing a blended financing strategy**: Valencia could allocate a modest equity stake (to leverage grants or cheap loans) while inviting a private partner to co-invest and carry the remaining financing via an SPV. This way, the city's upfront outlay would be limited, yet it would still benefit from lower energy costs through a long-term PPA. The discussion with EIB's representative also opened the door to potential **low-interest loans** or advisory support from European programmes, should the city opt to borrow directly.

- **Outcome and Deliverables:** Following this engagement, the Finance Team provided a **written follow-up brief** to Valencia's Mission team (summarising the workshop outcomes). This brief outlined the financial model results, the pros and cons of different financing structures, and a set of **next steps**. Key recommendations included validating the legal feasibility of a PPP for the solar project under Spanish procurement law, conducting market soundings with potential ESCOs, and preparing a city council briefing on the investment case (using the model's high IRR and NPV to argue for the project's viability).
- The Finance Team provided deep and specific support to Valencia – **building a tailored financial tool**, walking local officials through various scenario analyses, and advising the city on concrete financing mechanisms based on the realities of Valencia's financial circumstances. By addressing initial trust issues and data gaps, and by introducing innovative funding concepts, the engagement greatly enhanced Valencia's capacity to implement its CIP's solar energy component.

Main Challenges Addressed and Value Delivered to the City: The Valencia collaboration tackled the need to bridge **data transparency and trust** between the city and external experts. After an initially hesitant start, Valencia's team became more open, recognising the value of the support the Finance Team could provide. The collaboration also tackled the **financial capacity question** head-on: through candid dialogue, with the city acknowledging its limits in funding the entire project alone, and gaining insight into structuring options that could overcome this challenge and deliver project success. Finally, the engagement integrated Valencia's solar project into a **broader climate finance context** by connecting it with possible European funding streams and private sector interest, thereby moving the project from a concept in the CIP to a bankable proposition with identified investors and next steps.

4. Lappeenranta

For Lappeenranta – a pioneering green city in Finland – the Finance Team's support concentrated on the city's ambitious **building energy retrofit programme**. Lappeenranta had outlined a goal to drastically cut built environment emissions (especially in municipal properties) as part of its CIP but needed guidance on financing models to execute widespread retrofits. In late 2024, the Capital Hub engaged with the city to provide support through a combination of financial modelling and strategy consultation. Key stakeholders included the city's environment and asset management officials (e.g., the municipal energy manager, financial controller), experts from BwB and South Pole, and the NZC City Advisor (City Advisors are relationship-holders for cities from the start of the NZC Programme). The engagement was structured around a major workshop in November 2024, with preparatory exchanges prior to the event (and follow-up work exploring scalability beyond Lappeenranta):

- **October 2024 – Data Collection and Focus Selection:** In the lead-up to the workshop, the Finance Team liaised with Lappeenranta's city officials to gather data on the building stock and ongoing retrofit plans. Through e-mail and calls, the Finance Team obtained information on the number of public buildings to be upgraded, typical retrofit costs per square metre, current energy consumption and prices, and any existing financing schemes. Lappeenranta had some

experience with energy efficiency projects but was exploring ways to scale these efforts city-wide. After reviewing the data, the Finance Team proposed to develop a **financial model focusing on energy performance contracting (EPC)** – an innovative mechanism wherein an ESCO invests in efficiency upgrades and is repaid from the energy savings achieved. The city agreed that examining an EPC approach alongside traditional financing would be valuable. Accordingly, the Finance Team prepared an analysis framework centred on building retrofits delivered via an ESCO/EPC model.

- **November 2024 – Financial Model Presentation:** On 19 November, a dedicated online session was held to present and discuss the **Lappeenranta Building Retrofit Financial Model**. Participants from Lappeenranta included the head of city facilities, the climate strategy lead, and representatives of the city's finance department – multiple officials joined the meeting from the city's side. From the Finance Team, specialists from BwB and South Pole were present (including model developers and financial analysts). The meeting was arranged online and chaired by BwB. Critically, the Finance Team had also looped in Lappeenranta's NZC City Advisor to ensure **alignment with the broader Mission support**. The purpose of this session was to run through the details of the custom-built financial model with the city, and to collect the city's initial feedback for further refinement of the model.
- **Financial Model Overview:** The presented model was an Excel-based tool - 'Financial Viability Analysis of Building Retrofit Projects in Cities'. Having been developed with Lappeenranta's data, the tool enabled the city to simulate different retrofit scenarios for its building stock with a high degree of confidence. **Key variables** driving the model included the number and floor area of buildings retrofitted, baseline and post-retrofit energy consumption, unit retrofit costs, expected energy price trajectories, and financing parameters (e.g., interest rates, ESCO contract terms). During the presentation, the Finance Team walked through these each of these inputs and how they influence results. Two main financing **business model options** were illustrated in detail for the retrofits: an **EPC 'Guaranteed Savings' model** and an **EPC 'Shared Savings' model**.

  In the Guaranteed Savings scenario, an ESCO assumes the performance risk – it designs and implements efficiency measures and guarantees a certain level of energy savings; the city (as client) repays the ESCO's costs through the verified savings over a contract period. In the Shared Savings scenario, the ESCO not only implements the project but also provides (or arranges) most of the upfront capital – in return, the ESCO and the city share the actual energy cost savings in an agreed ratio, allowing the ESCO to recoup its investment with profit. The model can compare the outcomes of these models against a traditional self-financed approach. For example, it can output the projected payback period, annual cash flows, and net savings to the city under each approach.
- **Interactive Discussion:** Lappeenranta's officials were keen to understand the assumptions behind the model. The Finance Team answered questions about, for instance, the **cost of capital** for an ESCO versus municipal borrowing (the model allowed input of different interest rates for each, highlighting that ESCO financing might be slightly more expensive but would be off-balance-sheet for the city). They also discussed the **risk allocation**: under an EPC, the ESCO

guarantees performance, which is advantageous if the city is concerned about achieving the energy-savings target. The team emphasized how the model can be a decision-support tool – by adjusting inputs, the city can test what level of savings would make an ESCO deal attractive or how much grant support would be needed to make a self-funded programme viable.

Attendees from the Lappeenranta side provided initial feedback, noting local factors such as the need to consider the impact of Finnish winter conditions in the energy-savings estimates and the current market absence of ESCO providers in the region. The Finance Team took note of these and encouraged the city to treat the model as a living tool, explaining that they would incorporate any additional data the city could provide (e.g., updated energy prices or building-specific details), and could further modify the model's structure to align even more closely with Lappeenranta-specific considerations.

- **Deliverables and Next Steps:** The primary deliverable for Lappeenranta was the **tailored financial model and accompanying presentation,** which was passed to the city after the presentation meeting. The model included a user guide (within the Excel file) explaining how to update inputs and interpret outputs. The Finance Team committed to a follow-up session. They invited Lappeenranta to **pilot the model on a subset of buildings** and then the parties could reconvene to discuss the results. In addition, the Finance Team provided **policy and financing advice** – suggesting that Lappeenranta explore national programmes or EU funds that support energy efficiency investments (to possibly subsidise part of the retrofit costs) and consider issuing a **municipal green bond** if direct financing was preferred over the ESCO route. The engagement thus gave Lappeenranta a clearer view of the financial feasibility of its retrofit plans and introduced the city to new implementation models. The city had been provided with a tailor-made analytical tool and a set of financing options (i.e., EPC contracts, public-private co-investment, or blended finance) to evaluate – enabling it to significantly advance a concrete strategy for building retrofit activity under its CIP.
- **February 2025 – Regional Scaling: Finnish Cities Exchange:** Building on the positive reception of the Lappeenranta model, the Finance Team organised a follow-up session to showcase the retrofit financial model to a **wider group of Finnish cities**. The 'Retrofitting Models for Municipalities – Finance-Focused Dialogue' event, coordinated by the Capital Hub, was held online on 20 February 2025 with participants from the cities of **Lappeenranta, Lahti, Espoo, Turku, and Helsinki**, as well as representatives from **Sitra, the Finnish Ministry of Environment.** The purpose of the session was two-fold: i) to present the analytical framework developed for Lappeenranta as a replicable tool for other Finnish cities, and ii) to foster peer-to-peer exchange on challenges and opportunities in financing large-scale retrofitting of buildings.
- The Finance Team introduced the model's structure, assumptions, and usage, and walked attendees through example scenarios. They emphasized how local cost data and policy conditions can be incorporated, and **invited cities to adapt the tool for their own investment planning**. Participants engaged in a rich discussion on the practical barriers to retrofit scaling – such as fragmented

ownership, limited municipal budgets, and the need to align technical upgrades with lifecycle renovations. Cities expressed strong interest in adapting the tool for their own contexts. The session also helped identify shared concerns across municipalities, such as the need for a national retrofit finance framework, which the Finance Team agreed to reflect in its future strategic recommendations to national actors.

- This regional exchange further validated the robustness and flexibility of the model developed for Lappeenranta and demonstrated the added value of the Finance Team's approach – combining deep local tailoring with knowledge that can scale to cover city peers. It also reinforced the importance of structured, finance-focused peer learning between cities facing similar financing bottlenecks in their green transition.

Main Challenges Addressed and Value Delivered to the City: Lappeenranta's main challenge was working out **how to pay for deep retrofits at scale** without overburdening the city's budget. The Finance Team provided support by introducing the city to alternative financing mechanisms (such as ESCOs) that transfer upfront costs and performance risk to a third party, which was a novel concept for the city's team. Another challenge was the **lack of detailed financial analysis** in the city's original plan – the provided model filled this gap by quantifying impacts and viability, turning broad goals into concrete numbers. The engagement helped bridge critical **knowledge gaps**: city officials are now better equipped to engage with potential ESCO providers or investors, using the model's results to negotiate terms and ensure any partnership is favourable for the municipality. The iterative, feedback-driven approach (with the city providing input on local conditions) ensured the solutions were grounded in Lappeenranta's reality.

5. Kozani

The Finance Team's engagement with Kozani in Greece was particularly intensive, reflecting the complex and pressing nature of the city's transition challenges. Kozani's top-priority project – **the greening of the district heating system** – involves overhauling the city's heating energy system, which currently relies on lignite (brown coal), to use cleaner fuel sources by 2025. This is a huge endeavour with technical, financial, and social dimensions. Additionally, Kozani's CIP includes significant building energy upgrades and sustainable mobility projects (e.g., electrification of the bus fleet), all of which require robust financing strategies. Throughout late 2024 and early 2025, the Finance Team worked closely with Kozani's municipal leadership and local stakeholders to provide hands-on support. The engagement included two in-person visits, regular remote meetings, and continuous advisory input. Details of this multi-faceted engagement are set out below:

- **4-5 November 2024 – On-Site Visit and Diagnostic:** Finance Team members travelled to Kozani for a two-day series of meetings with city officials and stakeholders. The visit began with high-level consultations with the **Mayor of Kozani and the Deputy Mayor for Planning**. In this introductory meeting, the Finance Team outlined the Capital Hub's objectives and offerings. The city administration in Kozani, which had recently taken office, candidly described its

situation: the **city's Mission team was understaffed** and struggling to coordinate internally. The Mayor and Deputy Mayor emphasized that while they had political will to drive climate projects, the lack of human resources and coordination between departments (e.g., finance and technical planning) was hindering progress. They even requested help in finding funding to hire more team members. The Finance Team explained that while it could not directly fund staff, it could assess the needs and make a case for funding. It was agreed that the Finance Team would undertake a **gap analysis of the city's project team capacity** to quantify the expertise and budget needed for effective implementation of actions under the city's CIP. The Mayor designated a clear local lead for Mission work – the Deputy Mayor of Digital Transition and Innovation would act as the city's focal point, supported by a technical officer. Establishing this leadership was critical for ownership of the process.

During the visit, the Finance Team also met Kozani's **Urban Planning Department** staff, with discussions primarily centred on priority projects. The planners identified the **greening of the district heating system and the energy upgrade of buildings** as two crucially important projects for the city. The district heating project stood out as particularly critical: the **national mandate to abolish lignite by December 2025** means Kozani's current coal-fed district heating must urgently find alternative heat sources. Without this action, thousands of residents could be left without clean heating, risking social and economic fallout. This set a clear focus for the Finance Team's work – structuring a viable investment plan for the new heating mix was the top priority. The building retrofits, while slightly less time-critical, were also significant given Kozani's old building stock and the opportunity to reduce demand on the heating system. The planning officials noted that although **mobility projects** such as improving public transit are included in the CIP, these are not as advanced or urgent at this stage.

On another meeting (which included representatives from the local university, a regional energy cluster called *CluBE*, and municipal advisors), the city's participants stressed the need for better collaboration among Greece's six Mission cities. Kozani felt that 'ClimaNet' – the national network of Mission cities – was not yet functioning effectively. They proposed that the Capital Hub help organise an event with cities and national ministries to learn from successful climate networks in other countries. This reflects that, beyond project-specific help, Kozani valued the Finance Team's ability to convene and leverage broader support mechanisms.

The city also informed the Finance Team that it was establishing a new entity, the **Kozani Development Organization (KDO)**, which would take a central role in managing net zero projects. This was a positive step towards building capacity. The Finance Team advised that KDO's formation should be leveraged to channel funding and expertise into the city – for example, KDO could potentially be the vehicle to hire needed experts or to bundle projects together to attract a wider range of investors.

- **Greening of District Heating Project – Technical & Financial Insights:** Given its critical importance, the district heating transition was used as a case example throughout the Kozani visit. The Finance Team gave a presentation on typical

project development steps for such infrastructure, using Kozani's situation to illustrate each step, beginning with pre-feasibility work (e.g., assessing technology options), through to feasibility assessments, financing plan development, and, finally, implementation. Local stakeholders such as CluBE contributed insights, emphasizing that Kozani will likely need to use a mix of energy sources. For example, the city could potentially combine a small amount of natural gas as a bridging fuel with renewable sources such as biomass or large-scale heat pumps. However, one CluBE expert also cautioned about the city relying too heavily on natural gas, since Greece aims to phase out the use of natural gas within a decade.

The synergy between the district heating and building retrofit projects was also highlighted – if buildings become more energy efficient, the overall heat demand will drop, which will influence the scale of the heating solution needed. However, as an NZC technical consultant noted, the **financing models** for the two projects differ: the heating plant is a centralised infrastructure investment, whereas building upgrades involve many private owners, so these initiatives should be planned as **coupled but separate investment packages**. These discussions guided the Finance Team in understanding the local perspective and fine-tuning their subsequent advice.

- **Stakeholder Meetings for Data and Ideas:** The on-location engagement with various key stakeholders was comprehensive. As residential building retrofits are a large part of the CIP, the Finance Team met with the **Association of Kozani Property Owners** (Association). The Association's president explained the regulatory hurdles in Greece: in multi-family apartment buildings, if even 1% of owners oppose a retrofit, it legally cannot proceed. His position was that there needs to be changes in the law to allow simple majority decisions or deemed consent if owners do not reply by a deadline. The Finance Team noted this institutional barrier, which affects the feasibility of large-scale retrofits – a non-financial issue but crucial for project delivery.

  To tackle the financing angle, the Finance Team introduced the concept of **ESCOs and third-party financing for residential retrofits**. They discussed how an ESCO could fund and implement upgrades on a building-by-building basis, paid back through energy savings, if enabling frameworks were in place. All participants agreed more data was needed to evaluate this option: the Association committed to preparing a **table of retrofit needs per building type** (what types of work and costs would get an average building from its current energy class to at least class B+). The Finance Team offered to use that data to explore viable financial models (including potential ESCO contracts or subsidy schemes). The Association also highlighted practical challenges such as the **shortage of construction workers and availability of materials** that could slow any retrofit programme, as well as legal issues (many public buildings lack proper building permits and would first need to gain sound legal status). Though not directly solvable by the Finance Team, these insights were important context for creating a realistic investment plan timeline.

  Another key stakeholder is **DEYAK**, Kozani's municipal water and sewerage company, which also operates the district heating system. Meeting with DEYAK's president and finance director provided critical input on the district heating

project. The company plans to **expand the heating network** to new areas but must ensure this does not become uncompetitive. Regarding the supply side, company management explained that with lignite plants shutting down, Kozani has negotiated with suppliers to use **natural gas for about 43% of the district heating supply** (this part is to be municipally financed). The **remaining 57%** of heat must come from alternative energy sources (renewables or waste heat), for which **financing is needed** and has not yet been secured. The DEYAK side mentioned a pilot project (the 'Neutron' project) exploring an experimental technology but advised that it is still at a relatively early stage and currently a high-cost strategy, so should not be considered as a near-term solution.

Company management also outlined the **risks from their perspective**: if DEYAK is unable to put solutions in place, competitors offering individual solutions such as heat pumps will capture users. Also, Kozani's population is declining, reducing heat demand, which threatens to **undermine the system's economic viability**. Despite these concerns, company management expressed clear ideas for investment. Projects DEYAK wants to pursue include developing its own renewable energy sources (potentially solar thermal or biomass) with Power Purchase Agreements (PPAs), building energy storage to buffer the system, and replacing old pipelines to reduce losses (with potential energy savings of up to 27%). Company management agreed to send the Finance Team a concept note detailing DEYAK's proposed energy mix and an estimate of the funding required. This document would serve as a basis for the Finance Team to help structure a financing plan, possibly bundling the various investments into one programme that could attract development bank funding.

- January 2025 – Follow-up and Structured Support: After the November visit, the Finance Team maintained close contact with Kozani. The dedicated City Finance Specialist (CFS) took the lead in liaising with the city. Regular check-in calls were established. By January 2025, communication was formalised into a tri-weekly meeting schedule to maintain the momentum in providing tailored CIP recommendations. Building on this, a progress review and next steps meeting between the Finance Team and the city was arranged for 30 January. The agenda items included project identification and prioritisation status, how to advance with the district heating project, setting up recurring meetings, and planning the next on-location visit.

  At the 30 January meeting, the **district heating project dominated the discussion**. The Finance Team and the city went through the latest developments. DEYAK had begun completing the questionnaire provided by the Finance Team (to capture data on current network performance, costs, etc.), but some clarifications were required. The conversation was productive but consumed the whole meeting time. Thus, a **second meeting was scheduled for early February** to address the remaining agenda items. In an e-mail sent to all parties on 30 January, the CFS summarised the meeting discussion and outlined the agenda for the next one.

- **March / April 2025 – International Conference and Latest Developments:** In late March, Kozani hosted a two-day international conference on decarbonising district heating. A member of the Finance Team attended to **present on the**

Hub's services for cities in general (e.g., financial structuring, investor matchmaking), and on the specific services the Hub has already proposed to Kozani regarding the greening of district heating project. This helped to raise awareness among relevant stakeholders that the Finance Team are actively supporting the city and can be a focal point to streamline the external financial requirements.

In addition to delivering the Capital Hub presentation, the Finance Team member gathered valuable insights and feedback on the status and ongoing challenges for Kozani's climate objectives.

A wide range of organisations with interest in assisting Kozani were present at the conference (e.g., **EIB**, **European Bank for Reconstruction and Development (EBRD),** and **the Covenant of Mayors)**. However, this abundance of external support also highlighted the lack of people actually in the municipality who are available to coordinate and implement the project. The **consultants that had prepared Kozani's Climate City Contract and initial CIP** said that the conference felt like *"a flashback to 2015"*, noting that the same ideas were discussed a decade ago and that a **lack of continuity** from previous efforts was hindering progress. This insight reinforced the need for the Finance Team to help Kozani build on past studies instead of starting from scratch to avoid reinventing solutions.

A few days after the conference, the Greek Prime Minister announced that a new **data centre will be built at the premises of PPC (Public Power Corporation) in Kozani**. The data centre is likely to produce a large amount of waste heat. This potentially represents a high-value opportunity – the waste heat could be fed into Kozani's district heating network.

It was clear at the conference that **EBRD is ready to finance the district heating transition** and has already done substantial preparatory work. This is encouraging as it suggests Kozani will have access to international loans or grants provided it can develop a coherent project plan. The Finance Team recognise the need to **coordinate with EBRD and other institutions** to clarify what gaps they could fill. Rather than duplicating EBRD's efforts, the Capital Hub could, for example, focus on integrating the project into the city's overall CIP, or on mobilising local co-funding to complement EBRD's investment.

The Finance Team member had a side meeting with the **General Manager of DEYAK** at the conference. The General Manager reported that the company was close to **finishing its inputs on the Finance Team's questionnaire** regarding the district heating project. He mentioned a few technical points that needed to be confirmed before finalising the data. The Finance Team member encouraged him to send any questions or requests for clarification directly, so as "not to delay" the analysis. The GM agreed to follow up with additional information requests. This exchange was a positive sign – it showed DEYAK's engagement and the tangible progress in data gathering. However, the GM also echoed a concern: **within the municipality, essentially only one person serves as the contact point** for all these discussions, creating limitations for the pace of information flows. The Finance Team recognised this bottleneck, which reinforces their earlier recommendation (identified through the gap analysis) to bolster Kozani's team (potentially using external funding).

- **Ongoing Support and Deliverables:** Up to early April 2025, the Finance Team had produced several **deliverables for Kozani**. First, a **comprehensive Mission report** (meeting notes) was delivered in November 2024, capturing all findings and recommendations from the on-location visit to provide a roadmap of actions (e.g., conduct team gap analysis, gather data for the district heating project, coordinate with national network). Second, the Finance Team provided DEYAK with a **customised questionnaire** to capture data for the district heating ensuring that the eventual financial model will be built around accurate local data. Third, the Finance Team offered ongoing **advisory communication and support**: for example, the January e-mails to set regular meeting agendas and the conference debrief document in April, which distilled insights and highlighted issues that need to be addressed. This continuous input kept Kozani's leadership well informed for the purposes decision-making and planned actions (such as pressing the national government for more support or reconvening internal teams). While a full financial model for Kozani's projects is not yet complete (pending provision of required data), the Finance Team has already been sketching out potential **financial structuring options**. As communicated to the city, a promising pathway for the district heating project would be a blended finance structure that combines public financing (e.g., EBRD loan or EU grant) with private sector participation for certain components (e.g., a public-private partnership for a biomass plant). For the building retrofit project, an expanded version of Greece's 'Exikonomo' subsidy programme, targeted specifically at Kozani's citizens, is one potential option. These ideas continue to be refined based on new information and feedback.

Main Challenges Addressed and Value Delivered to the City: The Kozani engagement involved multiple intertwined challenges. The key areas of challenge and the Finance Team's response are summarised below:

Institutional capacity: The Finance Team has been actively helping the city identify its capacity gaps and advocating for practical solutions (such as creating the KDO and securing funding to staff it).

Complex stakeholder environment: With national agencies, international banks, and private companies all involved in Kozani's transition, the team played a coordinating role, ensuring that the city's interests were well represented, and that the continuity of work did not get lost amid a diversity of external advice and input.

Financing: The scale of investment needed for a new district heating system is significantly beyond Kozani's budgetary capacity. The Finance Team has focused on packaging the project in a way that financiers such as EBRD and EIB can support and exploring innovative ideas to improve project bankability (e.g., as referred to above, using waste heat from the new data centre).

Community impact and buy-in: Replacing a coal-based heating system involves social considerations. By engaging with the property owners' Association and KTEL, the Finance Team ensured that end-users' perspectives (e.g., concerns about costs and service levels) have been factored into the Investment Plan, which will help in designing funding schemes (e.g., ensuring the chosen scheme(s) protects low-income households and/or transit operators during the transition).

Overall, the depth of support provided to Kozani has been extensive: from strategic planning to tailored data work (see Appendix 2), the Finance Team acted as an extension of the city's capacity. Their involvement has helped Kozani progress **from general climate goals to a set of actionable projects,** with emerging financing strategies, all while navigating political and technical headwinds.

6. Conclusion

Across Valencia, Lappeenranta, and Kozani, the NZC Finance Team provided professional, hands-on support to translate each city's climate ambitions into concrete, investment-ready propositions. Starting with a Best Practice Climate Investment Plan (Appendix 1) and a structured Investment Planning Guidance phase (new chapter), cities were equipped with frameworks and advice that helped them assess their investment gaps and plan accordingly.

In Valencia, this led to a detailed rooftop solar PV business case. In Lappeenranta, a retrofit financing tool and EPC-based model were developed. In Kozani, the engagement focused on planning and financing strategies for a complex district heating transition.

Each engagement was grounded in local realities and supported through financial models, policy recommendations, and iterative consultations. The outcome is a marked improvement in cities' ability to implement their Climate Investment Plans – not just as paper documents, but as dynamic strategies backed by financial insight and practical feasibility.

The integrated approach – combining early checklist-based evaluations, best practice modelling, and city-specific technical assistance – demonstrates a robust pathway for supporting Mission Cities. These efforts have enhanced both investment logic and delivery capacity, providing a strong platform for implementation beyond 2025.

Appendix 1 – Best Practice Climate Investment Plan for Mission Cities

The following Climate Investment Plan (CIP) example has been developed by BwB through its engagement with and support for over 100 cities, using well-developed examples from cities that have validated Investment Plans. The information is based on submissions by real cities. For the sake of anonymity, city-specific references have been removed and replaced with the fictional city of Terra.

The purpose of the CIP is for cities to develop an understanding of the costs and benefits – and the capital required – to facilitate their transition to net zero and map these over the entire transition. This process also includes green budgeting as well as the identification of enabling conditions including financial and non-financial policies, key financial stakeholders, a risk management framework, and the development of innovative financing solutions.

The CIP complements a Climate Action Plan (CAP) and acts as a powerful tool and process for municipalities to engage with other local and national stakeholders, including national governments, businesses, and citizens. Whilst the municipalities can map out the costs, impact, and capital required to address all assets under their direct control, they can also use the CIP to facilitate and develop this process for the entire city, including private organisations and investments.

The CIP focuses on three key elements. Section A is the stage-setting opportunity that identifies the city's historical climate actions and activity, the financial and budgetary landscape, and any existing barriers to facilitating climate investment. Section B is the key component of the CIP where cities must forecast the costs, capital requirements, and co-benefits of all their climate actions and then plan for the necessary capital (including allocations from the municipal budget and private capital). Finally, Section C focuses on the supporting infrastructure and enabling conditions to help facilitate and implement the climate actions that have been identified, including potential policy enhancements, a robust risk management framework, and engagement with external stakeholders.

As part of the development of the CIP, BwB has developed new financial indicators and concepts, including the ***forecast yield on climate capital (FYCC)*** *and the* ***emissions return on invested capital (eROIC).***

Contents

A1: Existing Climate Action Funding and Financing

This task helps the city to collate all historical climate actions and initiatives in order to assess previous successes and any issues that arose. By establishing a baseline for climate action, the city can track future development and the implementation of their CAP.

Terra's Historical Climate Activities

Since 1990, greenhouse gas emissions in Terra have been reduced from 3.1 million tonnes of CO_2e to 1.4 million tonnes of CO_2e in 2020 – mainly due to strong policies and large investments implemented by the city and other actors and citizens. Some city interventions worth mentioning are renewable energy in district heating, energy efficiency requirements on new buildings, development of waste management, a shift to electric vehicles, and the development of new cycling and pedestrian infrastructure. A closer look at the developments during the decade to 2021 in relation to population growth shows a correlation of the investment level of the municipality and the emissions reduction, and a similar pattern emerges when distributing the investments and emissions per citizen.

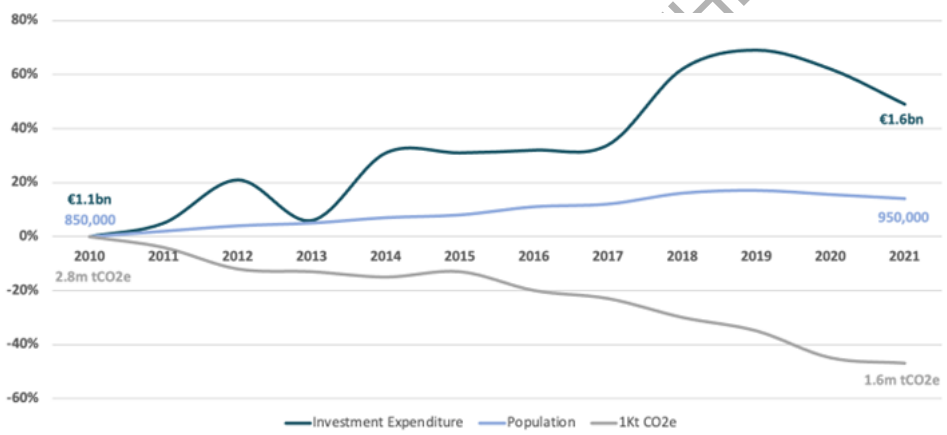


Figure 1: Percentage Change of Investments and CO_2e from 2010 to 2021

As is clear in *Figure 1* above, lower emissions have been achieved despite significant growth in the city's population. This CIP is intended to be the next step and principal tool used to support continued progress. Terra envisages that this will require even larger investments (in accordance with an enforced

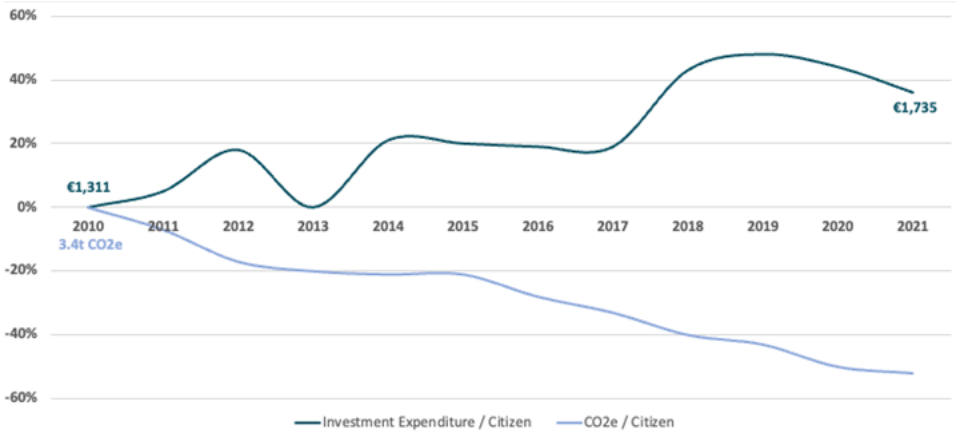


Figure 2: Percentage Change of Investments and CO_2e Per Capita from 2010 to 2021

investment plan) into climate reduction measures than has been previously invested, in order to achieve net zero in a growing city. The development of the municipal administration has led to the establishment of a transparent governance structure where goals, missions, activities, and responsibility of results are distributed to relevant specialist departments and city-owned companies, as demonstrated in *Figure 3* below.

The overall orientation goals for the city are decided at the City Council level in conjunction with the budget. At present, there are three orientation goals, two of which are relevant in this context. The first is the goal of achieving a **green and fossil-fuel-free city**, while leading the way in a just climate transition. The second is that Terra aims to be a **city with a solid and sustainable economy** where education, jobs, housing, and the relevant infrastructure are available for all. The goals, missions, activities, and indicators are systematically followed up by the top-down, bottom-up steering model in *Figure 3*.

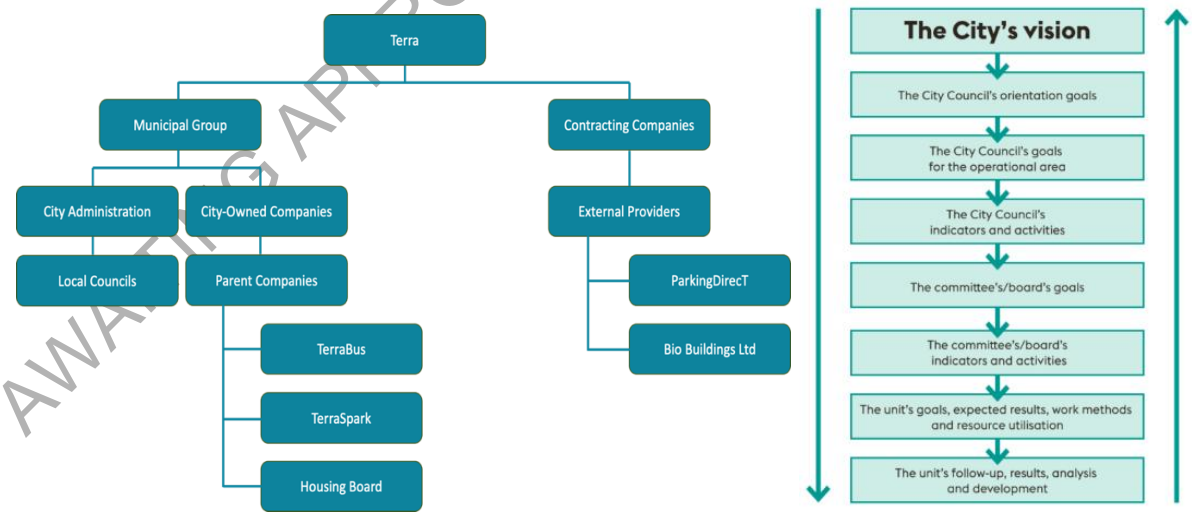


Figure 3: Terra's Operational Structure & Steering Model

Current Climate Budget

In the municipality's 2023 budget, several missions, directives, and actions indicate the path to reach Terra's goal of becoming a green and fossil-fuel-free city. The city plans to achieve this goal by cutting car traffic by 30% (vs 2017 levels), reducing climate emissions from the transport sector by 80% (vs 2010 levels), further investments in cycling and pedestrian infrastructure, and implementing low-emission zones within the old town and parts of the inner city by 2026. Terra will sort and segregate bio-waste for the production of biofuels, and support the expansion of EV charging infrastructure across the city and suburban areas.

Terra intends to develop a €100m Climate Action Fund through which a funding committee will allocate capital to localised climate actions across the city to reduce emissions. The city will also aim to decrease energy consumption by 10%, implement strategies and actions for a climate-neutral built environment and construction sector, and establish a centre for circular economy. This work will be completed in collaboration with the municipally owned energy company TerraSpark. Project costs are outlined in Section B.

In *Figure 4* below, the percentage distribution of climate investments within the city (as a percentage of total city budget) are outlined for the past five years, with total investment reaching €1.65bn by 2022. *Figure 5* reflects the percentage distribution of climate investments – as a percentage of the total municipal budget – for 2023 through 2027. In total, the annual investment volumes for 2023 sum to somewhere between approximately €1.4bn and €1.9bn, where approximately 30% are the investments within committees and the remaining 70% will be completed by municipally owned companies for the projects outlined in Section B. These latter projects include work on energy efficiency and energy production, waste sorting facilities, and the build-out of EV charging infrastructure and water treatment plants.

Field of Action	Project	% of Annual Municipal Budget				
		2018	2019	2020	2021	2022
Energy	District Heating	2.3%	2.8%	2.8%	2.8%	2.6%
	Emission Reduction from Electricity Consumption	0.4%	0.4%	0.6%	0.6%	0.6%
	Energy Optimisation in City-Owned Buildings	0.2%	0.3%	0.3%	0.7%	0.7%
	Increased Electrification Enablement	0.2%	0.3%	0.3%	0.3%	0.3%
	Total Energy Actions	***3.1%***	***3.8%***	***4.0%***	***4.4%***	***4.2%***
Mobility & Transport	Cycling & Walking Infrastructure	2.9%	3.4%	3.4%	2.8%	2.1%
	Public Transport Emission Reduction	6.3%	6.8%	6.8%	5.4%	5.4%
	Private Car Emission Reduction	0.5%	0.5%	0.4%	0.4%	0.8%
	Regional Transport Funding	2.1%	2.6%	2.6%	2.4%	1.8%
	Total Mobility & Transport Actions	***11.8%***	***13.3%***	***13.2%***	***11.0%***	***10.1%***
Built Environment	Developing Smart Cities Solutions	0.3%	0.5%	0.5%	0.2%	0.2%
	Low-Carbon Construction	1.2%	1.2%	1.2%	1.3%	1.3%
	Retrofitting Municipal Buildings	2.3%	2.4%	2.4%	1.8%	2.2%
	Total Built Environment Actions	***3.8%***	***4.1%***	***4.1%***	***3.3%***	***3.7%***
Waste Management	Emission Reduction for Waste Treatment	1.1%	1.1%	1.2%	1.2%	1.3%
	Promoting Circular Solutions	0.2%	0.2%	0.2%	0.2%	0.1%
	Total Waste Management Actions	***1.3%***	***1.3%***	***1.4%***	***1.4%***	***1.4%***
Nature-based Solutions	Promoting Urbanisation & Protecting Carbon Sinks	0.1%	0.1%	0.1%	0.1%	0.1%
	Nature Conservation Measures	0.2%	0.2%	0.2%	0.2%	0.2%
	Developing NBS in Urban Environments	0.1%	0.1%	0.1%	0.2%	0.2%
	Total Nature-based Solutions Actions	***0.4%***	***0.4%***	***0.4%***	***0.5%***	***0.5%***
Total		**20.4%**	**22.9%**	**23.1%**	**20.6%**	**19.9%**

Figure 4: Terra's Climate Actions as a Percentage of Annual Budget, 2018-2022

As detailed in *Figure 5*, the climate-related share of total investments in the city is about 20% and is relatively stable over time. The investments are dominated by efforts in energy and waste management in the municipally owned companies, though there is also a significant contribution to funding regional transport infrastructure.

Field of Action	Project	% of Annual Municipal Budget				
		2023	2024	2025	2026	2027
Energy	District Heating	2.7%	3.0%	3.0%	3.1%	3.2%
	Emission Reduction from Electricity Consumption	0.7%	0.9%	0.9%	0.9%	0.9%
	Energy Optimisation in City-Owned Buildings	0.7%	0.5%	0.7%	0.7%	0.7%
	Increased Electrification Enablement	0.3%	0.4%	0.5%	0.5%	0.5%
	Total Energy Actions	***4.4%***	***4.8%***	***5.1%***	***5.2%***	***5.3%***
Mobility & Transport	Cycling & Walking Infrastructure	1.8%	2.1%	2.3%	2.5%	2.5%
	Public Transport Emission Reduction	5.3%	5.2%	5.2%	5.2%	5.3%
	Private Car Emission Reduction	0.9%	1.2%	1.3%	1.3%	1.3%
	Regional Transport Funding	1.7%	1.9%	1.9%	2.1%	2.1%
	Total Mobility & Transport Actions	***9.7%***	***10.4%***	***10.7%***	***11.1%***	***11.2%***
Built Environment	Developing Smart Cities Solutions	0.4%	0.7%	0.7%	0.7%	0.7%
	Low-Carbon Construction	1.0%	1.2%	1.3%	1.4%	1.7%
	Retrofitting Municipal Buildings	2.1%	2.2%	2.2%	2.3%	2.4%
	Total Built Environment Actions	***3.5%***	***4.1%***	***4.2%***	***4.4%***	***4.8%***
Waste Management	Emission Reduction for Waste Treatment	1.0%	1.2%	1.3%	1.3%	1.3%
	Promoting Circular Solutions	0.3%	0.4%	0.5%	0.5%	0.5%
	Total Waste Management Actions	***1.3%***	***1.6%***	***1.8%***	***1.8%***	***1.8%***
Nature-based Solutions	Promoting Urbanisation & Protecting Carbon Sinks	0.4%	0.4%	0.6%	0.6%	0.7%
	Nature Conservation Measures	0.2%	0.3%	0.4%	0.4%	0.5%
	Developing NBS in Urban Environments	0.4%	0.4%	0.4%	0.4%	0.5%
	Total Nature-based Solutions Actions	***1.0%***	***1.1%***	***1.4%***	***1.4%***	***1.7%***
Total		**19.9%**	**22.0%**	**23.2%**	**23.9%**	**24.8%**

Figure 5: Terra's Targeted Climate Actions as a Percentage of Annual Budget, 2023-2027

A2: Strategic Funding and Financing Evaluation

By identifying the existing income and capital sources for the city – as well as potential future sources – the city can start to identify ways to fund the climate actions and initiatives identified within the CAP.

The annual fiscal budget for the city is decided and approved by the city council, with the primary mission of supporting the city's strategic goals. As mentioned in Section A1, Terra has set goals to be i) a green and fossil-fuel-free city and ii) a city with a solid and sustainable economy, and the budget approved must support these goals. The **overall budget for the city in 2023 is approximately €8.27bn**, with the list of confirmed income sources (for 2022) presented in *Figure 6* below. The annual budget has increased by approximately €19.4mn over 2022 (*0.25%*).

Income Category	City Income	% of City Budget
Tax	Municipal Tax	31.2%
	Corporation Tax	11.5%
	Sales Tax	3.1%
	Tourism Tax	1.7%
Funding	Deferment from National Government	23.8%
	Deferment from State Government	6.5%
Revenues	Services Revenue (Transport, Utilities)	18.9%
	Property Revenue (Public Housing)	3.3%
Total		100.0%

Figure 6: Terra's Income Sources for 2022

As per *Figure 6*, the most significant contributors to city income are municipal tax, deferred funds from the national government, and revenues from services that municipally owned companies provide to the city (mainly public transport and utilities). The city generates just under 50% of its income from taxation, with the majority of this income deriving from the municipal tax and corporation tax, which are paid by most residents and businesses. The budget for the city is mostly used for operations of city services as well as incremental improvements in each sector.

In addition to recurring revenues, the city obtained **€277mn for capital projects** in the year 2022, as indicated in *Figure 7*. The most significant contributor to this was the €242mn loan from the European Investment Bank (EIB) to finance the installation of photovoltaic (PV) panels on all municipal buildings, with repayment of the loan being financed by surplus energy sold into the power grid. The city also received €13mn for the retrofitting of some municipal buildings, including schools and department offices – this project will be completed by the end of 2023. A small EU grant was provided in order to develop a feasibility study for a new city tramway as part of a European urban pilot – these findings are due to be concluded and publicly released in early 2024. Finally, the city generated investment returns of about €21mn in 2022, driven mostly by returns on the city-wide commercial loan portfolio. The documented capital sources in *Figure 7* do not include debt undertaken by municipally owned companies that are encouraged to seek financing for new, green projects (TerraBus has obtained two green loans: one in 2019 and another in 2022).

Capital Source	Description	€ Amount
EIB Loan	Loan for the financing of PV infrastructure on municipal buildings	242,000,000
EU Grant	Grant to develop feasibility study for city tramway	1,200,000
State Aid	Funding for Retrofitting Municipal Buildings	13,000,000
Loan Portfolio Return	Revenue generated from commercial loan portfolio	17,436,200
Investment Returns	Returns on Municipal Investment Portfolio	3,850,189
Total		€ 277,486,389

Figure 7: Terra's Sources of Capital for 2022

As discussed in greater detail in Section B2, the Terra intends to part finance its net zero projects by the issuance of a Municipal Green Bond for €250mn. Other cities within the country have already seen some success with the issuing of green and blue bonds, and the city council has approved an initial feasibility study into this issuance with a view to launch the bond in the second half of 2024. Due to the absence of a municipal financing organisation, this seems to be the optimal approach to financing the city's contribution to the net zero transition. We envisage a coupon rate of approximately 5-7%, which aligns

with similar financing structures in other cities in the nation. The exact portfolio of projects that will be financed by this bond is to be confirmed following the feasibility study.

A3: Barriers to Climate Investment

Through listing the current barriers to climate investment, cities can start to identify solutions to overcome these barriers and facilitate further capital flows. This could involve collaborating to enact new policies or identifying external stakeholders that can assist overcoming structural and financial barriers.

The city has to deal with some significant barriers to climate investment, including the inability to develop Public-Private Partnerships within the city (except by municipally owned companies) due to national legislation, and having no scope to decide local taxation rates except for tourism tax. These challenges – as well as additional city-focused and wider stakeholder barriers – are identified in *Figure 8* below. Instead of identifying and explaining how it plans to overcome such barriers and facilitate further capital flows in this Section, Terra has addressed these issues in Section C1 of the Investment Plan (IP) – particularly in *Figure 16*.

One other significant issue is that Terra is required to have a balanced budget each year, and no deficit is allowed for general operations (the city is allowed to borrow to finance capital investments and projects). Any city in the nation that does not comply with this requirement can be taken into a special measures programme that involves increased oversight and management by the national government. This is a relatively new national requirement established in 2014 by the *PN07685 Fiscal Responsibilities Act.* To this point in time, Terra City Council has managed to balance its budget each year and has no requirements or forecasted need to run at a budget deficit for the general providing of services and operations to the city. This is ensured be a robust forecasting programme in the annual budget as well as early flagging of operational cost overruns during the budget year. This risk and mitigation mechanism is discussed in Section C2.

In order to reflect the overall barriers to climate investment in the city, barriers for other stakeholders (such as the general public or the private sector) are set out in *Figure 8* to provide an all-encompassing view of the potential obstacles that Terra as a whole faces with regard to facilitating further climate investments.

The list in *Figure 8* can be combined with non-financial and broader barriers presented in the CAP to provide a full picture of the challenges and obstacles that the Terra must overcome to achieve net zero. As can be seen, the municipality is not always the affected stakeholder and sometimes the private sector or local citizens are the actors impacted by the barrier that exists.

Financing Barriers to Climate Investment	Barrier Typology	Description	Sector & Stakeholders Involved
Ban on Public Private Partnerships for Municipal Operations	Policy	The city is not allowed to engage with or create any new Public Private Partnerships (PPPs) for any core municipal operation. This is due to national level policy. The municipally-owned organisations such as TerraBus or TerraSpark are allowed to engage in PPPs under certain conditions, subject to approval by a national government committee. This is a barrier for financing climate investment as, in other countries, it is clear that cooperation of projects with the private sector is one avenue for climate action financing. At this stage the only sufficient mitigation for this is working through municipally-owned companies.	Public Sector, Private Sector, Municipal Companies.
Inability to Set Local Taxation Rates	Policy, Fiscal.	The city is not allowed to establish local taxation rates except for the Tourism tax, nor can the city implement new taxation schemes without the national government's approval. This provides an issue as Terra cannot easily increase city revenues and (through an increased municipal budget) allocate further to climate actions. One consideration is to increase the Tourism Tax specifically for visitors that fly into the city rather than taking the train.	Public Sector
Prevention from Running a Budget Deficit	Policy, Fiscal	As a result of PN07685 Fiscal Responsibilities Act the city is unable to run at a budget deficit and must therefore run a balanced budget each year - no deficit is allowed for general operations. Though the city has so far managed to balance the budget each year through a robust forecasting and cost manageent programme, it does mean that the city cannot borrow to increase spending on climate actions (the city can however borrow to finance capital investments and projects, which is one financing avenue for some of the climate actions identified in this Plan).	Public Sector
Slow Progress of State-Owned Building Retrofit in Terra	Operational, Structural	There has been very slow progress in the retrofitting of buildings owned by the national government within Terra. This means that emission reductions from the publicly owned built environment are higher than city-wide targets. This is being rectified by the enforcement of new energy efficiency regulations at the city-level which will apply to all public buildings.	Public Sector, National Government
Lack of Loan Availibility for Climate or Energy Efficiency Projects	Operational, Structural	Due to the development of climate and energy efficiency projects still being new in the private sector, banks and corporate loan providers are skeptical of the issuing of loans to the private sector for these projects. This means that companies struggle to take out loans to finance their internal climate actions or to achieve company 'green' goals or targets. Lenders at this stage focus on traditional loans for new business opportunities or require a much shorter payback window than for the financing of new business activities (typically 1-2 years vs 3-8 years). Until this changes, it is a barrier to financing private sector decarbonisation.	Private Sector, Banks
Cost of Retrofiting Residential Homes vs Cheaper Cost of District Heating	Structural	One identified pitfall of the relative 'cheapness' of district heating solutions is that these are being prioritised over the more expensive option of retrofitting residential areas to be more energy efficient. The focus really - in terms of a carbon impact - should be on making the residential built environment more energy efficient to reduce emissions rather than focusing on cheaper energy generation.	Public Sector, Energy Companies, Citizens
Insufficient Payback Period for Retrofitting Residential Homes	Structural	Linked to the above, the outsized cost of implementing energy efficiency measures (such as the retrofitting of private properties) leads to payback periods in excess of ten years. This is not an attractive proposition for local homeowners unless energy costs increase which would decrease the payback period.	Citizens

Figure 8: Terra's Barriers to Climate Investment

B1: Cost Scenarios for Climate Neutrality

By identifying the costs and potential direct and indirect benefits to all climate actions, cities can begin to budget for their climate actions and begin to approach external financing partners to help financially support their CIP.

Terra has developed a full costing scenario for achieving the net zero goals established within the city's commitment document (a reduction of at least 80% in GHG emissions by 2030). The city cannot achieve these targets alone and will need to involve private sector companies that have their own decarbonisation plans, as well as private capital providers to finance certain climate actions (as outlined in Section B2).

Terra envisages that the total capital expenditure needed to achieve these objectives (as per *Figure 9*) is **€3,578mn** between now and 2030, with total costs of **€219mn for Terra's city administration** as well as €1,255m for TerraSpark and €459m total capital expenditure for TerraBus – including the development of the new tram line within the inner city (as outlined below).

Decarbonisation Lever	Capex €m	% of Total Capex	Annual Opex €m	Total Capex + Opex €m	CO2e Kt Reduction	Indirect Co-benefits
Transport	**698**	**20%**	**611**	**5,586**	**541**	
Reduced Passenger Transportation Need	0	0%	81	648	128	
Shift to Public & Non-Motorised Transport	422	12%	398	3,606	212	- Air Quality Improvements (Impact on Health) - Noise Reduction - Road Safety - Time Saved - Healthier Citizens - Job Creation
Increase Car Pooling	0	0%	21	168	42	
Electrification of Passenger Cars	129	4%	18	273	64	
Electrification of Busses	47	1%	8	111	48	
Optimised Logistics	11	0%	64	523	35	
Electrification of Trucks	89	2%	21	257	12	
Built Environment & Heating/Cooling	**2,241**	**63%**	**461**	**5,929**	**663**	
Building Renovations	823	23%	212	2,519	47	- Local Supply Chain - Job Creation - Air Quality Improvements - Energy Poverty Reduction
New Energy Efficient Buildings	204	6%	4	236	21	
Efficient Lighting & Appliances	304	8%	27	520	183	
Decarbonising Heating/Cooling Generation	910	25%	218	2,654	412	
Electricity	**625**	**17%**	**311**	**3,113**	**1,843**	
Decarbonising Electricity Generation	625	17%	311	3,113	1,843	- Local Supply Chain - Job Creation - Air Quality Improvements - Energy Poverty Reduction
Waste	**5**	**0%**	**14**	**117**	**31**	
Increased Waste Recycling	5	0%	14	117	31	- Job Creation - Circular Economy Opportunities - Cleaner City
Nature-based Solutions	**9**	**0%**	**1**	**17**	**2**	
Reforestation	9	0%	1	17	2	- Carbon Sink Benefits - Asthetic Benefits for City - Pedestrian Increase
Total	**3,578**	**100%**	**1,398**	**14,762**	**3,080**	

Figure 9: Terra's Forecast Spend for Decarbonisation of the City 2023-2030

By investing sufficiently in the areas identified in *Figure 9,* Terra will see a **reduction in emissions of 3,080Kt by 2030**. The key areas of focus are the shift to public transport (including the introduction of bus lanes and cycling lanes by TerraBus, and the new tramway) and decarbonisation of both the heating network and energy-generation assets. These projects will be managed by the respective municipally owned companies (TerraBus and TerraSpark), working in close cooperation with the city administration to ensure timely implementation.

In addition to the capital investment required, the **annual operational costs are estimated to be €1,398mn** which is in line with the city's forecast budget for climate action spending between 2023 and 2030. Due to the costs associated with the programmes in *Figure 9* only contributing the 80% reduction in GHG reductions during the period, the city will look to ringfence additional budget for localised climate improvements. The city is confident that the operational costs of the climate actions identified can be covered by the Terra City Budget for the period through to 2030 – in line with historical budgeting for climate actions as laid out in Section A1.

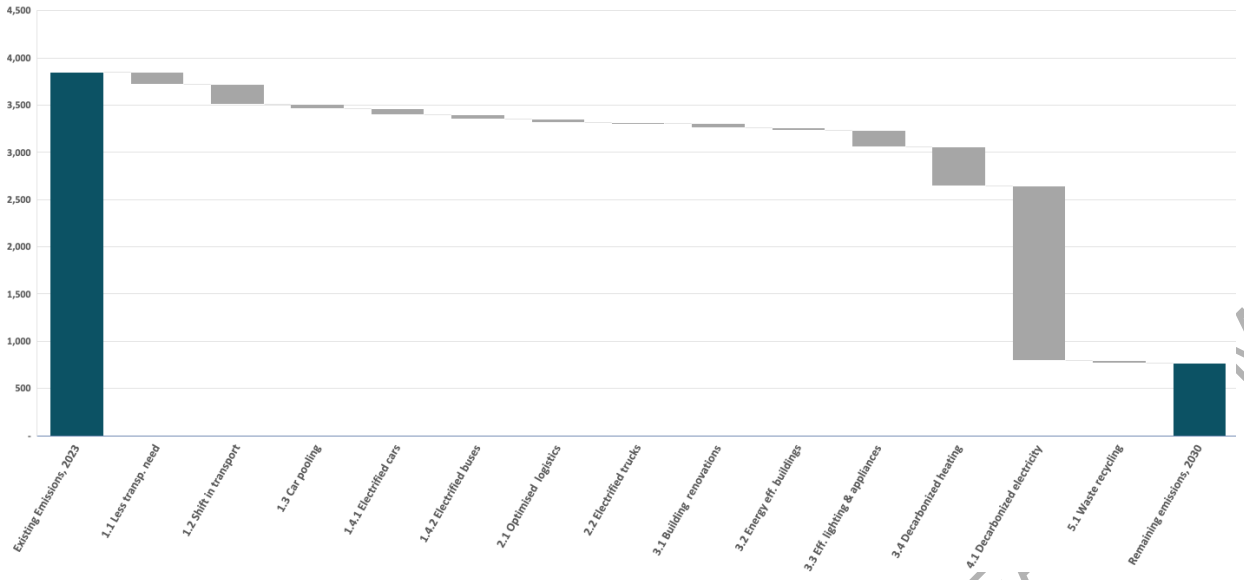


Figure 10: Terra's CO_2 Abatement Curve by 2030 (CO_2Kt per annum)

The city will, however, require significant funding for the upfront investments in these climate projects – particularly for the projects undertaken by municipally owned companies TerraBus and TerraSpark. As outlined in Section B2, Terra City Council have approved the future issuance of a Municipal Green Bond for €250mn which will sufficiently cover the forecast €219mn in capital expenditure required by the municipality, as outlined in *Figure 11* below. Further details on the capital planning for these climate actions can be found in Section B2.

Significant Projects

As mentioned above, the city has identified some ambitious projects that will contribute significantly to GHG emissions reduction. These projects will require large capital amounts to implement but are the keystone of Terra's CAP. A granular breakdown of all remaining projects can be found in the CAP. The four major projects are as follows:

TerraTram

Estimated Cost: €422mn Capital Expenditure; €163mn Annual Operating Expenses

Terra is assessing the feasibility of a new inner-city tram link that will connect the suburban Western District with the Southeastern town of Terra Est via the main city downtown area. The city recently received an ELENA funding grant to complete feasibility analysis and modelling for the project, with an intended construction period of 2025 to 2028 and a fully operational tramway available from late 2028. Although the feasibility process is currently underway, it is estimated that approximately 55% of the city's population would be within 500m of the new tram line and that annual ridership could reach 105 million journeys by 2030. The construction and operation of the project will be undertaken by the municipally owned transport operator TerraBus, which intends to obtain a loan to fund the majority of the project (further details in Section B2). In line with the development of the TerraTram, the city will research optimisation of the TerraBus network to focus on under-serviced areas of the city and to provide

connections to nearby TerraTram stops. Further details of the project and expected outcomes can be found on the TerraBus.TE website.

ProjectGreen

Estimated Cost: €823mn Capital Expenditure; €212mn Operating Expenses

Terra is looking to undertake a vast retrofitting programme of all public buildings and social housing, and will also look to provide an initiative or grant funding for the retrofitting of private residential houses to become energy efficient. At this stage, the anticipated cost to the city will be about €90mn for all public buildings and social housing, with citizens requiring approximately €450mn to finance the retrofitting of their homes and an additional €283mn needed by private sector asset owners to meet new commercial energy efficiency requirements of the city. The city intends to finance the public building and social housing project through the issuance of the Municipal Green Bond, and will enforce private sector retrofitting through the city's planned Commercial Energy Efficiency Framework (CEEF), which will require all private sector commercial and retail buildings to meet stringent energy efficiency requirements by the year 2030.

As for private residential homes, the city has begun discussions with a national retail bank about the possibility of providing discounted renovation loans to private citizens. One other area of discussion is some form of ESCO agreement for all high-rises and condominiums. Further information on ProjectGreen can be found on the Terra.TE website.

District Heating

Estimated Cost: €910mn Capital Expenditure; €218mn Operating Expenses

The shift from a decentralised heating network to new district and localised heating is of vital importance to Terra. This project is still at a very early stage of development but is fundamental to the city's decarbonisation. At this stage, the city is in talks with TerraSpark about the potential for this development and the implementation phase – this is expected to be a substantial project. Although very little is known about the project at this time, it is mentioned in this plan due to its importance to the decarbonisation of the city. Further details can be found at TerraSpark's website, TerraSpark.TE.

Terra Windfarm

Estimated Cost: €625mn Capital Expenditure; €311mn Operating Expenses

Given the geographical location of Terra, wind turbines offer the strongest potential for clean energy generation in the city (as opposed to hydro or solar). The city's public utility provider – TerraSpark – has developed an ambitious roadmap toward a self-sustainable energy network, powered by wind turbines, for the city. The project will surround Terra's outer boundary and involve 500 new wind turbines that will generate close to 2,500GWh of electricity per annum for the city. The first phase of the project – North East One – is due to commence construction in 2024. The installation of turbines will be supported by redevelopment of the city's power grid and – when combined with the ongoing PV installations on public buildings – will mean self-sufficient energy generation for the city from 2030. Costs are currently estimates as a tendering process is underway to decide on the supplier of the turbines and the contractor for their installation.

B2: Capital Planning for Climate Neutrality

This section requires cities to identify the funding and financing gaps within their IP so as to begin the process of securing additional funding and financing for climate actions. This exercise encourages cities to begin the process of identifying potential solutions at the project level.

As can be seen in *Figure 11*, there is a significant capital requirement for the municipality to fund the identified climate actions. The municipality will need to spend €219mn to implement the desired climate actions, with a further €1,714mn required from municipally owned companies. This is made additionally challenging by the barriers to climate investment that exist in the city (as outlined in Section A3), with the city unable to run at a budget deficit or to engage with or develop PPPs.

			Asset Owners - Capex €m					
Decarbonisation Lever	Total CO2 Reduction by 2030 (Kton)	% of Total Reduction	Citizens	Private Asset Owners	Municipality	TerraBus (Transport)	TerraSpark (Utilities)	Total
Transport	**541**	**18%**	**80**	**104**	**37**	**459**	**18**	**698**
Reduced Passenger Transportation Need	128	4%	0	0	0	0	0	0
Shift to Public & Non-Motorised Transport	212	7%	7	0	3	412	0	422
Increase Car Pooling	42	1%	0	0	0	0	0	0
Electrification of Passenger Cars	64	2%	73	41	15	0	0	129
Electrification of Busses	48	2%	0	0	0	47	0	47
Optimised Logistics	35	1%	0	0	11	0	0	11
Electrification of Trucks	12	0%	0	63	8	0	18	89
Built Environment & Heating/Cooling	**663**	**22%**	**557**	**821**	**174**	**0**	**689**	**2,241**
Building Renovations	47	2%	451	283	89	0	0	823
New Energy Efficient Buildings	21	1%	0	204	0	0	0	204
Efficient Lighting & Appliances	183	6%	94	143	67	0	0	304
Decarbonising Heating/Cooling Generation	412	13%	12	191	18	0	689	910
Electricity	**1,843**	**60%**	**2**	**71**	**4**	**0**	**548**	**625**
Decarbonising Electricity Generation	1,843	60%	2	71	4	0	548	625
Waste	**31**	**1%**	**1**	**0**	**4**	**0**	**0**	**5**
Increased Waste Recycling	31	1%	1	0	4	0	0	5
Nature-based Solutions	**2**	**0%**	**0**	**9**	**0**	**0**	**0**	**9**
Reforestation	2	0%	0	9	0	0	0	9
Total	**3,080**	**100%**	**640**	**1,005**	**219**	**459**	**1,255**	**3,578**

Figure 11: Terra's Capital Expenditure Spend for Decarbonisation of the City 2023-2030

Terra has developed a capital plan to ensure all required expenditure for the municipality (including for TerraBus and TerraSpark) will be covered, and has begun to develop relationships with the private sector to help facilitate the approximately €1bn in financing required in relation to private asset owner activity and the €640mn related to activity by the citizens of Terra (mainly for the retrofitting of their properties and purchase of electric vehicles). *Figure 12* breaks down the current status of funding / financing for the sub-sectors that have been outlined in Section B1 and the CAP.

Municipality

Of the forecast municipal capital expenditure requirement of €219mn for the identified climate actions, €197mn will be financed through the issuance of a €250mn Green Municipal Bond in late 2023. €18mn of the remainder will be financed through the city's transport budget over time through the 2023 – 2030 period – this relates to the new cycleways and the electrification of the city's vehicle fleet. The remaining

€4mn that is unaccounted for relates to the windfarm and, as yet, has no established financing source. Details on the options for financing the windfarm can be found in the TerraSpark section below. *Figure 13* is a breakdown of anticipated capital expenditure requirements per year for the municipality (excluding municipally owned organisations such as TerraSpark and TerraBus).

As can be seen in *Figure 13*, the investments into capital projects will be front-ended following receipt of the proceeds from the Municipal Green Bond. It is expected that the remaining €50mn of proceeds from the bond issuance that have not yet been allocated to a climate action project can help to finance local climate initiatives and also be held for any new projects to be established in the coming years. **It is anticipated that the expected yield on climate capital will be in the range of 6.2 – 7.2%** with the bond duration of seven years through to 2030.

TerraBus

The municipally owned TerraBus is forecast to require €459mn over the 2023-2030 period to finance the projects outlined within the CAP, with the majority of this for the new tramway and the remainder for the electrification of the bus fleet. The €47mn required for the electrification of the bus fleet will be taken from the city's transport budget over time, and there is already an agreement in place with a private provider for the EV charging infrastructure and maintenance of the batteries (TerraBus only owns the chassis in order to reduce costs). Of the €412mn required for the TerraTram project, about €2mn has been financed by an ELENA grant to conduct a feasibility study and the required modelling. It is envisaged that the remaining €410mn will be financed by three separate components: A €120mn grant from the national government which is currently in negotiation; a green loan from a national bank for €200mn, which is also currently in negotiation but is anticipated to be a 10-year loan with 3.25-3.5% interest rate; and the remaining €90mn will be financed by a private investor in exchange for an equity stake in the project. The city has been approached by an external investor that would provide and operate the tram fleet, and negotiations are underway, but details cannot yet be disclosed.

			Capex €m for the Municipality				
Decarbonisation Lever	Total CO2 Reduction by 2030 (Kton)	% of Total Reduction	Municipality	TerraBus (Transport)	TerraSpark (Utilities)	Total	Funding & Financing
Transport	**541**	**18%**	**37**	**459**	**18**	**514**	
Reduced Passenger Transportation Need	128	4%	0	0	0	0	
Shift to Public & Non-Motorised Transport	212	7%	3	412	0	415	*ELENA funding secured for PDA and feasibility study. TerraBus to issue Green Loan to finance significant portion of Tram initiative.*
Increase Car Pooling	42	1%	0	0	0	0	
Electrification of Passenger Cars	64	2%	15	0	0	15	*Municipal fleet to be electrified over time - this will be taken from the city's annual budget for transport not through capital financing.*
Electrification of Busses	48	2%	0	47	0	47	*Bus fleet electrification will take place over time as part of transport budget of the city. PPP already in place for maintenance of batteries and charging infrastructure.*
Optimised Logistics	35	1%	11	0	0	11	*Logistics electrification and optimisation will be an established project of the municipality - see Climate Action Plan. To be financed with proceeds of the city's Green Municipal Bond issuance.*
Electrification of Trucks	12	0%	8	0	18	26	*Logistics electrification and optimisation will be an established project of the municipality - see Climate Action Plan. To be financed with proceeds of the city's Green Municipal Bond issuance.*
Built Environment & Heating/Cooling	**663**	**22%**	**174**	**0**	**689**	**863**	
Building Renovations	47	2%	89	0	0	89	*ProjectGreen will be financed via proceeds from the city's Green Municipal Bond issuance.*
New Energy Efficient Buildings	21	1%	0	0	0	0	
Efficient Lighting & Appliances	183	6%	67	0	0	67	*ProjectGreen will be financed via proceeds from the city's Green Municipal Bond issuance. A smaller project to replace street lighting is detailed in the Climate Action Plan and will also be financed using the Green Bond.*
Decarbonising Heating/Cooling Generation	412	13%	18	0	689	707	*It is still undecided how the ~€700m for this project will be financed. The potential options include a green loan or the construction of a PPP / EPC to finance the project.*
Electricity	**1,843**	**60%**	**4**	**0**	**548**	**552**	
Decarbonising Electricity Generation	1,843	60%	4	0	548	552	*EIB Loan in place for installation of PV on municipal public buildings. That project is not included in these capex forecasts. Funding for the city's new windfarm has not yet been established. Options include the use of a Green Bond or a direct private equity investment from an external partner.*
Waste	**31**	**1%**	**4**	**0**	**0**	**4**	
Increased Waste Recycling	31	1%	4	0	0	4	*New recycling plant to be constructed in 2024, this is a municipal capital project financed by the proceeds of the Municipal Green Bond.*
Nature-based Solutions	**2**	**0%**	**0**	**0**	**0**	**0**	
Reforestation	2	0%	0	0	0	0	
Total	**3,080**	**100%**	**219**	**459**	**1,255**	**1,933**	

Figure 12: Terra's Capital Planning for its CAP project portfolio 2023-2030

TerraSpark

TerraSpark require a total of €1,255mn to finance associated projects in the CAP. €18mn of this is linked to electrification of the trucking fleet in the city and the associated infrastructure. This will be financed from TerraSpark's operating budget. The remaining capital requirement is for the new district heating network (€689mn) and the development of Terra's windfarm (€548mn). At this early stage of these latter two projects, no secured financing agreement has been made and there is therefore a requirement to find a significant amount of capital. Some of the options that Terra City Council are exploring include a

green loan or issuance of a green bond, as well as the potential to develop a PPP or secure private investment in the assets. **Of the municipal capital expenditure requirements, these two projects represent the only identified funding and financing gaps that need to be overcome.**

Decarbonisation Lever	2023	2024	2025	2026	2027	2028	2029	2030	Total Capex €m	% of Total Capex
Transport	**3**	**11**	**12**	**6**	**5**	**0**	**0**	**0**	**37**	**17%**
Reduced Passenger Transportation Need	0	0	0	0	0	0	0	0	0	0%
Shift to Public & Non-Motorised Transport	0	0	3	0	0	0	0	0	3	1%
Increase Car Pooling	0	0	0	0	0	0	0	0	0	0%
Electrification of Passenger Cars	2	4	4	4	1	0	0	0	15	7%
Electrification of Busses	0	0	0	0	0	0	0	0	0	0%
Optimised Logistics	1	7	3	0	0	0	0	0	11	5%
Electrification of Trucks	0	0	2	2	4	0	0	0	8	4%
Built Environment & Heating/Cooling	**7**	**88**	**43**	**16**	**2**	**18**	**0**	**0**	**174**	**79%**
Building Renovations	3	47	26	13	0	0	0	0	89	41%
New Energy Efficient Buildings	0	0	0	0	0	0	0	0	0	0%
Efficient Lighting & Appliances	4	41	17	3	2	0	0	0	67	31%
Decarbonising Heating/Cooling Generation	0	0	0	0	0	18	0	0	18	8%
Electricity	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**4**	**2%**
Decarbonising Electricity Generation	0	1*	1*	1*	1*	0	0	0	0	0%
Waste	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**2%**
Increased Waste Recycling	0	4	0	0	0	0	0	0	4	2%
Nature-based Solutions	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**
Reforestation	0	0	0	0	0	0	0	0	0	0%
Total	**10**	**104**	**56**	**23**	**8**	**18**	**0**	**0**	**219**	**100%**

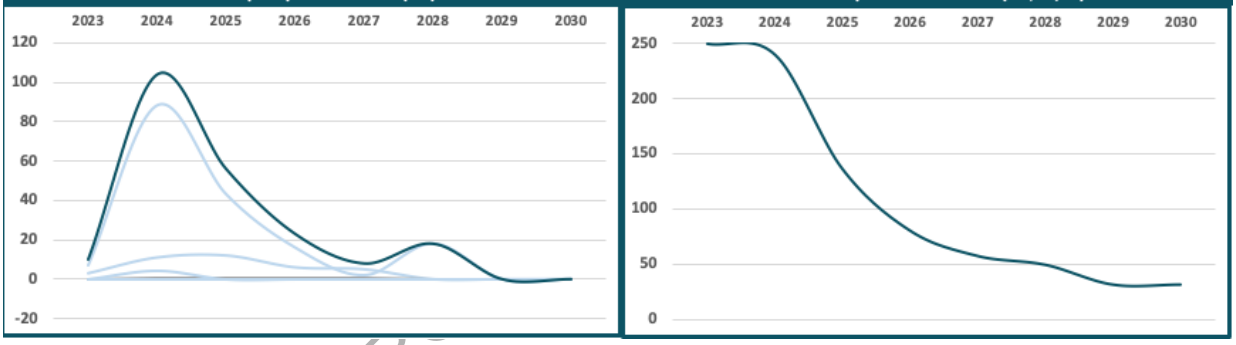


Figure 13: Terra's Capex Spending Plan for the Municipality 2023-2030

Private Asset Owners

Private asset owners will need to invest approximately €1bn to decarbonise the city as per the actions identified in the CAP. The majority of this investment relates to the built environment. It involves private landlord organisations as well as commercial and retail properties. Whilst private asset owners cannot be forced to invest, the city has recently been engaging with major asset owners to encourage investment. In addition, the city is considering implementing a new Commercial Energy Efficiency Framework that would require all commercial and retail properties to meet new, stringent energy efficiency requirements or face penalties. The city envisages that investment activity by private asset owners will take time but will ramp up over the coming years on the back of increased engagement and (potentially) the new policy framework.

Citizens

The citizens of Terra will also be required to invest a total of about €0.5bn over the period if the city is to reach net zero. These investments will be focused on privately owned property (i.e., residential housing and private vehicles). For housing, the city is engaging with national banks to try and establish a discounted loan for residents to retrofit their properties. In the case of condominiums, the city is assessing the establishment of an ESCO. For private vehicles, the city is engaging with the national government and hopes to secure a national subsidy scheme to help with the purchasing of electric vehicles.

B3: Economic and Financial Indicators for Monitoring, Evaluation, and Learning

A strong and robust monitoring, evaluation, and learning framework is crucial for internal monitoring as well as a requirement for securing external capital as any capital investor would require a monitoring mechanism.

Terra has a robust data collection process that was established in 2017 when the city began identifying and financing climate action projects (as detailed in Section A1). This data is collected annually and published online with public access at TerraClimateCapture.TE. In order to develop this CIP, the municipality has added new financial indicators, including **eROIC – emissions return on invested capital**. For private investments or sensitive data, the city plans to establish an online dataroom where access can be restricted to the relevant parties.

The city has identified an opportunity to improve the economic indicator set to also include new job creation and economic value added to public assets. A thorough review of the economic indicator set will therefore take place in early 2024, with new indicators added to the next iteration of the CIP, due for publication in 2025.

As can be seen in *Figure 14*, the city has set some ambitious targets including a 70% share of heating from district heating networks by 2030, and 0% of energy generation from fossil fuels or biofuels. The aim is to reduce private vehicle travel by 28% through the introduction of the new TerraTram and the optimised bus network.

The financial indicator set includes an increase of the annual ringfenced budget for climate actions to 28.5% by 2030, as well as an **optimised eROIC of €0.55mn spent per CO_2Kt reduced versus the 2022 baseline of €0.7mn**.

Sector	Indicador	Indicator Unit	2022 Baseline	2030 Target
Transport	*Reduced Passenger Transport Need*	*% reduction by 2030*	0%	23%
	Shift to Public & Non-Motorised Transport	*% reduction in car passenger kilometers by 2030*	0%	28%
	Increase Car Pooling	*average passengers per car*	1.2	1.6
	Electrification of Passenger Cars	*% of fleet electrified*	14%	41%
	Electrification of Busses	*% of fleet electrified*	6%	100%
	Optimisation of Trucking Logistics	*average utilisation of Trucks*	23%	45%
	Electrification of Trucks < 3.5t	*% of fleet electrified*	0%	47%
	Electrification of Trucks > 3.5t	*% of fleet electrified*	0%	23%
Buildings & Heatin	*Building Renovations*	*% annual renovation rate*	3.1%	3.5%
	New Energy Efficient Buildings	*% of buildings built to the top standard*	23%	40%
	Efficient Lighting & Applicances	*% annual renovation rate*	4.6%	5.0%
	Generation	*share of heating as district heating*	0%	70%
	Generation	*share of district heating produced using fossil fuels*	n.a.	0%
	Generation	*share of district heating produced using heat pumps*	n.a.	60%
	Generation	*share of district heating produced using bio fuels*	n.a.	0%
Electricity	*Decarbonising Electricity Generation*	*share of electricity produced using fossil fuels*	n.a.	0%
Waste	*Paper recycling*	*% recycling rate*	23%	75%
	Metal recycling	*% recycling rate*	18%	100%
	Plastic recycling	*% recycling rate*	7%	50%
	Glass recycling	*% recycling rate*	14%	75%
	Organic recycling	*% recycling rate*	0%	20%

Figure 14: Terra's Economic Indicator Set

Field of Action	Indicator	Indicator Unit	Indicator Baseline (2022)	Indicator Target (2030)
Cross-Cutting	Public Budget Invested in Climate Actions	*€ bn*	€1.6bn	€2.1bn
	Budget Assigned to Climate Actions	*% of Annual City Budget*	19.9%	28.5%
	Public Budget Invested in Climate Actions per Capita	*€ 000s*	€1,345	€1,800
	Private Capital Invested in Climate Actions	*€ bn*	€0.3bn	€3.8bn
	Coverage of Climate Finance Gap	*% of Finance Gap*	23%	90%
	Public to Private Capital Ratio	*Ratio*	1:01	1:1.8
	Emission Return on Invested Capital	*€ m*	€0.7m	€0.55m
	Cost Coverage	*% of Costs Covered*	218%	285%
Mobility & Transport	Public Budget Invested in Climate Actions	*€ bn*	€0.8bn	€0.6bn
	Private Capital Invested in Climate Actions	*€ bn*	€0.1bn	€1.4bn
	Coverage of Climate Finance Gap	*% of Finance Gap*	53%	95%
	Emission Return on Invested Capital	*€ m*	€3.1m	€1.8m
Built Environment	Public Budget Invested in Climate Actions	*€ bn*	€0.3bn	€0.6bn
	Private Capital Invested in Climate Actions	*€ bn*	€0.1bn	€0.8bn
	Coverage of Climate Finance Gap	*% of Finance Gap*	42%	88%
	Emission Return on Invested Capital	*€ m*	€0.6m	€0.6m
Waste Management	Public Budget Invested in Climate Actions	*€ bn*	€0.2bn	€0.6bn
	Private Capital Invested in Climate Actions	*€ bn*	€0.0bn	€0.0bn
	Coverage of Climate Finance Gap	*% of Finance Gap*	33%	100%
	Emission Return on Invested Capital	*€ m*	€0.4m	€0.4m
Energy	Public Budget Invested in Climate Actions	*€ bn*	€0.3bn	€0.3bn
	Private Capital Invested in Climate Actions	*€ bn*	€0.1bn	€1.6bn
	Coverage of Climate Finance Gap	*% of Finance Gap*	12%	83%
	Emission Return on Invested Capital	*€ m*	€0.6m	€0.45m

Figure 15: Terra's Financial Indicator Set

C1: Climate Policies for Capital Formation and Deployment

This is an opportunity for cities to identify potential policies to aid in facilitation of capital flows towards climate actions. This can take the form of high-level municipal actions or project-specific developments.

Climate Policy	Description of the Policy	Intended Outcome for Capital Formation
National Climate Act	The emission reduction targets for the country are much higher and more stringent than most of Europe, and has specific penalties for regions and cities failing to achieve targets.	The Act enables the development of a stable investment evironment towards Net Zero.
National Ban on Fossil Fuels by 2035	There is a national ban on the burning of fossil fuels for energy generation by 2035, with all remaining assets being forced to close at this time.	This is encouraging significant public and private investment into renewable energy assets as there is no alternative for energy generation from 2035 onwards.
EU Directive on Energy Efficiency	The Energy Efficiency Directive and Energy Efficiency Act lay down energy efficiency targets at the EU and National level. This was updated in 2021 with the new target to reduce energy consumption by 36-39% by 2030.	These requirements encourage investments to be directed to improving energy efficiency and also the development of new energy efficient construction of buildings.
EU Emission Trading System (ETS)	A cap has been set on the amount of GHGs that can be emitted by factories, power plants and other installations. This cap is reduced over time which forces an emission reduction.	Revenues from the sale of the allowances are put into a social climate fund to support energy-poverty alleviation.
Fit for 55 Package	The European Climate Law makes reaching the EU's climate goal of reducing EU emissions by at least 55%by 2030 a legal obligation.	The Fit for 55 package retained the Innovation Fund for investment, and the Modernisation Fund, and introduced a new Social Climate Fund which will invest to support energy-poverty alleviation.
Increase in Terra's Tourism Tax for Flights	The city of Terra intend to increase the current €15 per night tourism tax to €25 per night for any tourist that used an aircraft to reach Terra.	This initiative will have the dual effect of discouraging flying (vs encouraging train use or driving), and raising additional funds that can be used to finance local climate action projects.
Terra's Commercial Energy Efficiency Framework	A new framework for all commercial and retail premises that includes stringent energy efficiency requirements or face severe financial penalties.	This will encourage private investment from private sector asset owners who will need to retrofit their existing commercial and retail properties to ensure compliance with the new framework.

Figure 16: Existing & Potential Enabling Policies to Support Climate Investment in Terra 2023-2030

Due to the barriers identified within Section A3, the city has limited scope for adjusting policies to facilitate capital flows. The municipality is not allowed to run at a deficit and cannot establish PPPs, and this is unlikely to change. The city has, however, identified potential policies that could encourage or, in some cases, compel the deployment of private sector capital for climate actions. The biggest example of this is the establishment of Terra's CEEF, which would enforce energy efficiency requirements in all commercial and retail properties by 2030. Another fiscal policy that the city is investigating is the introduction of an increased tourist tax for those that fly into the city, in order to generate new funds for climate actions and also to discourage flying to Terra (the standard and coverage of the regional and national train infrastructure is such that Terra does not envisage such a tax significantly impacting the number of tourists visiting the city).

C2: Identification and Mitigation of Risks

By establishing a risk management framework and developing risk mitigations at both the sector and project level, cities can ensure they are equipped to identify any problems quickly and deal with these problems efficiently when they arise.

Terra has a robust risk management and mitigation framework in place (described in *Figure 17* below) that is tied to the indicators dashboard. The data collection process established for the indicators dashboard is leveraged in the collection of data to monitor investment and financial risks. There are both project-specific and cross-cutting risks to monitor. The largest risk to the city is an inability to pay its contractual obligations and sinking into a budgetary deficit, which would mean the enforcement of penalties by the national government and new oversight requirements.

Sector	Sub-Sector/Project	Risk	Risk Level	RAG	Mitigation Procedure
Mobility	Public Transport	Citizens do not shift to using more public transport or the take-up of public transport usage is too slow.	3		The introduction of the TerraTram and the optimised bus network will encourage higher public transport usage. These exercises will help avoid this risk becoming a concern.
Mobility	Public Transport	The level of public transport in less desireable (and lower socioeconomic) areas of the city is poor and is usually the areas where the population relies on public transport more. There is a risk of creating further inequality as a result of climate actions developing a new tramway.	3		The planned tramway will directly service some of the areas of Terra with a less wealthy demographic, and the optimisation of the bus route to service those not directly reachable with the tram will overcome this economic issue.
Mobility	Electric Vehicles	Electricity costs could spike and cause problems if the city becomes reliant on electrification. This could result in unaffordable travel for private cars and increased operational costs for the municipal fleet.	2		The recent tension in Ukraine and Russia has caused increased prices for energy, and further escalation could exacerbate this concern. By shifting energy generation to renewables and toward self-sufficiency the city will try to overcome this risk.
Built Environment	Retrofit	Recent cost increases in the building sector may reduce the willingness and the ability of public and private owners to retrofit towards energy efficiency.	2		There are several schemes to mitigate this risk, including the promotion of circular economy products and recycling construction materials, as well as introducing discounted retrofit loans in collaboration with a private retail bank.
Energy	Energy Generation	There is a risk that due to financial issues or an insecure financial environment investments slow down into renewable energy generation.	1		The city plans to overcome this risk by the developing of the Terra windfarm in collarboration with the municipally owned TerraSpark. This windfarm will ensure self-sufficiency for the city.
Energy	Clean Energy Use	In the current time, the affordability and availibility of green energy sources has been disrupted due to the ongoing issues in Russia and Ukraine. As a result, the city has been forced to procure more fossil fuels for energy generation than previously.	1		This is an ongoing issue that the city is looking to overcome by long-term contracts for energy in the city. TerraSpark update the government on a weekly basis as to their developments in mitigating this risk.
Energy	All Projects	There is a risk that implementing new policies (e.g. carbon pricing mechanisms or shifting to renewables) may have an impact on financial markets and both local and national corporations.	2		Cooperating with energy providers at the local and national level through our stakeholder engagement programme should allow a soft landing and adequate transition for companies.
Cross-Cutting	Financing Solutions	Climate investments typically offer a lower return on investment than traditional market products and come with additional complications and risks. There is the chance that private investors do not choose to invest in these products leaving significant funding gaps for the city.	2		By leveraging the support of the NetZeroCities platform the city intend to develop innovative finance mechanisms and solutions that encourage external investment. The city's Municipal Green Bond is the first example of this.
Cross-Cutting	Financing Climate Transition	The increased population of the city, as well as the need for significant investment in decarbonisation, means that the city's budget requirements are always under strain.	1		This is a significant problem for the city of Terra and is one that is heavily monitored. The city utilises a dashboard to monitor the current debt servicing coverage of the city and has a robust budget and cost forecasting process.

Figure 17: Terra's Risk Framework for Economic and Financial Risks

Risk management is a central part of the city's annual budget and forecasting exercise, and the City Council has a dedicated risk management meeting each month to monitor any potential risks. Each risk has an assigned importance value of between 1 (highest) and 3 (lowest), which is determined by the severity of the risk and its implications, and there are monthly updates as to the likelihood of each risk that follows the RAG (Red, Amber, Green) system, with red indicating an imminent threat of triggering and green indicating that the risk is low at this time. In the event that a risk is triggered, the mayor is immediately alerted and a Handling Meeting is convened. Risks are also elevated to the national government.

Please note that the risks listed in *Figure 17* are only related to climate finance and investment in climate actions – a fully comprehensive risk framework for all climate actions is available in the Terra CAP.

C3: Capacity Building and Stakeholder Engagement for Capital and Investment Planning

Cities should use this exercise to identify any potential stakeholders that can support the financing and development of their CAP. By identifying these stakeholders early, cities can facilitate optimal engagement.

Capacity Assessment and Capacity Building

Terra has conducted a thorough assessment of the city administration's internal capacity and identified some significant internal weaknesses. Though engagement between the city's climate and finance teams has improved significantly through the development of the CIP, it is clear that the climate team still has some knowledge gaps as regards financial and cost analysis of projects, and the finance team lacks the investment and markets experience that is crucial for securing private investment and engaging with private capital.

The recent ELENA funding has allowed the city to bring on a new climate finance advisor who sits in both the finance and climate departments to work on the development of the tramway feasibility study, and this is strengthening the ties between departments and helping to build internal capacity.

Through the NetZeroCities programme, city officials have attended webinars and conferences to develop an understanding of innovative finance solutions and how to engage with private capital. The city plans to leverage the programme's Cities Mission Capital Hub to help flesh out an investment plan for the new windfarm and district heating network. Outside of NetZeroCities, the climate and finance teams have attended webinars introducing the new EU Taxonomy framework, and national capacity-building workshops aimed at developing bankable climate projects.

With the issuance of the city's Green Municipal Bond upcoming, the city's finance team are currently looking to hire a corporate finance officer to join the team and help with the issuance. This individual will need an extensive investment or finance background. A budget has been secured for this role. It is hoped that the new hire will be able to build a team over time that can develop capital projects and project financing models, as well as engage with private investors.

Stakeholder Engagement

As has been made clear in this CIP, it is of vital importance for the city administration to engage with numerous stakeholders if the climate actions that have been identified are to be successfully financed and implemented. This engagement ranges from reaching out to private companies that will need to

spend over €1bn to decarbonise, to private investors who may invest in the Municipal Green Bond and provide financing for some of the planned major infrastructure projects.

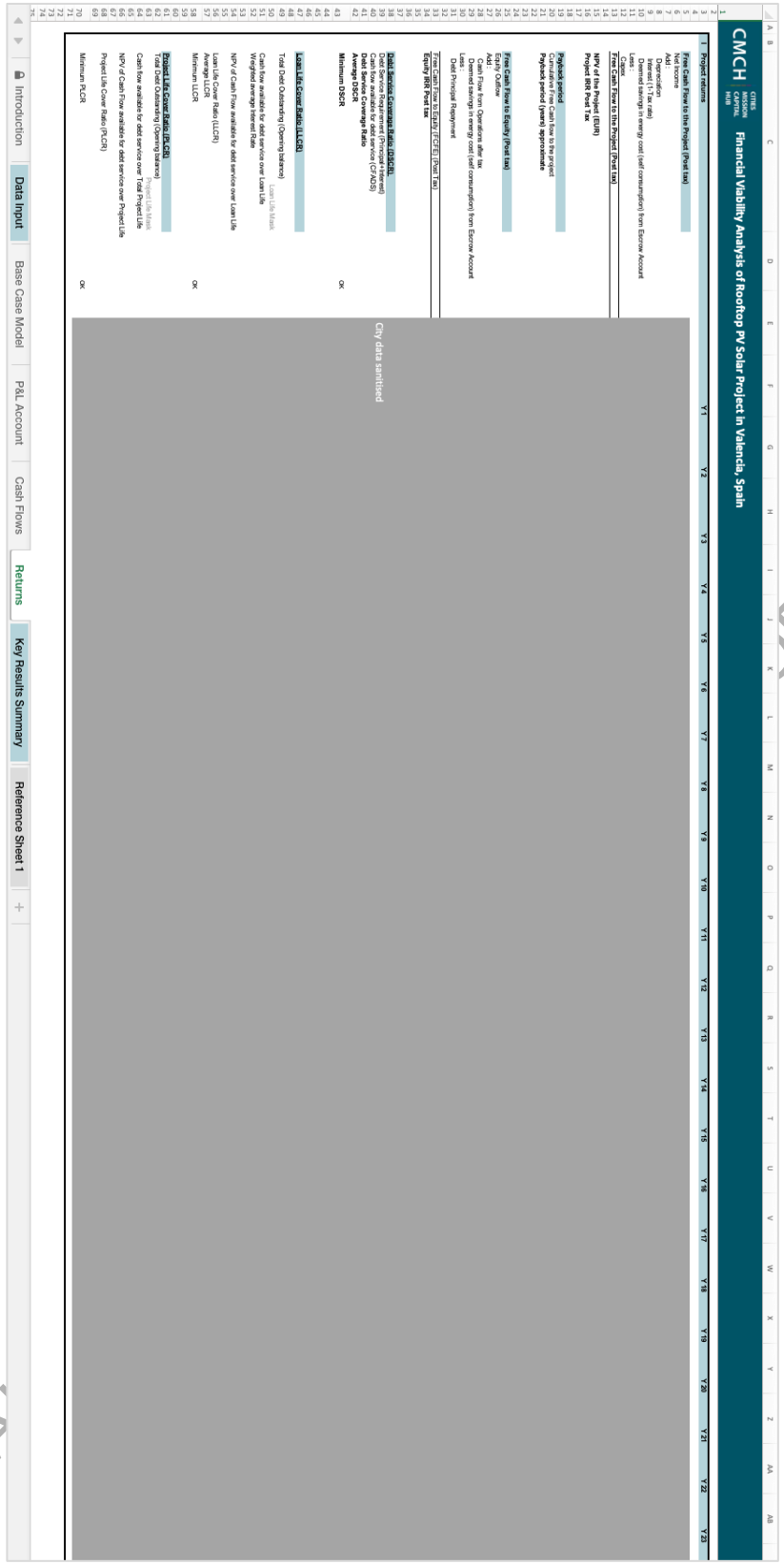
The city has developed a stakeholder engagement plan that targets the most significant and influential stakeholders and focuses on establishing long-term relationships. By co-creating climate actions with these stakeholders, the city is better placed to find solutions that are viable, impactful and offer potential to provide attractive economic outcomes for all parties.

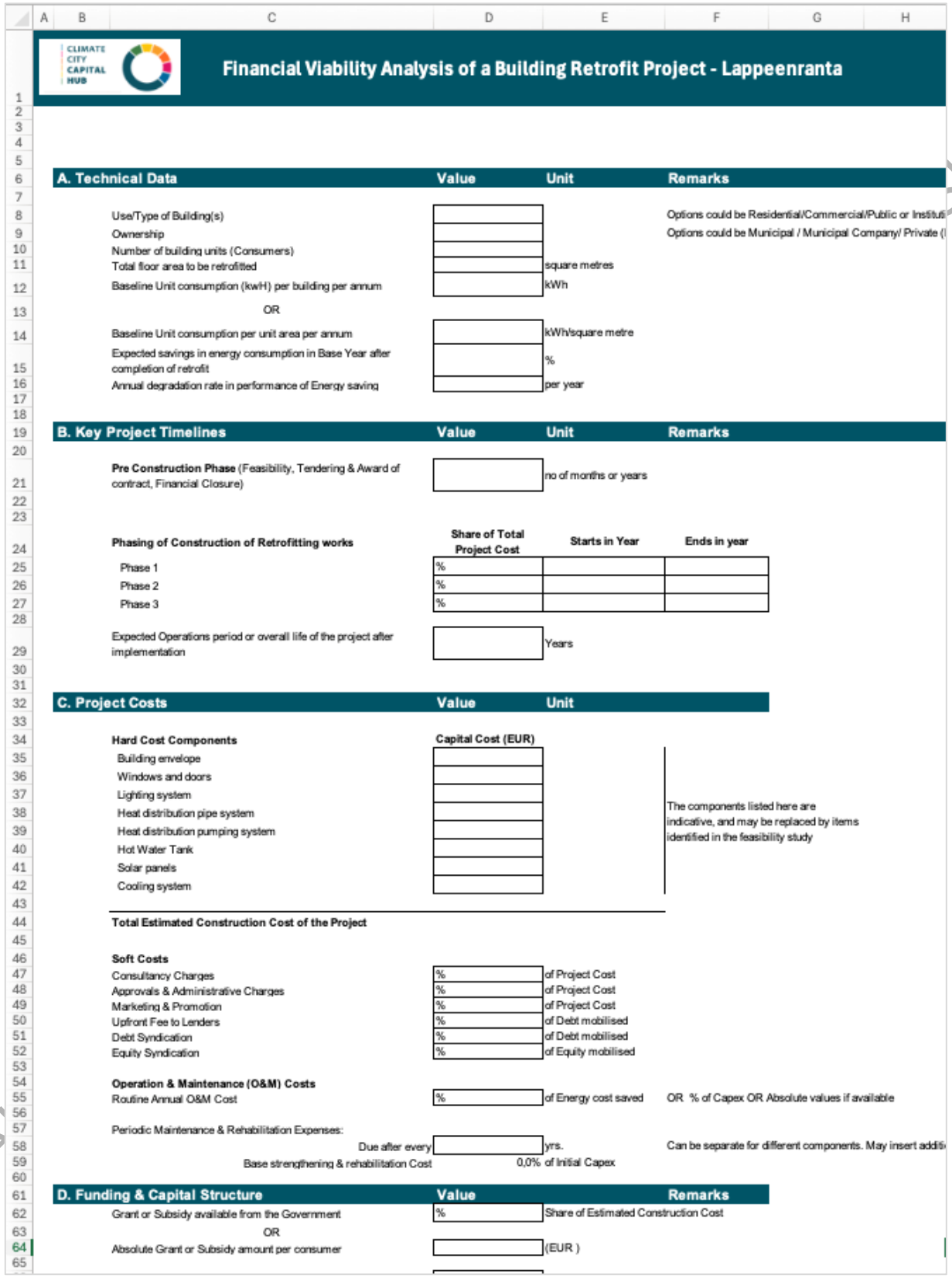
Figure 18 provides a breakdown of all stakeholder engagement related to finance and investment. For a comprehensive stakeholder mapping and list of engagement, please see the city's CAP. The names of some organisations have been withheld due to sensitivities over ongoing negotiations.

Stakeholder	Sector	Interest	Influence Level (1-3)	Type of Engagement
Ministry of Finance	Cross-cutting	Weekly discussions with the national Ministry of Finance on the deferment of funds for climate and infrastructure projects.	1	Weekly and friendly conversation with colleagues at the Ministry.
Bio Buildings Ltd	Built Environment	Construction company that utilises the recycling and reusing of building materials, with a view to helping develop a retrofit project for public buildings.	2	Procurement discussions for bio-materials and recycled construction materials.
MuniBank	Built Environment	Local bank looking to engage and develop green retrofitting loans for private residential homes.	2	Initial feasibility discussions for a new innovative financial product.
BwB	Cross-cutting	Work with BwB to build financial models and seek external financing for transport and energy projects.	2	Initial engagement through NZC and the Capital Hub.
Private Investor for Mobility	Public Transport	Part ownership and operation of the new tramway system.	3	Ongoing engagement for the potential investment in the new tram network.
EIB	Energy	Ongoing relationship with the EIB following the financing of a PV implementation project within the city.	3	Monthly catch-ups on outstanding investment and potential future alignment.
Local Consultant	Cross-cutting	Contracted a local financial consultant to develop a Green Bond framework and book build for the issuance.	3	Constant dialogue on the development of the bond framework and introduction to bond investors.
Various Fixed Income Investors	Cross-cutting	Engagement with interested investors for the municipal green bond.	3	Due diligence discussions and interaction.

Figure 18: Current State of Stakeholder Engagement with Terra City Administration

Appendix 2 – Support Modelling for Cities: Illustrative Excel Model Snapshots





CLIMATE CITY CAPITAL HUB

Financial Viability Analysis of a Building Retrofit Project - Lappeenranta

A. Technical Data	Value	Unit	Remarks
Use/Type of Building(s)			Options could be Residential/Commercial/Public or Institut
Ownership			Options could be Municipal / Municipal Company/ Private (
Number of building units (Consumers)			
Total floor area to be retrofitted		square metres	
Baseline Unit consumption (kwH) per building per annum		kWh	
OR			
Baseline Unit consumption per unit area per annum		kWh/square metre	
Expected savings in energy consumption in Base Year after completion of retrofit		%	
Annual degradation rate in performance of Energy saving		per year	

B. Key Project Timelines	Value	Unit	Remarks
Pre Construction Phase (Feasibility, Tendering & Award of contract, Financial Closure)		no of months or years	

Phasing of Construction of Retrofitting works	Share of Total Project Cost	Starts in Year	Ends in year
Phase 1	%		
Phase 2	%		
Phase 3	%		

Expected Operations period or overall life of the project after implementation		Years

C. Project Costs	Value	Unit	
Hard Cost Components	Capital Cost (EUR)		
Building envelope			The components listed here are indicative, and may be replaced by items identified in the feasibility study
Windows and doors			
Lighting system			
Heat distribution pipe system			
Heat distribution pumping system			
Hot Water Tank			
Solar panels			
Cooling system			
Total Estimated Construction Cost of the Project			
Soft Costs			
Consultancy Charges	%	of Project Cost	
Approvals & Administrative Charges	%	of Project Cost	
Marketing & Promotion	%	of Project Cost	
Upfront Fee to Lenders	%	of Debt mobilised	
Debt Syndication	%	of Debt mobilised	
Equity Syndication	%	of Equity mobilised	
Operation & Maintenance (O&M) Costs			
Routine Annual O&M Cost	%	of Energy cost saved	OR % of Capex OR Absolute values if available
Periodic Maintenance & Rehabilitation Expenses:			
Due after every		yrs.	Can be separate for different components. May insert additi
Base strengthening & rehabilitation Cost	0,0%	of Initial Capex	

D. Funding & Capital Structure	Value		Remarks
Grant or Subsidy available from the Government	%	Share of Estimated Construction Cost	
OR			
Absolute Grant or Subsidy amount per consumer		(EUR)	