Greener Small Cities:

Deploy Environmental Action Faster and Smarter

by Victoria Vandenberg

Abstract

How might we support small Canadian cities (1k-100k) to become greener and smarter in a way that prioritizes deliberate and proportional action whilst accounting for their unique composition?

Greener Small Cities: Deploy Environmental Action Faster and Smarter, was built to support those in charge of climate action in the municipal level of small Canadian cities with strategy, systemic, and foresight tools. The first half of this report explores the theory surrounding environmental action and smart technologies within a Canadian context. Action is the focus of the second section. We'll walk readers through the steps of building a comprehensive, measurable, equitable, and effective environmental action plan of their own, or revamp the one they currently have in place by learning how to include and manage stakeholders, decide on a vision, set strategic pillars, strategies, and strategic actions, envision future states, leverage data, secure funding, and much more.

Technological fixes alone cannot reduce emissions deeply or rapidly enough.

-Gardner et al., 2016

Land Acknowledgement

I acknowledge that the report authors' work and target audience live and work across what is now called Canada. These lands are traditionally and currently home to many different First Nations, Indigenous, Métis, and Inuit peoples. I recognize how systems around us, and the field of design, have been complicit and complacent in colonization and anti-Indigenous oppression, along with other structures of oppression such as racism, xenophobia, heterosexism, and many others, which all intersect and affect people differently based on their lived experiences and identities. I am committed to working in ways that honour the history of this land; to respect, protect, and uphold the rights of all peoples, and work to undo those structures of oppression.

Author Statement

Hello, I'm honoured that you're here! Thank you for downloading the Greener Small Cities toolkit. This report was built through the lens of a small Canadian city, with a hope to act as a starting or continuation point for ideation and implementation of climate action plans.

There are an abundance of resources listed and activities for you to explore further. Please use this toolkit as an opportunity to start and guide a deliberate conversation with all city stakeholders - residents and employees alike: to determine how we can come together to solve the most challenging problem of our lifetime.

We can do this if we come together - no matter how large or small our municipality is, there is room for change. Let's build upon what we have, and build something even better.

Best of luck with your journey.

For any further questions or consultation requests, please contact
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Introduction

Framing the Problem

Canada is heating up faster than any other country in the world (BBC, 2019). From coast-to-coast, Wildfires have taken over summer headlines and skies, tornadoes are sweeping away urban neighbourhoods in seconds, and floods are demolishing homes and their water systems where cities thought they were ready. Unfortunately, these disasters only seem to be gaining momentum. Studies predict that "fires could burn twice as much average area per year in Canada by the end of the century as has burned in the recent past." (Flannigan, n.d.).

Additionally, in Canada, up to 60% of all local infrastructure is in the hands of local governments (Federation of Canadian Municipalities, 2021). Indicating an inviting opportunity for municipal governments and communities to locally introduce adaptive and mitigative environmental strategies; bearing in mind the strong causal relationship between infrastructure assets globally and climate change.

However, the complexity of implementing such strategies is increasing by the minute. The environment is sometimes knowingly and typically unknowingly woven into every decision we and our government make regarding how we live, work, move, and play. Each of which consists of thousands of systems of its

own - making environmental decisions a wicked problem. As such, the environment is an embedded entity and must be treated as such in how it's approached.

Remarkable work and research have been done globally on the topic - leading to advancements in green technologies, policy, collaborative forums, scientific research, and data collection. Yet, the system is still littered with barriers for stakeholders and decision-makers.

As surprising as it may seem, the technology needed to transition to green living globally already exists. The barrier to progress "is the failure to engage stakeholders and communities (Bibri, 2019). Which luckily for us, is a systems and communication issue, which we know how to solve - meaning, there's lots of hope. This leads me to the problem statement,

How might we support small Canadian cities (1k - 100k) to become greener and smarter in a way that prioritizes deliberate and proportional action whilst accounting for their unique composition?

Forcing an unnaturally speedy transition

"We have to force an unnaturally speedy transition, that introduces a level of complexity - in public policy and technology - that we've never had to deal with before" (Gates, 2021). There is a gap between environmental technologies and city officials' understanding of them, why they are critical, and how to implement them into their city, in a faster and smarter way. Addressing this gap will require not only tools and coordination but as Christina Figueres, the Co-Lead of the Paris Agreement likes to say, radical optimism.

Furthermore, the Intergovernmental Panel on Climate Change (IPCC), recently released a special report from 234 authors from 66 countries drawn from 14,000 essays. Some of their key takeaways were,

- Humans' role in the climate crisis is unequivocal
- CO_2 levels are the highest in 2 million years
- Every bit of action matters and,
- climate goals of 1.5˚C and 2˚C are slipping beyond reach (IPCC, 2018).

In 2015, 196 countries came together to formalize and add accountability to action for climate change, with an overarching goal of "limiting the global average temperature rise to well below 2 degrees Celsius and pursue efforts to limit the increase to 1.5 degrees Celsius." (United Nations Framework Convention on Climate Change, 2021). In the six years since its enactment, it's goal is slipping. Climate change is a wicked problem, comprising numerous systems and subsystems at a global level - which often makes Climate Change feel intangible and unapproachable. Considering compound extreme weather events are on the rise, and every region on earth is already affected (IPCC, 2021), its effects are ever so rapidly becoming tangible, disproportionately affecting disadvantaged groups.

In Bill Gates' new book, How to Avoid a Climate Disaster, he emphasizes a need to get from fifty-one billion tons of greenhouse gases released into the atmosphere to zero. In order to do so, we will need to design and deploy tools for "zero-carbon ways to produce electricity, make things, grow food, keep our buildings cool and warm, and move people and goods around the world." (Gates, 2021). From his research, he has drawn three massive conclusions,

1. To avoid a climate disaster, we have to get to zero
2. We need to deploy the tools we already have, like solar and wind, faster and smarter
3. And we need to create and roll out breakthrough technologies that can take us the rest of the way.

Gates' second point will be the focus of this research paper. We need to deploy tools that we already have, faster and smarter. I'll be exploring this from a municipal Canadian context to equip municipalities with information and tools to navigate environmental decisions, strategic alignments, technology assessments, implementation, and Federal and Provincial support, policy, and funding - to approach the problem from the point of decision making with a goal to maximize the environmental impacts across all of our Canadian systems.

Why? To combat the fact that climate goals of 1.5˚C and 2˚C are slipping beyond reach. "If we do not halve our emissions by 2030, we are highly unlikely to halve emissions every decade until we reach net zero by 2050." (Figueres, 2020). We need to deploy, faster and smarter, now.

Desired Outcome

"Local governments have direct or indirect control over 60% of Ontario's greenhouse gas emissions. There are no substitutes for local information, local capacity and local strategies and solutions."

(Herbert, 2019)

The overarching contribution of this work is assisting cities in implementing environmental action strategies, intending to reduce Canada's carbon footprint from the local municipal level. The process-focused toolkit will outline how to go from concept to implementation for environmental strategies. It will serve as a collaborative tool for city stakeholders to outline why action is necessary, the process based on Canadian contexts, setting and communicating goals and objectives, what smart technologies are available and their impact (how to measure, evaluate, and utilize their data), and how to navigate funding, communications, reporting, and evolving.

The upcoming decade represents a critical tipping point. Either we will collectively meet goals to halve emissions by 2030 and continue to do so until hitting net 0 in 2050. Or, we miss the first ambitious goal, setting ourselves up to miss subsequent goals, consequently missing the 2050 goal of net-zero and negatively affecting future generations. Local Canadian governments can contribute positively to this goal. Accordingly, this research will demystify how to get there.

Rather than banking on individual cities conducting research and mapping out their implementation plan, this MRP will bridge the gaps and barriers to action and promote collective process and knowledge sharing to encourage widespread adoption. Not only will collective process sharing build momentum and community, but it will identify the wasted resources (mainly financial and human) of individual work. Enabling city stakeholders to at minimum gain an understanding of how these climate strategies could be implemented into their city, could bypass a plethora of barriers to implementation.

Moreover, my decision to conduct this research is to combine my experience and love for systemic design and environmental action to fill a gap that feels ever so prevalent in our society - environmental concern and environmental action. Uncertainties, decision paralysis, lack of priority, and red tape within environmental decision-making is minimizing the possibility of meeting the Paris Accord goals with each passing day.

I hypothesize that if we simplify and demystify the process of smart environmental action, that decision-makers in the city could demand systemic interventions that support the net-zero goal. Ultimately, enabling future generations to look back on the 2020s and say, we rose to the challenge and we were triumphant.

Solution Statement

We challenge you to leverage existing technologies and processes to deploy a robust and actionable climate action plan in your city. This toolkit will supply you with a combination of theory, tools, and activities to jumpstart that very journey! Let's begin.

- Understand your city composition
- Don't reinvent the wheel
- Determine and engage your stakeholders
- Leverage existing technologies
- Set proportional and measurable goals
- Spread ownership
- Communicate value
- Share your learnings

"Cities are places of human convergence, where people live, work, and play. But beneath the bustle of any city are systems that make these hubs of humanity function. Cities are akin to living things that take in energy, metabolize material, and spit out waste. They consume and grow, using digestive, respiratory, and circulatory systems. And, like living things, cities can, with a nudge from citizens and their leaders, evolve in directions that increase their prospects for survival."

(Gardner et al., 2016)

Analysis of Context

Amount of Impact

More

Sweet spot

Less   More

Resources needed

Efficiency Matrix

Less

Why Small Canadian Cities?

Unsurprisingly, Canada's top 10 greenest cities have over 100k residents (Pretty, 2017). Truly, the environmental action strides that some Canadian cities are making are remarkable. Toronto has enacted a Green Roof bylaw that sets a "green roof requirement for new development or additions greater than 2,000 m² gross floor area, as well as governing the construction standards of green roofs" (City of Toronto, 2019). Halifax has committed to retrofitting existing buildings, rooftop solar, large-scale renewables, electrified transportations, and new-zero new buildings to build towards a net-zero 2050 for Haligonians (Dharssi, 2020).
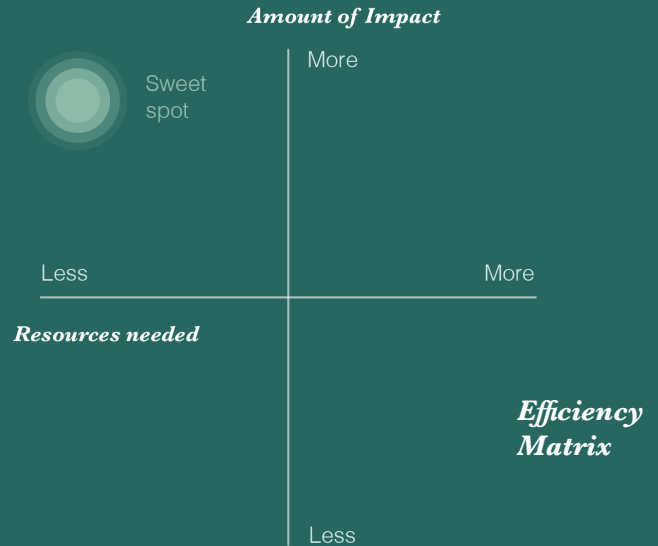
Although these strategic achievements are both necessary and in the right direction, it isn't a simple feat to scale down their initiatives to small Canadian cities. Small cities face similar anxieties towards the climate but are equipped with fewer resources to approach environmental action. As opposed to distilling larger-scale initiatives and forcing them to fit - we will identify what these initiatives are truly solving, and define how to achieve similar impact whilst accounting for the constraints and differing needs of a small city.

Accordingly, the goal of this paper is to address these barriers and minimize the need for expensive upfront human, financial, and knowledge resources to begin your environmental action strategy. Our biggest tension will be existing resources and desired impact; we will need to be consciously cognizant of the need to satisfy two embedded requirements for success as we work our way through roadmaps:

Mid-sized to Large Cities

- Entire environmental sustainability team on staff
- Access to larger municipal fund pool
- Relevant resource sharing amongst other larger cities
- Lots of funds and group organizations
- Built, tested, and replicable processes (Particularly in Integrated Design)

Small Cities

- One person, or small team
- Less access to capital
- Smaller impact per capita, seen as a less lucrative opportunity
- Few or no formal processes
- Fewer resources increase the intensity and level of necessity in project prioritization
- Siloed efforts
- Difficult to convey urgency when gain is delayed
- Varied standard (some cities have nothing, some have internal efforts, and some have reports from engineering firms)

Relevant Domains

The overlaps, differences, extractions, and lines of questioning across these four domains will be the basic themes of this toolkit. These domains have been determined by frequency in creditable literature and relevance to the problem statement.

Climate Change

Using trends derived from data by trusted sources surrounding climate change in your region is a great first step to understanding where your region is, where it came from, where it is going. The toolkit will explore how your city's geographic location influences how climate change will affect your community, and how to mitigate impacts and communicate those forecasts.Ultimately, this will enable you to determine where you are going to intervene to minimize the impact on your community.

Environmental Decisions

Every environmental decision, whether good or bad, ultimately affects climate change. Your strategy will ideally be centred around mitigating environmental threats to your community and adapting your systems to become more resilient and environmentally positive. Ideally, your environmental decisions will account for the needs and constraints of your government, local business, and residents alike. Lastly, environmental decisions still have effects on the environment even if they aren't formally labelled as so. I challenge you to assess what processes and decisions inadvertently affect the environment.

City Systems

City systems host an abundance of opportunities for optimization from an environmental lens. Cities such as Vancouver and Windsor are taking an integrated approach to embed environmental impact into their city system updates - by aligning environmental goals to the strategic initiatives of different city departments.

Smart Cities

There is a misconception that cities must rebuild to become smart. Cities can definitely use a piece-meal approach to only leverage smart technologies that align with their direct strategic objectives. We are entering a unique era where massive amounts of data are available to us. This data is only helpful if we use it meaningfully. This toolkit will look at how we can use smart city data with an environmental lens to build out your strategy, by using data to not only build the case for transformation but to monitor and build trends to measure project success or the need for iteration over time.

Targeting environmental action as a siloed objective pillar, can cap its effectiveness; the systemic and webbed nature of environmental sustainability precludes that it should be approached within our systems as opposed to outside of them as its existence is caused by the inefficiencies and blindspots in our implemented systems.

Types of Green Cities

Eco City

Smart Sustainable City

Focus on Environment

Less   More

Smart

Sustainable City

Smart City

Less

Types of Green Cities Matrix
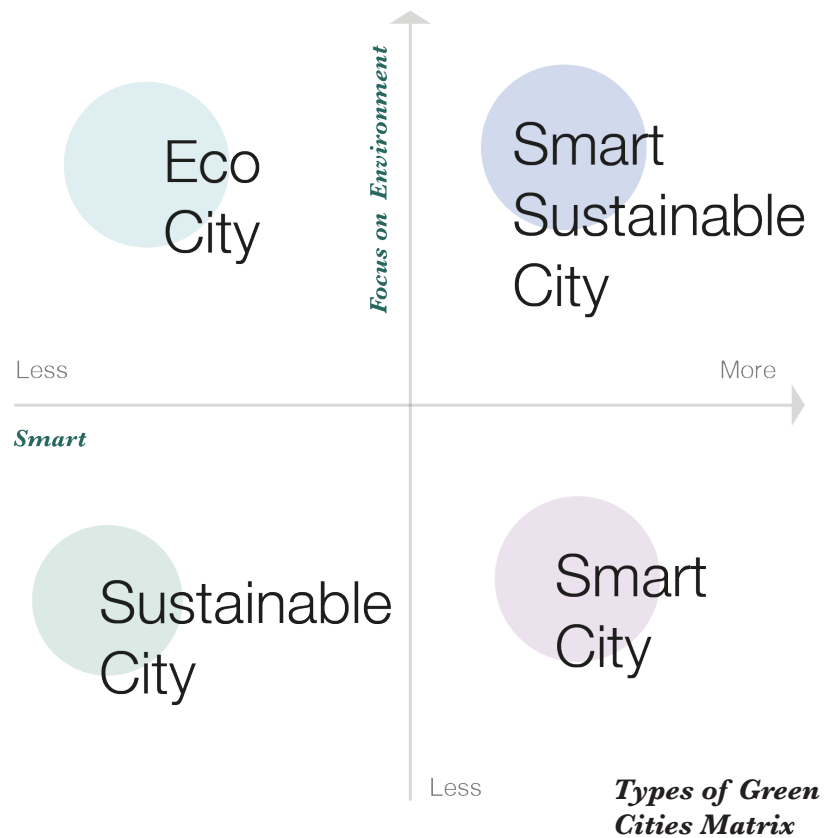
Listed below are the four key types of green cities. Among them, you'll notice a variance in their amount of both focus on the environment and on smart technologies. These two dimensions were chosen since prioritization of the environment and smart technologies are key drivers in global advancements of environmentally sustainable practices, even beyond the scope of cities. Green technology (smart) enables from a tangible perspective whilst prioritization of the environment is an enabler from a legislative and monetary perspective.

Please refer to the matrix above to understand the relationship of the cities to one another, as well as their unique pros and cons from the lens of a small Canadian city.

Sustainable City
A sustainable city is an urban center engineered to improve its environmental impact through urban planning and management (Locke, 2021).

Eco City
For an eco-city, picture cities with parks and green spaces, solar-powered buildings, rooftop gardens and more pedestrians and cyclists than cars. This is not a futuristic dream.

Smart City
A smart city is a municipality that uses information and communication technologies (ICT) to increase operational efficiency, share information with the public and improve both the quality of government services and citizen welfare (Shea & Burns, 2020). "Smart cities are actively moving toward greener urban ecosystems and better environmental stewardship" (Locke, 2021). A traditional smart city has distributed focus and priorities across its six tenants: mobility, governance, people, environment, economy, and wellbeing (Samih, 2019).

Smart Sustainable City (SSC)
As defined by the United Nations Economic Commission for Europe (UNECE), A smart sustainable city is an innovative city that uses ICTs and other means to improve quality of life, the efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects. (UNECE, n.d.). Note: There is a set of defined key performance indicators (KPIs) to meet to be considered an SSC.

What Makes a City Green?

Every green city is different in its composition; particularly, in how its inhabitants move, work, live, and play, but, there is a set of common shared dimensions amongst the world's most environmentally sustainable cities. Above all else, these dimensions prioritize minimizing the cities overall impact on the earth by bettering the systems we live within, not getting rid of them.

Eco-mobility
High Return, high risk. Movement is one of the largest contributors to global emissions. Transitioning to clean means for the public transportation cities systems such as buses, trains, rails to move to hybrid or electric fleets as an expensive and extensive but rewarding undertaking.

Educating and Empowering the Public
High return, high risk. Not only should city systems update their practices but the public should too. This is done through local strategies centred around education and enabling residents to lessen their carbon footprint and shift their mindset to the "why" of these initiatives, with the strategy of embedding these better practices in their lives.

Service-based Activities for the Public
High return, low risk. Centre activities and public engagement around the consumption of services rather than the consumption of goods. Not only is this a good indicator for the environment, but also community, and mental health. (Gardner et al., 2016)

Renewable energy
High return, high risk. The 2016 report titled Renewable Energy in Cities states that every city has a massive potential to cost-effectively boost renewable energy use at the local level. Additionally, this report lists key priorities: renewable energy in buildings (for heating, cooling, cooking, and appliances); sustainable options for transport (electric mobility and biofuels); and creating integrated urban energy systems (IRENA, 2016).

Electric Vehicle Charging Stations
Low return, low risk. The United States Environmental Protection Agency states that a typical passenger vehicle emits about 4.6 metric tons of carbon dioxide per year (United States Environmental Protection Agency, 2018). Setting up the infrastructure for electric vehicles not only signals eco-advancements to the city but enables residents to transition to electric vehicle households. Additionally, these charging stations allow the city to consider electric vehicles in its next round of procurement.

Public access to Green Spaces
High return, low risk. Ontario Green Infrastructure describes Open and Green spaces as "places we go to exercise, have fun and relieve stress. They also connect urban and rural ecosystems, helping to protect biodiversity, migratory routes and pollinator habitat."

Improved water and Waste Management
High return, high risk. Within city services, water and waste are two high-impact contenders for proactive asset management. As Climate change continues to unfold and drastically impact regions, it is critical to both proactively mitigate the risk of delivery of these essential services and minimize their impact of emissions.

Green Buildings
High return, high risk. Design for new builds and the retrofit of existing buildings using certifications such as GBCI, LEED, ICP, SITES, TRUE and WELL to follow the latest green architecture standards (GBCI Canada, 2020).

Local Food Production and Urban Farming
High Return, Low/High Risk. Opportunities range from agriculture to farm-to-table, to urban or community gardens with a focus on local production and both the sustainability and resiliency of the city's food chain.

Walkable and Bikeable Neighbourhoods
High return, low risk. Promote walking and biking within city infrastructure (laneways, lit streets, biking lanes, nature paths) that enables and encourages residents to walk to/throughout green spaces and local businesses.

Heat Minimizers
High return, low risk. Air conditioning is a huge contributor to a city's energy footprint. Adopting strategies that "cool down" the city to minimize the Heat Island effect is crucial. Examples include green roofs, painting roads white, and deliberate tree planting.

Activity

Has your city implemented any of these dimensions? If so, which ones? Which would you implement next? Are any of these on your roadmap? If not, pick out several dimensions of interest and describe which would be the easiest to implement and which would take the most time.

The Greener Cities Toolkit

"The central challenge is to make it easy and even desirable to be green – to create the infrastructure that will allow inhabitants to make sustainable decisions because they are in their own best interest. The challenge is for a city to be 'Good for me' and 'Good for the planet'."

-Gardner et al., 2016

Welcome to the Greener City Toolkit! Ideally, you'll leave this toolkit with a deliberate and smart climate strategy. Climate action falls into one of two categories: urgent or deliberative. Urgent plans are reactively triggered by unexpected events, such as cleaning up the wreckage of flooding, and forest fires. Meanwhile, deliberative plans are proactive - intended to strategically avoid the unfortunate social and economic circumstances of events requiring urgent attention. You can think of them as an investment in the overall sustainability of your city - preparing your infrastructure, assets, residents, and policy to not only withstand but mitigate the forecasted effects of climate change in your region.

Additionally, and perhaps, non-traditionally for a small Canadian city, we'll explore smart environmental technologies that take data-driven approaches to minimize your city's overall impact. This piece is critical as an adaptive measure to battle climate change; focusing on large-scale process changes to avoid climate effects.

In terms of wayfinding, depending on your needs, these streams highlight how the Greener and Smarter Cities toolkit can be most helpful to you.

Read the entire report
If you're hoping to build a new strategy from end-to-end but hiring a consultant or engineering firm isn't in the budget

Read and do the activities in the toolkit section
If you already have a plan in action but you think you could be doing more, advance your process, or include more stakeholders or departments

Read the Research in Action subsection
If you're curious about what envriontental options and processes are out there, or how to incorporate smart technologies that focus on reducing GHG emissions

Framing the Dialogue

You cannot take a one-size-fits-all approach with sustainability, hence why it takes a great deal of orchestrated resources to fulfill promises to act. This section will give you the lens to approach the toolkit activities from an honest and self-aware perspective. We are going to frame your relationship with environmental action by distinguishing

1. What do you have? (current climate action plan
2. Why are you here?
3. What is your city composition?

1. *What do you have?*
1 hour - Several key stakeholders

Gather your current climate action plan. Answer the following questions:

1. What do you like about your current climate action plan?
2. What do you not like about your current climate action plan?
3. What has been the biggest success/transformation in your current climate action plan? Why do you think it performed better than other sections?
4. What is missing from your current climate action plan?

2. *Why are you here?*
1 hour - Several key stakeholders

Answer the following questions:

1. What would you like to change about your city's relationship with sustainable environmental practices?
2. What / who triggered your desire to change from your current trajectory?
3. Why do you think becoming "greener than we are today" is important?

3. *What is your city composition?*
1 hour - Several key stakeholders

The unique circumstances of a city can completely vary from even its closest neighbour, making a need for their environmental approach to completely differ. Understanding the core physical realities and the collective pulse of your city is the first step to building an environmental action plan that fits the context of your city. Some key dimensions that make up a city are climate; location; energy; culture; economic structure; building stock; urban form; history; and wealth. Map out your city composition on *worksheet A.*

1. Map out the different dimensions of your city.
2. We will refer back to this section a lot throughout the process. Understanding the unique circumstances of your city will allow stakeholders to build a strategy for your city, not a city - thus increasing relevancy, applicability, and its consequent opportunities for success

Research for Action

Actor's Map

Determining and Gathering

Stakeholders

The amount of stakeholders involved in a city's relationship with the environment comes as no surprise when you consider the complex web of entities and relationships it entails.

There are four key groups of stakeholders in environmental decisions, Regulatory Agencies, the Business Sector, Environmental Advocates, and Affected Communities. (Sexton, 1999).

In this matrix, we plot the different stakeholders across two axes - knowledge and power, to better understand the leverage points, opportunities, and threats of the circumstances we are working in. This matrix represents the environmental sustainability system of a generic Canadian city.

Interestingly, there are not many stakeholders with little to no power in this system - representing the sheer volume of opportunity in this system if that power is harnessed, fused, and mobilized. Whilst knowledge hosts the most variant spectrum of plots, it emphasizes a need for a shift across the knowledge continuum. This can be achieved through:

1. Including as many stakeholder types as possible to build out the strategy (build buy-in and create value for varying stakeholders)
2. Leverage the key and involved players from different stakeholder groups to advocate the necessity and value of the strategy to their respective groups
3. Collect feedback from the ground up to ensure strategic initiatives are increasingly optimized, inherently valuable, and adamantly appropriate.

Activity

1-3 hours - Project Leads

Make an Actor's Map for your City. You'll want to include these stakeholders in the process of building your strategy, as it will help to build a strategy that is systemic, compatible, flexible, effective, direct, and proportional.

1. Start by using the stakholder activity on **worksheet B.1** to list out specific types of stakeholders within the four categories Regulatory Agencies, Business Sector, Environmental Advocates, and Affected Communities. (This can be anyone involved with environmental decisions, advocacy, effects, education, or expertise. Try to be as extensive as possible. Make sure to try to map people to stakeholder types to list their names and their role/title.)
2. Map the listed stakeholders in an actor's map on **worksheet B.2**, as we have above.
3. How similar or different is your actor's map from the one above? Why do you think those differences exist?
4. Gather stakeholders and deliberately include them in the strategy definition activities.

Interpreting the Principles

Climate action plans should be direct, systemic, proportional, flexible, complementary, and effective (Sexton, 1999). First things first, they ought to be systemic. Every facet of a city affects the environment - accordingly, climate action plans need to be holistic and systemic to best determine effective intervention points to avoid emissions. Additionally, the plans need to be direct. Considering the complexities of cross-departmental and cross-organization ownership and differing industries, and needs of stakeholders, climate action strategies need to be direct, or else their ambiguity invites inaction which causes an interesting conundrum where even less climate work gets done due to a false belief that a functioning strategy is in its tenure.

Proportionality is critical because it sets realistic expectations for your environmental endeavours. If you're a city with a population of 5,000, a comprehensive super block smart city strategy would likely fail, considering the funding, trained team, and large-scale shift to the city systems that your residents rely on - let alone the cultural, economic, social, and historical map of your city that would get lost in its wake. This leads well into complementary, the principle that ensures the strategy meshes well with other departments and the heartbeat of your city. Lastly, flexibility conveys how your strategy will respond to the city as it inherently evolves. Considering the long timeline associated with a social, policy, and structural change, your climate action strategy needs to be resilient to the ebbs and flows of the city as a system and its subsystems - evolving to the needs of the city as they continue to present themselves.
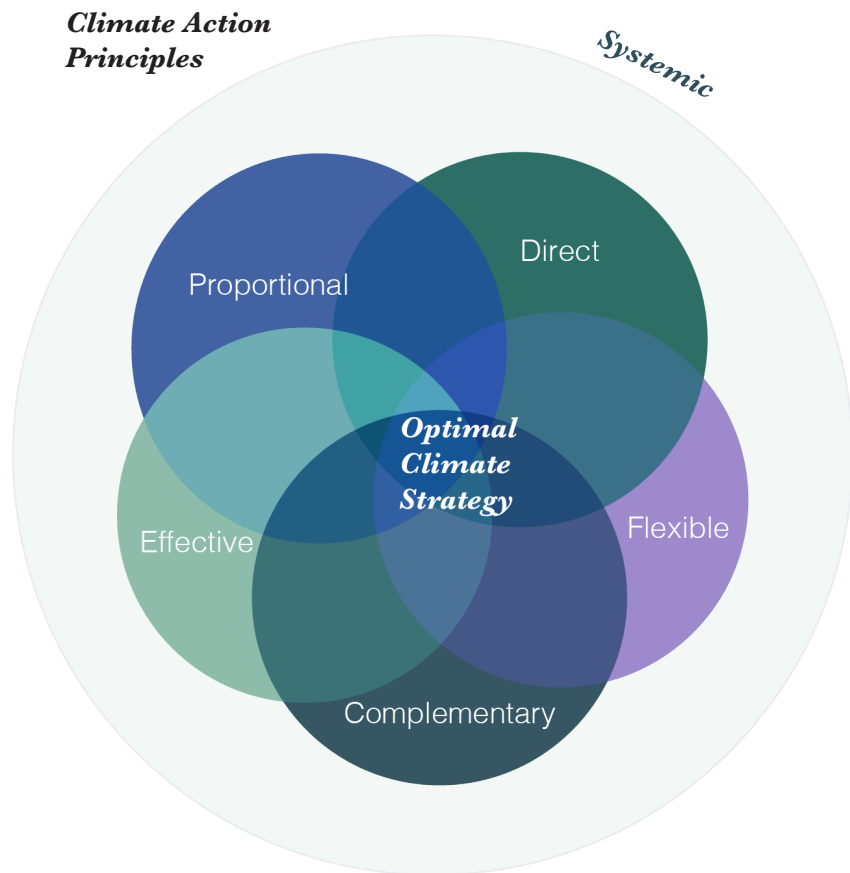
Activity

1 hour - Several key stakeholders

Use *worksheet C.* Each of these terms is subjective as to what they mean in action. Once you determine your stakeholders, decide what these terms mean to you collectively.

1. 20 mins of solo work. Write out what each of the six principles looks like in action to you.
2. Then spend 10 minutes discussing your answers in groups of five.
3. Lastly, appoint a stakeholder to lead a session with the entire group where you collectively discuss and write down the tenents that you believe your city's environmental action plan should be built upon.

Success Criteria

The culmination of reading countless environmental articles and climate action plans has led to observed patterns that indicate a successful climate action plan. Here is the compiled list:

1. The end product is a living document
2. Ownership is necessary or it will never come to fruition
3. Include tangible activities that your residents can see, feel, and experience
4. Evolution of the city, not a project
5. Made for all with all: Government, business, and citizens
6. Measure success, or it will stagnate
7. Timelines change activity from a promise to an action
8. Everything gets measured
9. Stay within your capability. Don't over-promise.

Activity

1+ hours - All stakeholders

Use **worksheet D** for this activity.

If you currently have a climate action plan:

1. Is there anything on this list that your city climate plan doesn't have?
2. What changes would you have to do to incorporate those criteria into your climate action plan?

If you do not currently have an action plan:

1. How will this list inform your decision-making?
2. Are there any that surprised you? If so, why?

Small Canadian City Climate Action Plans

These findings are derived from reading through the climate or environmental action plans of Canadian cities ranging from 1k - 100k residents. These insights can be used to understand the current landscape for cities varying in size and access to resources. In the next section, we will dive into several climate action plans to understand the best practices of climate action plans.

1. Most Canadian cities with under 100k residents and above 1k residents have a climate action plan of sorts
2. Larger cities had more robust and actionable plans
3. Smaller cities had more generic and unambitious plans (likely due to a lack of resource allocation and domain knowledge)
4. Some cities with under 30k residents do not have a climate action plan
5. Cities with the most actionable climate action plans started with pillars/streams and built out subsequent strategies with actions and measurements within them
6. A strong narrative was an important element of the best climate action plans. All of the actions, strategies and strategic pillars came together under a unified strategic narrative.
7. Only some plans included communications and governance models
8. Barely any cities leveraged smart technologies in their plans
9. A lot of plans were created by local governments or outsourced to third party vendors in isolation from residents and businesses
10. Engineer-led climate action plans were typically very technical and missed both a story/human element and community involvement.

Case Studies

Leverage work other people are doing and put your circumstances on it. Here are some examples of small Canadian cities that are doing environmentally action best.

Kamloops City Composition	Energy: Fossil fuels and bioenergy. The more common types of bioenergy being used in Kamloops right now are geothermal energy and using wood waste to produce energy.	Building Stock: Combination of heritage homes and newer builds	History: The Kamloops area has been inhabited by the Secwépemc and Nlaka'pamux peoples, who have lived here for close to 10,000 years.	Urban form: City
Location: Okanagan valley. Where north and south Thompson river meet	Economy: Service	Climate: Semi-arid	Culture: Active. Outdoors. Connected to the environment	Wealth: Med / High

Kamloops, BC

Link to Kamloops Climate Action Plan (Kamloops, 2021)

Western Canada is beginning to feel the unfortunate wrath of climate change, with forest fires and floods increasing in frequency and intensity, cities like Kamloops, in particular, have put together robust, data-driven, radically optimistic, and actionable climate plans.

1. Inherent awareness of their city composition and its history. Speak to environmental justice, advocacy, and acknowledgement of the traditional lands their city sits on,
2. Built on 8 strategic pillars they call, "Big moves" each big move has targets, a description, and co-benefits, as well as nested strategies with their own goals, actions, economic considerations, and projected annual GHG reductions by 2050.
3. Kamloops took a highly visual and human approach to their document design, making it incredibly easy for residents and businesses to consume and understand it

4. Every strategy action is measured and compiled to understand projected GHG reductions per Big Move, then the projections per Big Move are compiled for overall projections - building towards an 80% cut in emissions by 2050.
5. The document is capped with an implementation chart that goes further in-depth for each Big move, outlining an implementation priority, a lead, support department or agency, and an initiatives timeline (short, medium, long)
6. A section at the back explaining definitions
7. Art project showing grade 9 students' interpretations of the Big Moves.

Conclusively, Kamloops is a 10/10 in terms of a recommendation for a small Canadian city to follow in its footsteps to build an effective climate plan.

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Saint John, NB

Link to the asset management plan
(The City of Saint John, 2016).

Saint John City Composition	Energy: Fossil fuels, solar, wind, the choice for residents	Building Stock: Old. Particularly in the city core	History: Oldest city in Canada	Urban form: City
Location: On ocean. Gateway and port city. Ferry to NS. Lots of imports/exports	Economy: Manufacturing	Climate: Continental	Culture: Relatively small community. Proudly working class	Wealth: Low / Med

Saint John is one of the Canadian cities with a population under 100k that does climate action best. The city has been awarded as one of the forerunners of environmentally sustainable action in Atlantic Canada being an early adopter of launching a Municipal Energy Efficiency Program (MEEP) (The City of Saint John, 2017). Although they are currently launching their new Climate Action strategy, we will focus on their asset management plan.
Insights from their report:

1. Includes their workshops and collaborative tools
2. Focus on measurement and ownerships
3. Strategy is first broken down into streams, with each stream hosting its owns strategic activities
4. After the strategy section, they visualize the strategic activities in an implementation roadmap
5. Each strategic activity hosts the following dimensions: strategy, deficiency addressed, Related Strategies, Proposed Activities, Proposed Tasks, Deliverables, Who (Lead/Staff), Framework Benefits, Duration, and Cost
6. Detailed communications and governance plan
7. Incredibly detailed, direct, and systemic

Please note Saint John did work with an outside engineering firm, which some of the smaller cities might not be able to afford. The opportunity for smaller cities is to understand their designing and implementation process criteria that lead to success.

Activity

4-6 hours - Project Leads

First get your answers from the city composition map you made in "Framing the Dialogue". One of the best ways to get exposure to environmental action plans in motion is to see what cities with similar compositions to you are doing - how they're framing, action on, and talking about environmental action.

1. Use the answers to find cities of a similar composition to yours. Make sure to look outside of the typical climate characteristics, because you might find unexpected cities with similar historical or economic compositions to you with great environmental projects implemented within those domains.
2. As a data-gathering exercise, read into what those cities are doing.
3. When you find a city that stands out, reach out to the city to see if anyone would be interested in talking you through the process.
4. Add these cities to your map from Framing the Dialogue in the boxes labelled "Similar Cities"
5. How could their strategic initiatives be applied to your city?

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Environmental Decisions

Strategies for Fostering Integrated Decision Making

1. Build mutual respect, trust, and understanding
2. Adopt sustainability as a unifying principle
3. Take shared responsibility
4. Institutionalize public participation
5. Continue to refine and use decision-making tools
6. Collect and analyze important information
7. Use incentives to encourage innovation

Ken Sexton is a Bond Professor of Environmental Health and director of the Center for Environment and Health Policy in the School of Public Health at the University of Minnesota. In 1999 he wrote a book titled "Better Environmental Decisions: Strategies for Governments, Businesses, and Communities" with Alfred A. Marcus, K. William Easter, and Timothy D. Burkhardt. It is a robust, systemic, and actionable resource in the domain of environmental decisions. Their 500-page book starts with "integration of perspectives from governments, businesses, and communities are one of the keys to better environmental decisions" and concludes that integrated environmental decisions are the way of the future, "As the margin for error continues to shrink, we must act on the truth that greater integration is a prerequisite for better environmental decisions" (Sexton, 1999). And accordingly, lists of principles for Integrated Environmental Decisions.

Environmental decisions "must strike a balance between environmental protection, economic prosperity, and social justice." Emphasizing the need to include regulatory agencies, the business sector, environmental advocates, and affected communities in the process - each group hosting different needs, goals, and decision-making criteria. Their table on the multidimensions of environmental decision-making captures the importance of understanding how each aspect of your decision across the dimensions affects your outcome.

Although this resource has aged, the cities at the time of this writing (2021) that have the best performing climate action strategies leverage the format and strategies that Ken Sexton et al have shared. As such, with this toolkit, we will be designing towards integrated and deliberate environmental decisions in the mode of analysis centred, routine procedures and collaborative learning.

Environmental Strategic Pillars

Compiled List of Environmental Strategic Pillars

1. Green Buildings
2. Green Energy
3. Green Movement
4. Green Manufacturing
5. Clean Air
6. Green Economy
7. Smart City Systems
8. Reduce Air and Water Pollution
9. Resilient Water and Waste Systems
10. Preserving Biodiversity
11. Access to Nature
12. Green Food
13. Lighter Footprint
14. Biophilic City
15. Improved Public Health
16. Zero-waste (Minimized waste)
17. Increased Carbon Sequestration
18. Expanding Recycling Systems
19. Increased Resilience

We now know that environmental strategies can be either proactive (deliberate) or reactive (urgent) in nature. Reactive strategies are typically triggered by a negative event, easier to fund due to their necessity, and prioritized. Meanwhile, proactive strategies mainly develop anticipatory policies and projects to minimize negative environmental impact.

The objective is to use adaptive and mitigative measures to build a resilient system, in this case, your city and all of its subsystems. Below is a list of proactive (deliberate) environmental strategic pillars that you can leverage in your city. Strategic pillars will mark the start of our strategy exploration since they are the broadest strategic component of climate action plans. Afterwards, we will sequentially cover strategies and strategic actions so we can visualize their nested form.

Strategic Pillars **= Broad**
Strategies **= Targetted but difficult to act**
Strategic Actions **= Specific**

Environmental Strategies

Your environmental strategies will live between your strategic pillars and your strategic actions. They must thematically correlate to your strategic pillar and its consequent actions must contribute towards meeting the goals of the strategic pillars.

Listed below are more environmental strategies that cities have used globally:

Smart Environment Strategy
Smart environment strategies leverage information communication Technologies (ICTs) to collect data, process and hold this data, and then use it through different means of application to deliver value to stakeholders. Mitigative use cases of smart environment Technologies look to reduce our footprint, for example, smart street lights that only turn on once a sensor is triggered by a pedestrian. Meanwhile, adaptive use cases of smart environment technologies help more with collecting and mobilizing big data to help with decision making.

Market-based-Incentives (as opposed to Command and Control)
"Market incentives and well-designed initiatives to increase flexibility in implementation such as performance standards rather than rigid regulations." (Sexton, 1999)

Prioritize Vulnerabilities
Vulnerability management is the process of identifying, tracking, prioritizing, and remediating security weaknesses in systems and software (Bellis, 2021).

15-minute city
Although a full 15-minute city strategy can be infeasible for a small city, its principles can be leveraged to create connected, sustainable, and decentralized social and economic pockets throughout your city. (World Economic Forum, 2021). We will dive further into this strategic pillar in the trends section.

Proactive Asset Management
Proactive asset management prioritizes keeping assets in the best shape. Typical benefits of proactive or predictive maintenance include improved uptime, asset longevity, maintenance cost control, and safety.

Public Information Campaigns
Motivate the public through a bottom-up approach. Whilst your local government utilizes different strategies to optimize the larger city systems, don't forget to mobilize and empower your citizens to minimize their impact. This comes down to communicating effort to residents from the local government and equipping them with the tools and community necessary to improve, without losing convenience within their daily activities or breaking the bank.

Decentralized Governing Body
Distribute the weight of decision making, acting, and reporting across stakeholders to ensure legitimacy, accuracy, and effectiveness of activities in their domain as well as the ability to leverage collective resources to accomplish more in a shorter period - creating a sense of collective accountability.

System resilience
System resilience is the ability of the system to withstand a major disruption within acceptable degradation parameters and to recover within an acceptable time (IGI Global, n.d.).

Bridging the Green Premium
The green premium articulates a gap in price between traditional methods and new green methods (i.e. fossil fuels vs. renewable energy). Hence how expensive it currently is for governments, businesses, and residents to shift away from business as usual with their procurement of goods. The gap will continue to close as demand increases. Accordingly, it doesn't mean that your city can't partake in green initiatives. Bridging the green premium through low-tech and tangible solutions to residents is a great step to work towards those larger and more expensive endeavours.

Service-Based Community
"Clever strategies, many centred around providing people with services rather than goods, can accelerate reductions in materials use."(Gardner et al., 2016) Service-based strategies also strengthen a sense of community and well-being.

List of Strategic Actions

Policy

1. Densify
2. Zoning changes
3. Mixing business and residential
4. Asset management policies
5. Preventative Subsidies in projected trouble areas
6. Speed limits
7. Implement green building policy
8. Dedicated funds
9. Establish a carbon budget framework
10. Invest in Green Businesses
11. Green procurement policy
12. Market-based incentives
13. Compact and connected development patterns
14. Walkable tree-covered boulevards
15. Smart growth
16. Prioritize mixed neighbourhoods: mixed-use, mixed-age, mixed-income
17. Paper-free policies

Nature

18. Preserve the natural environment
19. Improve Water Conservation and Waste Management
20. Permeable pavement
21. Access to green spaces
22. Reduce vehicle miles travelled (VMT)
23. Support urban farming
24. Green roofs
25. Biodiversity protection
26. Ocean resources
27. Increase tree canopy
28. Protect natural eco-systems (wildlife, flora, and fauna)
29. Eco-system restoration projects
30. Miniature urban forests

City Systems & Infrastructure

31. Environmental Vehicle infrastructure
32. Energy retrofits
33. Green building standards
34. Light sensors
35. Industry retrofits
36. Superblocks
37. Incentives and financing campaigns for residential and commercial retrofits
38. Biophilic Design
39. Update street standards with plants for walkability, bike-ability, urban cooling, and a rainwater retention
40. Lighting, heating, and cooling systems
41. Paid garbage tags and limits
42. Circular economy
43. Digital Twins
44. Service-based activities
45. Placemaking
46. A residential organics collection program
47. Bioluminescent trees
48. Support circular economy initiatives
49. Zero waste
50. Green fleets (public transport)
51. City waste reduction strategy with targets
52. Cool roofs
53. Co-working spaces
54. Vertical gardens
55. Mixed-use walkable, economically integrated, transit-rich places
56. Bioswales
57. Rain gardens

Food & Agriculture

58. Indoor Vertical Farming
59. A local city food system
60. Community gardens
61. Meatless Days
62. Composting Program
63. Farm stands
64. Access to fresh local foods
65. Integrating livestock and crops
66. Agroforestry practices
67. Integrated pest management
68. Cover crops

Renewable Energy

69. Biogas
70. Solid biomass
71. Geothermal
72. Wind power
73. Hydro power
74. Explore bulk-purchase financing for renewable energy
75. Fund not-for-profit renewable energy co-ops
76. Liquid biofuels
77. Incentivize solar for homes and businesses
78. Solar farms
79. Cogeneration facilities

Education

80. School programs
81. Partnerships with community centres
82. Smart Home products
83. Promote lending services
84. No grass front lawns
85. Native plant species seed kits for bee population and biodiversity
86. Public information campaigns
87. Adopt a tree
88. Voluntary pollution prevention initiatives
89. Rain barrels
90. Sponge cities
91. Access to public resources
92. Asset sharing

The
Psychology of Environmental Action

Behavioural economics is a method of economic analysis that applies psychological insights into human behavior to explain economic decision-making.

Bridgeable, a service design studio in Toronto has a great toolkit on behavioural economics that you can download here. In this section, we are going to look at behavioural economics principles that could be applied to environmental action (or lack thereof) - affecting how people in government, business employees, and residents make decisions. Below is a list of relevant behavioural economics principles to environmental action from Bridgeable's toolkit.

Activity

1-2 hours - Project Leads

Learning to use behavioural economics principles for your advantage

1. Which of these behavioural economics principles do you think will be the most relevant and helpful in your climate action plan design phase?
2. What changes could you have made to your current climate action plan that uses these principles to your advantage?

Pre-Commitment
When people actively commit to a goal, they are more likely to achieve it

Decision Paralysis
When given many options, people make the easiest choice, which is often no choice at all.

Social Proof
People want to be like everyone else and are heavily influenced by what they perceive everyone else is doing

Implementation Intentions
People are more likely to do something when they specify how, when, and where they will do it

Hyperbolic Discounting
People put an unrealistically high value on the here and now and an unrealistically low value on the future

Lack of Self-Control
People have a hard time delaying gratification

Substitution
It is easier for people to substitute a similar behaviour than to eliminate an entrenched one

Default Bias
People pick the easiest option to avoid complex decisions. Defaults provide a cognitive shortcut and signal what people are supposed to do.

Status Quo Bias
People are very committed to keeping things the way they are

Identifiable Victim Effect
One identifiable individual, who is described in great detail, evokes deeper emotions and sympathy than does a large group of anonymous individuals

Optimism Bias
We overestimate the probability of "things going right for us" and underestimate the probability of "things going wrong for us"

Payment for Effort
People place a greater value on services and products if they can see the amount of effort put into them

(Bridgeable, 2017)

Provincial & Federal Support

The Canadian government is purposefully pursuing a net-zero Canada by 2050. Aligning your climate action plan not only with other departments within your city but your broader context can be a lucrative strategy in terms of unlocking...

1. Support
2. Funding
3. Resource Allocation

Activity

Read through the following climate strategies that your city is nested within, then answer the questions below

Global: UNFCC's Paris Agreement (Canadian Federal government is required to report back on our committed GHG reduction targets)

Federal: Pan-Canadian Framework on Clean Growth and Climate Change, and The Green Municipal Fund (GMF) from The Federation of Canadian Municipalities (FCM)

Provincial: Find your province's climate action plan

1. What objectives are there within the three climate strategies that could be relevant opportunities to you?
2. How can you align your climate action plan with objectives from any of these strategies to ensure your climate action plan is backed financially and supportively.
3. What opportunities are there for small Canadian cities?
4. Based on your city composition, are there specific areas where you could receive provincial or federal support?

Resources & Funding

Useful Resources

1. Sustainability Tools for Assessing and Rating communities (STAR Communities)
2. LEED Certification
3. Canada Green Building Council
4. Adapting to Climate Change: An Introduction for Canadian Municipalities
5. World Resources Institute
6. Low Carbon Cities Canada (LC3)
7. Green Municipal Fund
8. Climate Data Canada
9. Federation of Canadian Municipalities (FCM)
10. The Municipal Asset Management Program (MAMP)
11. Collection Methodology for Key Performance Indicators for Smart Sustainable Cities
12. Three Horizons Foresight Tool

Funding Opportunities

Canadian Federal Climate Change Funding Programs
 including a Climate Action and Awareness Fund, Green Infrastructure Fund, Clean Technology Programs, Low Carbon Economy Fund, Public Transit Infrastructure Fund, Carbon Pollution Pricing Proceeds Programming, and Environmental Funding

Green Municipalities Fund
Organized by FCM, they help municipal governments bring projects to life

Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative
Aiming to deploy fast-charging stations from coast-to-coast

Municipal Energy Plan (Ontario)
Funding to design and implement a new energy plan

Municipal Climate Change Action Centre (Alberta)
Aimed at Alberta, but their blog sections and learnings are applicable across different provinces. Their goal is to lower energy costs, reduce GHG emissions, and improve community resilience.

Design ---------------- Tensions

Changes reveal tensions - in how we work, how we budget, in our processes, and how we collaborate. Awareness is key to design tensions - these competing forces will likely present themselves organically in the form of a barrier, or setback in your transformation, in this case, to becoming more environmentally sustainable as a city. Design tensions can be used as an opportunity if the elements are properly identified as a tension, analyzed to see why the tension exists and acted upon by strategically choosing a path forward.

Listed below are the tensions that have been identified within the strategy work. By identifying the forces that could pull and push the strategy towards success or failure, we equip ourselves to be prepared as they present themselves along the way - empowering us to adapt to a naturally evolving environment.

Urgent Action ---------- Strategic Resiliency
Holistic but targeted ---------- Siloed but general
Initial Investment ---------- Delayed KPIs / growth
Urgent priorities ---------- Environmental updaters
Separate pillar ---------- Embedded pilar
Data collected ---------- Value created
A desire for change ---------- Unsure of how
Budget ---------- Environmental Concern
Triangulation of: Business, Government, and Community
Massive overhaul (holistic) ---------- Small calculated steps (incremental)
Retrofit ----------New
Individual learning ---------- Collaborative learnings and discussion
Siloed efforts ---------- Integrated approach
Getting investment ---------- KPIs
Business as usual ---------- Defined vision
Proactive ---------- Reactive approach
Buzzing priorities ---------- Long-term negative impact
Global impact ---------- Impact on your community

Activity

1 hour - Key Stakeholders

I recommend using these design tensions as a lens in the discussion, curating stakeholder involvement, decision making, and building a general empathy with stakeholders surrounding the complexity of strategically embedded environmental action into your city system.

Feel free to add to these as you see fit - and as you see tensions unfold in the implementation process.

Recommended Structure

Climate action plans are multidimensional in the process of which they're built, how they approach a city, the systems they affect, and who builds them - thus it only makes sense that they're also multidimensional in how they're implemented. Based on our work so far, an effective climate action plan should be systemic, whilst accounting for Sexton's insight that "In the short term, however, there is an immediate need to implement workable strategies that foster integration in ways that are direct, systemic, and effective." (Sexton, 1999). Leading to three core dimensions of a climate action plan, each of which hosts different benefits, pricing structures, breadth of resources required, size of impact, time to implement, and direct visibility. It is recommended that you have at least one initiative in each dimension, after that point continue to build to a balance of all three; consequently entrenching initiatives in the household, neighbourhood, and city level.

1. System-level interventions (densify, renewable energy, green building standards)

2. Targeted artifacts (incentivizing local green businesses, green downtown street, sensor street lights, increased tree canopy)

3. Micro-projects (community gardens, funding student initiatives, EV charging, farm stands, vertical gardens)

Recommended Structure

Scale	Goal	Solves a/an…	Characteristics
System Overhaul Macro	Adapt	Cause	• Least tangible • Focused on delivery of city services • Most valuable (in terms of ROI) • Fully integrated approach necessary • Highly resource intensive
Sizable Update Meso	Mitigate	Effect	• Less "flashy" • More departments involved • Integrated approach • Alignment with department strategic goals
Quick to Implement Micro	Educate	Symptom	• Highly visible and very tangible • 1-2 departments involved per project • Minimal resources needed • Make sure to include measurable success metrics

Section 2:
Envisioning the Future

Climate Forecasts & Possible Futures Derived by Data

"The Intergovernmental Panel on Climate Change (IPCC), which includes more than 1,300 scientists from the United States and other countries, forecasts a temperature rise of 2.5 to 10 degrees Fahrenheit over the next century. ... Net annual costs will increase over time as global temperatures increase."

(NASA, 2021)

This is a daunting number - to many, it's too big, too hard to grasp. I've often wondered, how does my little city have the power to change that number? Frankly, it doesn't have the power to affect it alone. But if we all hyperfocus on our minimizing the impact our community has on the world, then we could collectively make a big dent.

Many people currently feel compelled to do something for the environment - media, scientific reports, and direct impacts of climate change are hitting areas where we call home, or those we love call home, signifying a need to change. But what exactly? According to the behavioural economics principle, "Decision Paralysis" when there are too many options or we don't know where to start, we typically make the easiest decision: nothing at all, which in turn doesn't bring those desires to act through to fruition.

To act and have the impact we are looking for, we must first narrow our scope and hyper-focus on two things: where our region is currently at, and where it is projected to go. By using data to inform our strategies we can focus on closing the gap between our current state and our projected state to minimize the negative impact on our residents, natural systems, wildlife, city systems, businesses, and infrastructure.

The best way to collect this data is to leverage organizations that are doing wonders at collecting and processing this data for these very circumstances. Climate Data, a project led by ECCC (Environment and Climate Change Canada) looks to be the best resource for Canada-specific data, giving users the ability to search, analyze, and download data by city, variable, or industry. This tool enables you to visualize data across time, and across scale (hyper-local to national) to consider possible futures and minimize risk.

Data Sets

Canada Specific
Climate Data

Thematic Environmental Sustainability Datasets
Socioeconomic and Data Applications Centre (SEDAC)

Global Indicators and Data Sets
The Organisation for Economic Co-operation and Development (OECD) Environment

Green Drivers

In a cause and effect relationship, drivers would be the cause and trends would be the effect. We use drivers as a tool in strategic foresight work to acknowledge and understand what forces are causing change.

Population Growth
Annually, the global population increased by 81 million people - which perpetually adds to the number of mouths to feed, minds to nourish, homes to supply, jobs to create, and movement to maintain as a global collective; a conflicting priority with our pressing need to diminish our greenhouse gas footprint.

Overexploitation
"We've altered over half of the world's land. By clearing fields, building cities, damming rivers, and even removing mountain tops in search of coal" (Stromberg, 2013). Collectively the need for goods, materials, and services which is expanding at an ever-increasing rate, is fuelled by the desire to increase global wealth. We will not be able to counter this by completely cutting back on usage, but opportunities lie in how we harvest, procure, craft, manufacturer, energize, distribute, purchase, and consume these resources.

Natural Disasters
Natural disasters are terrifyingly unpredictable, and variable in both breadth and scale of impact - capable of destroying homes, infrastructure, wildlife, businesses, and communities in a split second. Although their timing and scale are variable, one thing is becoming inevitable, their increasing frequency. Local, and state (regional or provincial) governments are responding globally to build resiliency into their asset management and risk mitigation strategies to protect our communities from avoidable social and economic despair.

Communicating Urgency and Hope
The coined term Climate Change is seeing a re-branding to the term Climate Disaster from the UK-based environmentalism design agency, EarthRise studios. They leverage a plethora of types of media to merge a sense of urgency with poignant data-backed narratives to catalyze action and emotional investment from their viewership. This urgent but hopeful approach is starting to become more prevalent amongst governments, businesses, and NGOs alike. Effectively communicating our environmental actions to the public and gaining their support is a critical factor to success.

Protecting Global Biodiversity
Biodiversity is an important indicator of health, our global food chain, the economy, and wellbeing. A diverse ecosystem is more resilient to climate variances. Biodiversity is best served by combatting ocean acidification and land-use change. (Malhi et al., 2020).

Green Technological Advancements
Entrepreneurs have developed a lucrative market with green technologies. Government and private funding, public demand, and scientific advances have been the breeding grounds for truly groundbreaking greenhouse reducing technologies - ranging from optimization sensors to renewable energy, to green building materials. Human and process issues arise when private firms approach cities with vested interests - leading to piecemeal implementations that do not align with city strategic initiatives and lack integration with other city systems.

Green Trends

Biophilic Cities

Summary
Biophilic cities are sustainable and regenerative by nature - embedding nature into the built environments of the city as opposed to solely focusing green efforts in optimizing city systems.

Description
Dr. Tim Beatley, Professor of Sustainable Communities coined the term biophilic cities in his book titled Biophilic Cities: Integrating Nature Into Urban Design and Planning. The concept has gained quite the following since it was coined in 2010 - with a Partner City Network, an online community, a renowned journal, and shared resources of biophilic projects launched in cities globally. Incorporating nature into cities is surpassing environmental needs and also aiding in public health. Isolation has been a collective reality since the start of the COVID 19 pandemic in March 2020, and a San Francisco case study shows that access to nature "can help to alleviate stress and anxiety and promote mental wellness" (Shuff-Heck, 2020).

Biophilic patterns include but are not limited to:

- Beehive rooftops
- Blooming facade
- Blue Greenway
- Green ring
- Freeze way
- Urban water trails
- Street parks
- Mural nature
- Walled garden
- Water steps
- Sponge city
- Harbour Bath

(Biophilic Cities, n.d.)

Extrapolation
Updating city systems with new innovations and clean technologies is critical for a city to reduce its carbon footprint. Although, access to nature can be just as important. Leveraging the unique geography and topology of your city to meaningfully incorporate nature to foster connection and environmental education for your residents can host benefits for the environment, public health, and tourism
.

Signals
- Transforming City Seascapes for Healthier People and Planet in Plymouth, UK (Pittman & Moseley, 2021).
- The Butterfly Highway, connecting people to nature in Charlotte, North Carolina (Hjarding, 2017).
- Vancouver's biodiversity strategy routed in biophilic city design, "lays the foundation for the sustained ecological health of their city. (Fraser, n.d.)

Implications
Applying biophilic patterns to your city can positively affect the public health and ecological well-being of your city. Restore, protect, regenerate, educate, celebrate, sustain, and monitor are action words that represent the ways biophilic design integrates nature into a city's traditional built environment of steel, cement, brick, and pavement. Lastly, biophilic design/planning is a very tangible representation of a city's commitment to environmental efforts.

Counter Trends
Concrete jungles and prioritizing the built environment

Summary
The 15-minute city is an urban planning concept that brings all of the goods and services that you need to live, work, and play within 15 minutes of your home. These are hyper-focused on hyper-proximate delivery of needs to minimize time and resources wasted to prioritize your and your community's wellbeing.

Description
Imagine being in the heart of a small community that has everything you need for your daily activities within a 15-minute walking or biking radius - your community garden, local vendors, cafés, a co-working space, public schools, and a walk-in clinic, without public transport fare, a stop at the gas station, or an "I'll be a couple of minutes late for the meeting" text.

Access is the primary principle as opposed to mobility, which currently drives a lot of modern cities. Daniel Herriges explains the distinction as such, "Mobility is how far you can go in a given amount of time. Accessibility is how much you can get to in that time" (Herriges, 2021). Expanding on his point, he notes that a slower speed of travel when a neighbourhood is positively correlated with a higher number of destinations reached means there is a richness of access to goods and services in congested areas.

Cities like Paris and Portland are embracing the 15-minute cities concept with intensity - completely unravelling traditional ways of planning centralized cities, by creating a decentralized network of self-sustaining "mini-cities" within the city itself. Minimizing sprawl to focus on mixed-use and greener access, the cities are sustainable nodes of living.

Extrapolation
"At its heart is the concept of mixing urban social functions to create a vibrant vicinity," says Carlos Moreno (O'Sullivan & Bliss, 2020). By decentralizing a city, you enable smaller greener community pockets to self-sustain with all of the social, environmental, and economic elements necessary to flourish without mobilization (a symptom of lack of access) driving strategic decisions.

Benefits include enhanced environmental protection and sustainability, Increased convenience and sense of community, paving the way for affordable housing, and improved resilience via multipurpose neighbourhoods (Deloitte, 2021).

Signals
- "Paris is planning to become a 15-minute city. Where everything you need is within a 15-minute radius on foot or bike. The aim is to cut car use, resulting in fewer CO2 emissions and cleaner air" (World Economic Forum, 2021).
- "In 2009, only six percent of the population of Portland were living in areas with a substantial presence of all three 20-minute neighbourhood factors - density, distance, destinations. A detailed plan to expand 20-minute neighbourhoods was developed as a part of its Climate Action Strategy. The plan included a target by 2030 for 90 percent of the city's residents to be able to walk or cycle to meet all their basic daily, non-work needs." (Deloitte, 2021).
- Stockholm, Sweden has introduced a Street Moves program to be implemented by 2030 transforming parking spaces into meeting places - bringing everything you need within one minute of your home. With a goal of being, healthy, sustainable, and vibrant (Visit Sweden, 2021).

Implications
- Completely challenges the traditional zoning and structure of cities (downtown, uptown, midtown, residential, commercial, industrial, etc) and weaves them into mixed-use nodes
- Outside of its direct application, 15-minute cities showcase principles a city can incorporate into planning that promotes environmental, economic, and social sustainability.
- Emphasizes access over mobility. By building in hyper-proximity to goods and services as your city grows for benefits exceeding the environment

Counter Trends
- Urban Sprawl
- Mobility-focused environmental sustainability plans: too fixated on the symptom of previous city decisions that revolved around mobility to access goods and services. Mobility is something that needs to be shifted to green principles, as long as it's paired with a reexamination of how we use our spaces.

Greater Reliance on Green Power

Summary
Green/clean energy minimizes the use of finite natural resources and reduces the amounts of greenhouse gases produced as a result of our global energy consumption. As of today, clean energy provides 16% of Canada's primary energy supply. (Canada, 2020).

Description
"Renewable energy use increased 3% in 2020 as demand for all other fuels declined" (IEA, 2021). Renewable energy needs to be able to provide three different types of energy to surpass traditional fossil fuels: electricity, heat, and fuels. Electricity has seen the most advancements and adoption within Canadian markets. Economic recovery plans, green agreements, and increased capacities of renewable technologies will continue to mature this trend. The largest obstacle to overcome will be the green premium, which involves the higher price tag tied to green technologies. As demand increases, supply will also increase and the green premium will diminish in time. Municipalities have higher adoption averages than countries, highlighting clean energy as a strategic opportunity for regions to incorporate green practices.

Extrapolation
Renewable energy is a growing trend, with political support and budget allocation to fund its implementation. A report from the International Renewable Energy Agency stated that the three key areas of opportunity for cities to use renewable energy are in buildings (for heating, cooling, cooking, and appliances); sustainable options for transport (electric mobility and biofuels); and creating integrated urban energy systems (IRENA, 2016).

Signals
- Governments also committed to installing an additional 698 gigawatts of renewable energy from solar, wind, geothermal, hydro and renewables-based hydrogen, and businesses, notably power utilities, pledged to install an additional 823 GW, all by 2030 (United Nations - UN News, 2021).
- "Long-term contracts, priority access to the grid, and continuous installation of new plants underpinned renewables growth despite lower electricity demand, supply chain challenges, and construction delays in many parts of the world" (IEA, 2021).
- Globally, renewables made up 29 percent of electricity generation in 2020, much of it from hydropower (16.8 percent). A record amount of over 256 GW of renewable power capacity was added globally during 2020 (Center for Climate and Energy Solutions, 2021).

Implications
"Renewable energy provides reliable power supplies and fuel diversification, which enhance energy security, lower risk of fuel spills, and reduce the need for imported fuels. Renewable energy also helps conserve the nation's natural resources" (Buy Clean Energy, n.d.).

Counter Trends
Banks use patrons investments to fund more productive ROI, and traditionally fossil fuel companies

Read the full report from IREA here

The Birth of Digital Twins

Summary
To date, the uncertainty of success and the high price tags associated with infrastructure building and development updates necessary to reduce greenhouse gases have caused delays and hesitation with budget allocation. Digital twins combat these barriers by simulating physical products over time with real-world operating elements to validate the proposed success metrics of their physical counterparts.

Description
Digital twins are a massive contribution to not only environmental advancements but to product design as a whole - enabling decision-makers to feel confident backing innovations to bring them to market. Healthcare, construction, space, automotive, and manufacturing have been some of the largest applications. Additional benefits include the ability to refine assumptions with predictive analytics, troubleshoot far away equipment, and manage complexities and linkage within systems-of-systems. (Armstrong, 2020).

Extrapolation
Industry 4.0 will show a shift to the digitization of manufacturing processes leveraging smart and connected technologies. Digital twins de-risk product rollouts, and provide automation, and data exchange (TWI, n.d.).

Signals
- "Aguas do Porto (AdP), a Portuguese utility organization, is responsible for the water supply in the city of Porto. AdP uses digital twins to forecast flooding and water quality issues, improve city services and responsiveness, and ensure the resilience of water infrastructure" (Sidyuk, 2021)
- "Energy is another sector benefitting from digital twins. GE's wind farm has increased productivity by as much as 20%. The real-time information fed to their digital replicas from sensors on each of the turbines enables more efficient designs and even suggests changes for making each active turbine more effective" (Karidis, 2021).
- "The ultimate vision for the digital twin is to create, test and build our equipment in a virtual environment," says John Vickers, NASA's leading manufacturing expert and manager of NASA's National Center for Advanced Manufacturing. "Only when we get it to where it performs to our requirements do we physically manufacture it. We then want that physical build to tie back to its digital twin through sensors so that the digital twin contains all the information that we could have by inspecting the physical build" (Marr, 2017).

Implications
Working completely in computerized environments, digital twins leverage AI, machine learning, and advanced data modelling to mimic their built counterparts. Digital twins, "allow the industry to anticipate downtime, react to changing circumstances, test design improvements and much more" (TWI, n.d.).

Counter Trends
Continuation of blind or unvalidated product rollouts.

The Further Marginalization of Marginalized Communities

"Reducing severe economic, political, class, and social inequalities is pivotal to achieving urban sustainability. Many of these class and cultural inequalities are the products of centuries of discrimination, including instances of officially sanctioned discrimination at the hands of residents and elected leaders"

(Fullilove and Wallance, 2011; Powell and Spencer, 2002).

Summary

"Climate change could result in more than 100 million additional people living in poverty by 2030" (Hallegatte et al., 2016). Larger, richer consumeristic countries are driving climate change, yet economically and socially marginalized peoples and countries are experiencing the brunt of the climate crisis brutal effects.

Description

Policies, programs, and actions must benefit economically and socially marginalized peoples - within your community and beyond. From an action perspective, it is critical to ensure you are intentionally diverse and inclusive with those who are involved in program building and decision-making. Traditionally, those who are most affected by climate change are the voices least heard; this narrative needs to be flipped if we collectively choose to avoid an interwoven global climate and poverty crisis.

Extrapolation

"Climate change represents a significant obstacle to the sustained eradication of poverty, but future impacts on poverty are determined by policy choices: rapid, inclusive, and climate-informed development can prevent most short-term impacts whereas immediate pro-poor, emissions-reduction policies can drastically limit long-term ones." (Hallegatte et al., 2016).

Signals

- "Widespread deforestation and unmaintained drainage infrastructure increase Haiti's vulnerability to hurricanes, storm surges, and flooding, while increasing temperatures during dry months, strengthening tropical storms, and unpredictable rainfall patterns will likely worsen climate impacts on already sensitive sectors" (Climate Links, 2017).
- "Life in the world's coastal cities is about to get much worse as temperatures rise a further 4C over the century. Manila, Guangzhou, Lagos, Ho Chi Minh City, Kolkata, Shanghai, Mumbai, Tianjin, Rangoon, Bangkok and 100 others in high-risk tropical and subtropical regions are most vulnerable. They can expect to be swamped more often by tidal surges, battered by ever stronger typhoons and storms, and hit by deeper droughts" (Vidal, 2014).
- "The effects of climate change disproportionately fall on underserved communities who are least able to prepare for, and recover from, heat waves, poor air quality, flooding, and other impacts» (EPA, 2021).

Implications

Equitable action on climate change is an urgent need to create systemic change that enables justice for all. Who you are, where you live, and your net worth should not be an indicator of how climate change will affect you and your family. This trend is incredibly complex as it lies at the intersection of two already wicked systemic issues: the marginalization of people and poverty, and climate change.

Counter Trends

Youth and NGO activism creating conversation and dialogue at the intersection of poverty and the climate crisis to catalyze systemic action. For example, Earthrise Studio is based out of the UK.

Time Machine

Next up, we are going to do a written foresight activity based on all of the information we gathered thus far. It's a tool from Foresight work created by design strategy practice, verynice that focuses on imagining plausible futures through the creation of artefacts. In this case, we are going to do a written Time Machine that focuses on your sensory experience: what do you see, feel, hear, smell, touch, think, and do in this "world".

Activity

Use *worksheet E* for this activity.

First, you're going to answer this question:

1. 20 mins of solo work. Write out an answer to this prompt,

    "If [insert city name] stays on its current trajectory with its environmental action and goals, what would a day in life be like for you in 2035 [insert city name]?"

2. Then spend 30 minutes discussing your answers in groups of five.
3. Lastly, appoint a stakeholder to lead a session with the entire group where you collectively discuss and capture themes and experiences that come up.

Next, you're going to answer this question:

4. 20 mins of solo work. Write out an answer to this prompt,

    "If [insert city name] updates its environmental action and goals based on climate forecasts, what would a day in life be like for you in 2035 [insert city name]?"

5. Then spend 30 minutes discussing your answers in groups of five.
6. Lastly, appoint a stakeholder to lead a session with the entire group where you collectively discuss and capture themes and experiences that come up.
7. What were the key differences between the two scenarios? What gaps did you encounter? How do these findings make you feel for yourself? For your community? For the next generation?

Bridging the Present & the Future

In the foresight section, we have explored the trends and drivers steering environmental action and we've imagined your city in a business-as-usual scenario along with a low-carbon scenario. Now, we are going to use the Three Horizons Framework, developed by Bill Sharpe of the International Future Forum. It is a great method from the foresight toolkit to show a transition from the status quo to a new vision over time; essentially looking to transition from our business-as-usual scenario through to the low-carbon scenario. «Three Horizons connects the present with desired (or espoused) futures and helps to identify the divergent futures which may emerge as a result of conflict between the embedded present and these imagined futures" (International Training Centre, Foresight Toolkit, n.d.).
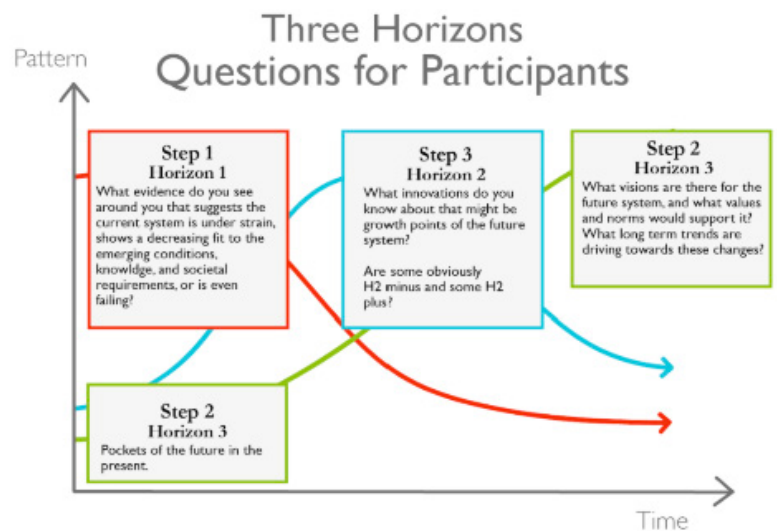
Activity

Use the Three Horizons framework below from the International Training Centre Foresight Toolkit, to run this workshop with stakeholders who participated in the other two foresight exercises.

Link to resource:
https://training.itcilo.org/delta/Foresight/3-Horizons.pdf/

Reflection questions to ask with participants:

1. What surprised you about this exercise? Did it feel motivating or unmotivating? What pockets of the future did you write down in step 2? How could you expand upon those pockets in the climate action plan? Does the end state feel feasible?

Three Horizons Questions for Participants

Pattern

Step 1 Horizon 1
What evidence do you see around you that suggests the current system is under strain, shows a decreasing fit to the emerging conditions, knowledge, and societal requirements, or is even failing?

Step 3 Horizon 2
What innovations do you know about that might be growth points of the future system?

Are some obviously H2 minus and some H2 plus?

Step 2 Horizon 3
What visions are there for the future system, and what values and norms would support it? What long term trends are driving towards these changes?

Step 2 Horizon 3
Pockets of the future in the present.

Time

Three Horizons Tool   35

City Inventory

Defining your target emissions reduction will be much easier once you know where you currently are. Start with an inventory collection across buildings, transportation, waste, industrial processes, and agriculture, forestry, and other land use. C40 Knowledge has a really robust system free excel-based tool called City Inventory Reporting and Information System (CIRIS) it is based on the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) standard (C40 Cities Climate Leadership Group, 2019). Link to resource.

Note: If you have already conducted an inventory of your GHG emissions, you're a step ahead! If you're confident that they were done robustly enough and recently enough to still be relevant, continue on to the next section.

Departmental Strategic Pillars

Taking an integrated approach to environmental action comes with a requirement of understanding what departments are planning and how they're spending their money. Work closely with the Planning Manager and Finance Manager to get a view into the activity and spending habits across municipal government.

Activity

8+ hours - Project leads

Sourcing integration opportunities

1. Before setting objectives and strategic pillars you're going to casually interview different department leads across the city with the goal of sourcing opportunities for integration through partnerships, advocacy, support, and/or resources.

    a. What is their department's strategic objective?
    b. What projects do they have in the pipeline?
    c. Are there any areas where they are working to reduce their GHG emissions? If yes, what are they? If yes, how do they resource or fund these projects?
    d. Are they working with any other departments on their projects?
    e. What has been their biggest hurdle in any environmental initiatives they've worked on?
    f. Would they be open to working with other departments to help the city build towards a smaller carbon footprint overall?
    g. If yes, would they have any requirements for that sort of collaboration?

Ideally, these interviews will unveil opportunities for partnership, advocates, resourcing, and strategic alignment - use these findings to inform strategic direction. *36*

Define Constraints

Resources are finite, time moves faster than we anticipate, and by nature, cities are a complex system of conflicting priorities all demanding attention and resources.

Constraints are typically viewed with a negative lens. And yes, they can hold you back from your initial idea but in design, they can be your competitive advantage in leveraged correctly. The first step to leverage them is being aware of what they are and why they are there. As interesting of an exercise it would be to pretend constraints didn't exist and "blue sky" climate action - it wouldn't evolve into an action plan, because in reality, environmental action is a complex systems issue that requires listening to and understanding how the system operates.

Considering your constraints empowers your stakeholders to be realistic in how you approach the next phase of building your climate action plan and both equips you to deploy strategic activities faster, and deploy smarter by leveraging the constraints to build something creative that meets the unique needs of your city, because of your preemptive navigation of the realities of the city as a system.

Activity

1+ hours - As many stakeholder types as you can

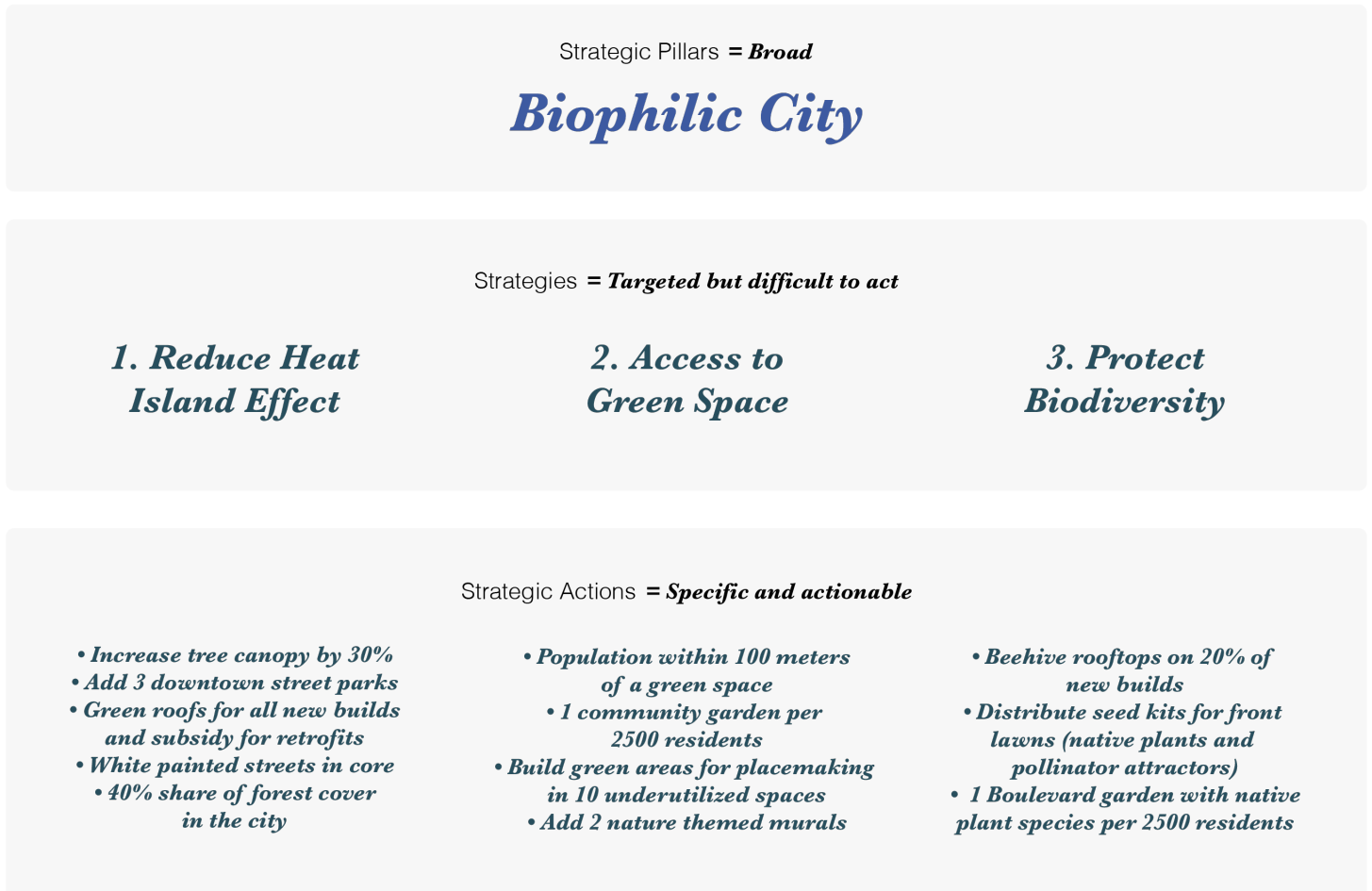*Use **worksheet F**. Let's define constraints that exist in your city*

1. Do this activity in a group environment with your diverse set of stakeholders. This activity makes for some honest discussion. The lead should be making notes on a whiteboard (something everyone can see), or an online whiteboard or allowing the stakeholders to input thoughts themselves
2. Talk through different constraints. The types listed at the top are a great place to start.
3. Then answer these two questions for each type of constraint. How does this constraint hold you back? How could you work with it on an environmental initiative?

Building a Climate Action Plan

We have learned the foundations, best practices, and aspirations of a climate action plan within the context of small Canadian cities and now it's time to put the theory and exercises to the test by building out or revamping a climate action plan of your own.

Visual Example of the Strategy Structure we will Follow

Strategic Pillars *= Broad*

Biophilic City

Strategies *= Targeted but difficult to act*

1. Reduce Heat Island Effect

2. Access to Green Space

3. Protect Biodiversity

Strategic Actions *= Specific and actionable*

1. Reduce Heat Island Effect	*2. Access to Green Space*	*3. Protect Biodiversity*
• *Increase tree canopy by 30%* • *Add 3 downtown street parks* • *Green roofs for all new builds and subsidy for retrofits* • *White painted streets in core* • *40% share of forest cover in the city*	• *Population within 100 meters of a green space* • *1 community garden per 2500 residents* • *Build green areas for placemaking in 10 underutilized spaces* • *Add 2 nature themed murals*	• *Beehive rooftops on 20% of new builds* • *Distribute seed kits for front lawns (native plants and pollinator attractors)* • *1 Boulevard garden with native plant species per 2500 residents*

Define Objectives and Targets

Setting practical yet ambitious objectives is the most important step of your climate action plan because everything else you add to the plan will be working to support it. Setting an overarching objective is the art of balancing radical optimism and sheer practicality. If we are ambitious in our targets without any care for the implementation or resourcing, it will be unattainable and demote action on smaller scales. Meanwhile, if you're too conservative, your overall impact will be much too minimal in scale - leading to missed opportunities. It must be ambitious, but achievable.

The main objective you set is going to the gold star that your strategic pillars, strategies, and strategic actions all work to achieve. The formula for a climate action plan's main objective typically involves a reduction of greenhouse gas emissions (GHG) by a certain percentage by a certain period. Here are some examples.

1. Build-in alignment with the Canadian government's 2021 pledge to reduce greenhouse emissions (GHG) by 40 to 45 percent in under a decade (CBC), working towards their promise to be net-zero by 2050 as part of the country's involvement in the Paris Agreement.
2. To reduce our overall emissions by 25% by 2030 and work towards a 75% reduction in 2050. To reduce our overall GHG emissions by 35% by 2030
3. by building a green economy that supports the overall well-being and sustainability of our community and its ecosystems for our current and future generations.

Activity

2-3 hours - All stakeholder types

Gather your stakeholders in either an online collaborative tool or a physical environment with whiteboards or blackboards.Remember Climate action plans should be direct, systemic, proportional, flexible, complementary, and effective (Sexton, 1999).

1. We are going to map out three different spectrums of GHG level to understand perceived feasibility. The ends of each spectrum will be Highly Conversative and Highly Ambitious.
2. Each spectrum will have a different objective percentage of GHG reduction. Ex. one spectrum labelled 20% GHG reduction, another with 30% GHG reduction, and the last with 40% GHG reduction.
3. Give each stakeholder three dots (in a virtual or physical space) and ask them to place their dot along the spectrum where they perceive that goal to rest between highly conservative and highly ambitious. Have the stakeholders work on all three spectrums at once. They can start on whichever they'd like,
4. Have a group discussion to discuss patterns and outliers. Aim to collectively work your way to an amount that is more towards the middle of the spectrum.
5. Once you decide on a percentage choose a timeline for your objective. What feels like a reasonable amount of time to reach this objective?
6. Lastly, are there any co-benefits you'd like to add? Refer to the next section for a list

Co-benefits

The Tyndall Centre for Climate Change Research, the Centre for Climate Change and Social Transformations, and the CDP Disclosure Insight Action collaborated on a report titled, "The Co-benefits of Climate Action: Accelerating City-level Ambition". Co-benefits are defined in the report as, beneficial outcomes from activities that are not directly related to climate change mitigation. Co-benefits are useful in communication strategies, building support for funding and deployment, and in the tangible positive impact to the co-benefit itself. (Tyndall Centre for Climate Change Research et al., 2020).

Activity

<u>2-3 hours - All stakeholder types</u>

Gather your stakeholders in either an online collaborative tool or a physical environment with whiteboards or blackboards.

1. Lens for participants: What co-benefits are most in line with your city's goals outside of GHG reduction?
2. Make sure there is a lead facilitator and a notetaker. They will be responsible for synthesizing and reporting the findings from this exercise.
3. Give each participant 3 dots to put on the different co-benefits that they feel are most in line with your city's goals outside of GHG reduction?
4. List the 8-10 chosen co-benefits and why they were chosen.

Disaster risk reduction

Economic growth - increasing the value of goods and services produced in the city

Ecosystem preservation and biodiversity improvement - increased connectedness between green spaces

Enhanced climate adaptation - making the city more able to withstand changes in climate

Greening the economy - making economic acticity in the city more environmentally sustainable

Improved access to and quality of mobility services and infrastructure

Improved acces to data for informed decision-making - collection and sharing of data that supports city officials and wider stakeholders' decision-making

Improved public health - for example, reduced respiratory diseases due to improved air quality

Improved resource efficiency (e.g. food, water, energy) - meeting the needs of the city with a lower level of resource input.

Improved resource quality (e.g. air, water)

Improved resource security (e.g. food, water)

Job Creation

Proversity reduction/eradication

Promote circular economy

Resource conservation

Security of tenure

Shift to more sustainable behaviours

Social community and labour improvements

Social inclusion, social justice

(Tyndall Centre for Climate Change Research et al., 2020).

Set Strategic Pillars

Gather your stakeholders in either an online collaborative tool or a physical environment with whiteboards or blackboards. As you're deciding which strategic pillars fit best with your city's general and environmental objective, try to approach the exercise through a lens of integrated actions as opposed to isolated actions.

Strategic pillars will ultimately be the goal that its nested strategies and strategic actions build towards; they offer a great opportunity to chunk environmental action together towards larger desired system change. A community garden program on its own won't have a substantial impact, but if it's paired with other food system goals around localizing food such as green roofs, urban farming, farm stands, meatless days, vertical gardens, and school gardening programs, and then nested within food security, then your actions become substantially more targeted making projects easier to justify, fund, and validate - considering its reduction data will be compiled with other strategic actions in the pillar to progress towards the strategic pillars overarching GHG reduction goal.

Please consider that the higher of a target reduction you have, the more strategic pillars you're likely to require because each strategic pillar represents a combined effort of strategic actions to reduce GHG emissions in a particular domain.

As we work our way through the next few exercises of setting strategic pillars, strategies, and strategic actions, it helps to think of them in this hierarchy:

Strategic Pillars **= *Broad***

Strategies **= *Targetted but difficult to act***

Strategic Actions **= *Specific***

Note: Look back to the strategic pillars section for a list of strategic pillars used in cities across Canada.

1. Give stakeholders time to read over the list of strategic pillars and add to it where they see fit
2. Give all stakeholders up to eight dots. Ask them to place dots on the strategic pillars they think would integrate best with their city whilst achieving the highest amount of feasible GHG reduction through the lens of the stakeholder group they represent.
3. Encourage discussion and elaboration from stakeholders as to why they chose particular strategic pillars (start with those with the most dots and outliers)
4. Make sure a notetaker is capturing the discussion and the role of whoever is talking. These conversations can later be used as insights.
5. Allow stakeholders to move their dots after discussion.
6. List out the chosen strategic pillars. How many are there? Is that too many? Not enough? How robust or bleak would your climate action plan be if you only worked with these pillars?
7. Ask participants to list out how their stakeholder group could integrate with / partner these pillars.

THIS WORKSHOP CONTINUES IN THE NEXT SECTION
(it can be done across two sessions)

8. Once the pillars are finalized (this doesn't have to be in the workshop) the project lead will be in charge of collaborating with project leads to fill out ***worksheet G***. This covers the name of the strategic pillar, a summary, a description, co-benefits, and targets. Later on, you'll add in the strategies associated with this strategic pillar.

Setting Strategies

Within your strategic pillars, you will nest 2-5 strategies that will work together to meet the GHG reduction needs of the strategic pillar. Strategies will be more specific than the strategic pillars but still more general than strategic actions. Creating several strategies within each strategic pillar will allow you to be diverse, creative, and holistic in your approach to meeting the needs of the strategic pillar. Examples of diversity include building strategies in partnership with different departments, each strategy can then be integrated with the objectives and strategies of its partnered department. Meaning that your energy efficiency pillar could integrate with transportation, agriculture, development, education, and households in the ways most meaningful to the needs, plans, and constraints of those industries/departments.

Activity

2-3 hours - All stakeholder types

Gather your stakeholders in either an online collaborative tool or a physical environment with whiteboards or blackboards.

1. This activity is a continuation of the Strategic Pillars activity. Considering how large and important these activities are, we recommend doing them on different days, so we avoid decision fatigue and inattention to detail.
2. We are going to be making tree diagrams in this exercise to emphasize hierarchy and nesting. Start with your strategic pillars at the top, very spread out. Under each pillar, you're going to make space for 2-5 strategies, that connect upwards to the pillar. Make a space beside each tree diagram to use for open ideation.
3. Pull in the list of strategies from page 20 of this toolkit, as well as your city composition chart so stakeholders can refer to them as they go.
4. Feel free to leave this as an open timed exercise where stakeholders can participate under the pillars that are most meaningful or relevant to them, without feeling pressure to participate in strategic pillars where they have little domain knowledge or power.
5. Ask stakeholders to brainstorm ideas through the lens of their stakeholder group as to what strategies would be fitting for that strategic pillar specifically within the context of your city composition.
6. The facilitator will host a synthesis discussion after an allotted period. Use the points in the ideation areas to discuss what strategies would be most effective, direct, and proportional to the strategic pillar. If any are fully agreed upon, feel free to place the strategies in the tree diagram placeholders. Feel free to not make any decisions during the workshop, and instead take the insights to decide the strategies with your smaller, direct team.
7. Once the stategies are decided. Add them to *worksheet H.* Use one full worksheet per strategy.

Set Strategic Actions

Once you have determined your strategies. The final step to the core of your climate action plan is your strategic actions, which are the specific activities that make a strategy actionable and measurable. In this case, we will be choosing 2-5 actions per strategy that can be used as projects or initiatives that can be implemented and reported on. The reports back from each action will be combined to meet the overall impact for that strategy, and the impact of each of those strategies will be compiled to reach the overall impact of that strategic pillar.

To switch a strategic action from a promise to a deliverable, it needs to be accompanied by deepening dimensions. Each strategic action should have a department partnership, an owner/lead, low-carbon scenario target, business as usual scenario, a type, and a level of priority.

Look back to the strategic actions section for a list of strategic actions used in cities across Canada that you can leverage. Feel free to add to that list where you see fit! Also refer back to the recommended structure to ensure you're including system-level interventions, targeted artifacts, and micro-projects.

Activity #1

2-3 hours - All stakeholder types

Gather your stakeholders in either an online collaborative tool or a physical environment with whiteboards or blackboards.

1. This activity is a continuation of the Strategies activity. Considering large and important these activities are, I recommend doing them on different days, so we avoid decision fatigue and inattention to detail.
2. The actions definition section of this activity will be done as a group, meanwhile, the deepening of the actions will be done by the lead by individually meeting with stakeholders on line items relevant to them.
3. Similar to the last activity, have an open ideation space next to each strategy.
4. Ask stakeholders to brainstorm ideas through the lens of their stakeholder group as to what strategic action would be fitting for that strategy specifically within the context of your city composition.
5. The facilitator will host a synthesis discussion after an allotted period. Use the points in the ideation areas to discuss what strategic actions would be most effective, direct, and proportional to the strategy. If any are fully agreed upon, feel free to place the strategic action in the tree diagram placeholders. Feel free to not make any decisions during the workshop, and instead take the insights to inform strategic action decisions with your smaller, direct team.

Activity #2

2-3 hours - Project Leads

Building out strategic actions. Gather your direct team.

1. Take everything you have worked on for strategic pillars, strategies, and strategic actions and input it into a ***worksheet H.***
2. If you haven't done so already, choose the actions that work best for your goals, city composition, stakeholder needs, and resources
3. Work through the deepening dimensions for each action, tying a department or partnership, owner, priority level, and type (systems-level intervention, targetted artifact, or micro-project). Collaborate with your stakeholders to fill out these dimensions to ensure their feasibility and proportionality to the number of resources on hand.
4. Key Performance Indicators (KPIs), are a measurable value that indicates progress towards a project outcome or result. In this case, we are going to use them to measure the success of our strategic actions. KPIs are critical for measuring patterns over time and monitoring progress. Additionally, they are a tangible target to work towards. We will also convert them into GHG emissions later on. How do you plan on measuring the success of each strategic action? Decide on a type of KPI and a quantitative amount. And remember, everything can be measured.
5. Leave out GHG emissions reductions, for now, we will work through it in the upcoming section.

Incorporating GHG Emissions Reduction Goals

Each strategic action needs a success metric and a measurable target for GHG reduction. This starts with a baseline understanding of your city's current annual carbon footprint. Does your city already calculate its GHG emissions? Such calculations are outside the scope of this project. There is a list of credible resources provided to help calculate GHG emissions internally. In this case, you can also work with other departments or outsource help for accurate calculations.

Learn how to calculate these metrics:
Greenhouse Gas Protocol released a brilliant 160-page report on "Accounting and reporting standard for national and subnational greenhouse gas reduction goals", it goes into the level of depth necessary to approach calculating GHG emissions properly. The report recommends how to estimate baseline emissions, as well as how to develop a GHG inventory and calculate reporting year emissions.

[Accounting and reporting standard for national & subnational greenhouse gas reduction goals](#)

[How to Calculate Greenhouse Gas Emissions by the Municipal Climate Change Action Centre](#)

Below are the metrics you need to complete your climate action plan:

1. [Insert city name]'s Current Annual GHG emissions:
2. Objective to reduce GHG emissions by [insert objective]% by [insert year] which would be: [current annual GHG emissions] - [objective annual emission] = [target GHG emissions reduction]
3. For each strategic action, the current emissions of that domain
4. For each strategic action, the desired amount of reduced GHG emissions: [current emissions] - [reduction target % turned into GHG] = [target GHG reduction for that strategic action]
5. Add all of the target GHG reductions for every strategic action within a strategy together to calculate the overall GHG reductions for that strategy
6. Add all of the target GHG reductions for every strategy within a strategic pillar together to calculate the overall GHG reductions for that strategy

Gap Analysis

Gap analyses give you visibility into missing assets and processes between your current state and your desired state. Now that we have taken inventory of your city assets and defined our desired state as a city with a deliberate climate action plan, we will seek to understand the gap, in order to properly approach the strategic actions.

Examples of how other Canadian cities have bridged the gap:

1. Integrating with other departments for supplementary funds and resources
2. Build momentum with micro-projects and gradually expand scope to include targeted artefacts and system-level interventions
3. City budget allocation
4. Grants
5. Federal programs such as FCM
6. Partnering with local NGOs and community organizations
7. Co-op student project leads reporting to city staff
8. High school volunteer hours
9. City budget allocation
10. Provincial and federal government funding

Activity

2-3 hours - Stakeholders from Inventory Exercise

Conduct a gap analysis. Gather the stakeholders you included in your inventory exercise.

1. Write out the resources that will be necessary for each of the strategic actions (think through the seven types of resources services; labour; equipment; materials; money; space; time.
2. Now compare that list against your initial city inventory. Highlight resources that are in the gap. They aren't inherently negative as they
3. ***Reflect***:
   a. Is bridging the gap between the current state and desired state feasible? Or will you need to alter your targets to meet keep your climate action plan proportional to the assets you have?
   b. How do you intend to bridge the gap between inventory and desired state? Do you have the city council backing to receive allocated funds?

External Communi-cations

How you communicate the value of a climate action plan to your residents is critical to the success of the program. Your residents will be your biggest supporters or your biggest barrier, dependent on how your efforts are framed and com-municated. You need to catalyze advocates, supporters, champions, and actors, across all age groups and pay brackets alike with your efforts. Based on an in-depth litera-ture review, I have compiled a list of communication recommenda-tions within the context of environ-mental action.

Helpful Resource:
The Science of What Makes People Care

(Christiano & Neimand 2018)

Communication Recommendations:

- Everything must be told in story form. Be compelling in how you portray value to your city's current residents and future genera-tions. Ignite a desire in residents to partici-pate themselves, not only in city systems, but,
- Your efforts must have a level of saliency to them (think of your micro-projects here). Giving the public the opportunity to observe and possibly interact with your strategic actions. These are your most tangible oppor-tunity to connect with and portray value to residents.
- Leverage data to show where the city is projected to be in 50 years and how these actions are deterring the likelihood of that happening.
- Materialize your co-benefits! Where you can, tell a compelling story as to how your efforts not only reduce GHG, but benefit public health, the economy, mental health, diversi-ty, equity, and inclusion, and other important societal domains.
- Must be able to explain in human terms why it's reasonable. Communications should be written with layperson's terms.
- When you measure or assess success, com-municate your findings to stakeholders and the greater community. Build momentum and excitement.
- When using data, focus on one or two clear statistics that you can build a human story around. Why is that data important to the audience? How does it affect them? Should it inspire them to do or change something?
- Connect successes back to the grand vi-sion/objective of the program.
- Capable of logical defence and based on good science. (Sexton, 1999)

Reporting Structure

Reporting structures refer to the interrelationship between various stakeholders in a company or project. In this case, reporting structures are the accountability paradigm of the climate action plan; ensuring ownership is spread across stakeholders and those stakeholders are aware of their reporting responsibilities to track the success of both deployment as well as ongoing monitoring and maintenance.

From a project management perspective, there are some key dimensions to assign per strategic action to guarantee a clear reporting structure:

"Creating incentives for change will require persistent and careful efforts to build political support"

1. **Owner/Lead:** Who is the primary contact and person leading this strategic action?
2. **Timeline:** When should the target goal be reached?
3. **Reporting Frequency:** How often should there be check-ins? How often should data be collected to monitor progress towards objectives? (this will vary dependent on the type of data you're collecting. For example, monitoring sign-ups for a community garden will be of a much lower frequency than, calculating saved energy from a sensor street light initiative for instance)
4. **Communication channel:** how will they present their reports back to the greater team? How will the public access this reporting data?
5. **Resources:** What key resources will this project require? Is there a whole team on this project?

Creating an Action Plan

Congratulations! At this point, we have worked through the stages and steps of building a climate action plan. Now you can compile your findings from the activities to present your integrated and deliberate climate action plan. Below you can find a checklist and sequential ordering for the narrative to pull everything together in a report for the public.

1. Objective
2. Climate projections for your city, where it is today, versus bad case scenario where it's head, and projections with an intention
3. Your city composition and how it affects how you approached environmental sustainability
4. Current emissions
5. Co-benefits
6. Stakeholders
7. Your Design process
8. List strategic pillars
9. For each strategic pillar…
10. Description worksheet
11. And a worksheet for each strategy
12. GHG emissions reduction summary
13. Communications strategy
14. Reporting structure
15. How to get involved
16. Partners (government, grants, local businesses, NGO's, residents)
17. Project leads contact info

This structure is in no way comprehensive, but a starting ground with the baseline required sections to build a compelling and contextual narrative by walking stakeholders through why you're doing this, what you're doing, and how you're doing it. Feel free to add and amend where you see fit.

Evolving with the Data
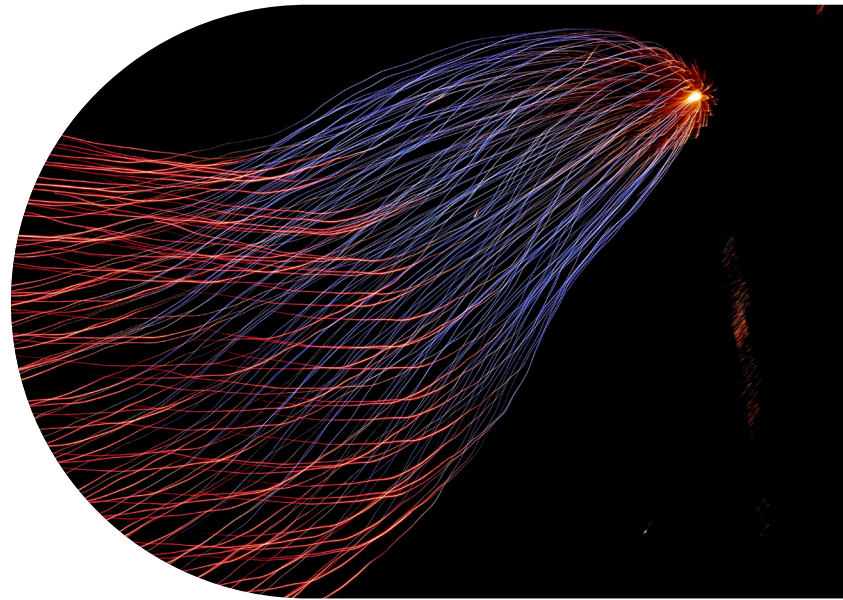
Measurement is used to answer questions, show results, demonstrate value, justify our budget, identify opportunities for improvement, and manage results (Vance, 2018). Mobilisation of the data findings is a key factor necessary for a measurement to be useful. The purpose of collecting and processing these large amounts of data is to use data to purposely evolve what we are doing, how we are doing it, and why we are doing it. Meaning that with projects such a climate action, which were not always deemed by the general public as necessary, you need to build your case with data for two main reasons:

1. *For stakeholders and program success:* Demonstrating your projects value and justifying budget and resource allocation
2. *For the earth and her health:* Identifying opportunities for improvement to ensure we are actually doing the best for the earth and our current and future generations. Essentially taking action for the sake of positive results, as opposed to taking action for the sake of taking action.

Keeping these reasons in mind, I recommend you work through an evolution plan with your team. A commitment to iterate upon and evolve your program dependent on the data is an indicator of a successful climate action plan. Flexibility and adaptiveness to the ever-changing environment are critical when designing systems interventions. Your program runs the risk of becoming a stagnant execution that misses the mark, underperforms, misses an important sector, or omits a new technology because of a similar target that is underperforming if iteration is not discussed and strategized before initial deployment

Activity

1+ hours - Varied stakeholder types

Gather your stakeholders in either an online collaborative tool or a physical environment with whiteboards or blackboards and answer the following questions

1. If the data comes back from the Owner/Lead of one of your strategic actions, and it is showing the program is underperforming, how will you handle it?
2. If the data comes back from the Owner/Lead of one of your strategic actions, and it is showing the program is overperforming, how will you handle it?
3. If a new technology arises that performs the tasks of one of the technologies you already have implemented. Will you consider it? Will you not consider it? What criteria would qualify it to be considered?
4. If the public brings a missed opportunity or sector to your attention, how will you handle it? Will you amend your plan to include it? Will you validate it?
5. How flexible are you willing to be to meet the needs of direct stakeholders and the earth?

Climate change is the single greatest threat to a sustainable future but, at the same time, addressing the climate challenge presents a golden opportunity to promote prosperity, security and a brighter future for all.

Ban Ki-Moon, Former Secretary-General of UN

Best of luck on your journey and thank you for taking the lead on deploying environmental action faster and smarter.

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A

City Composition Worksheet

Determine areas for opportunity, optimization, threat, protection, and get an understanding of the multidimensional elements that come together to become your city.

City Composition dimensions

1. Location	*2. Climate*	*3. Energy*
4. Economic Structure		
5. Culture	*6. History*	*7. Building Stock*
8. Wealth	*9. Urban Form*	

Stakeholder Worksheet

Determining and gathering stakeholders

1. Regulatory Agencies

- Who in your local government is currently involved?
- Who in your local government should be involved?
- What departments are working on green projects of their own?
- What gov. lead community centre have access to the population or resources?
- Who is going to sign the paper? Who is going to get the person who signs the paper to listen?

2. Environmental Advocates

- Who is already doing work in the space of championing environmental action?
- Thinking in terms of children, young adults, adults, and older residents is a great starting point

2. Business Sector

- What are your biggest industries? Who are the key players? Who are the emerging players?
- What companies and/or industries influence policy or strategic decisions?
- What companies support/advocate/value environmental action?
- What companies and/or industries block environmental action?

4. Affected Communities

- Who is Indigenous to the land your city now sits on?
- Who in your community is most vulnerable to climate change?
- Based on climate projections who will become the most affected?
- Consider the current and future generations

Note: come back to this section as you work your way through the activities after more actors present themselves
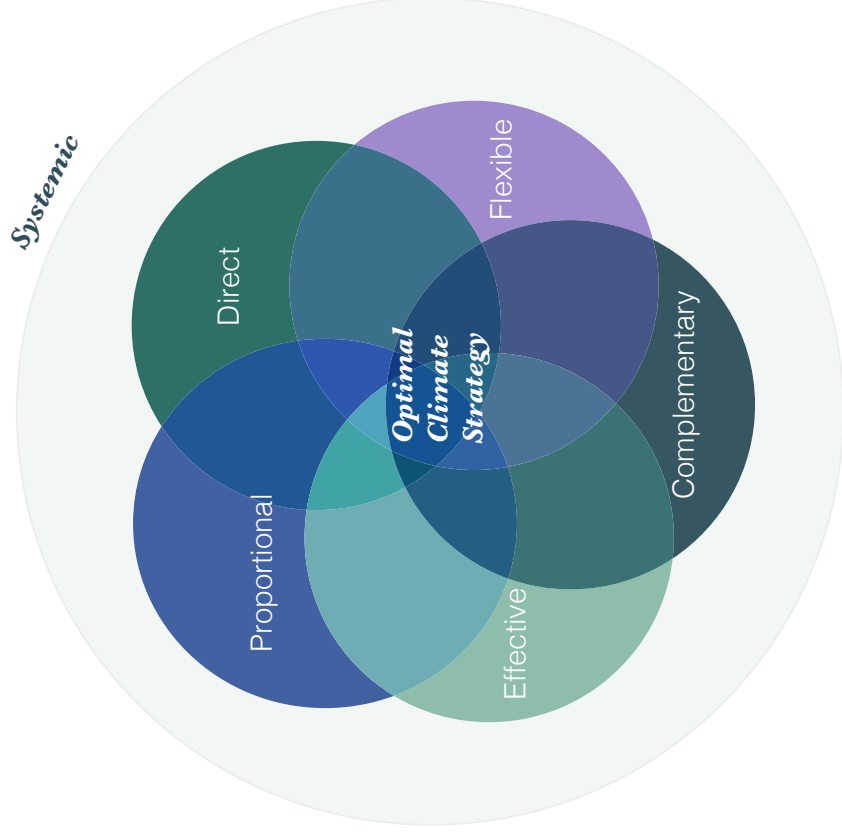
Stakeholder Worksheet

Determining and gathering stakeholders

Power

Knowledge
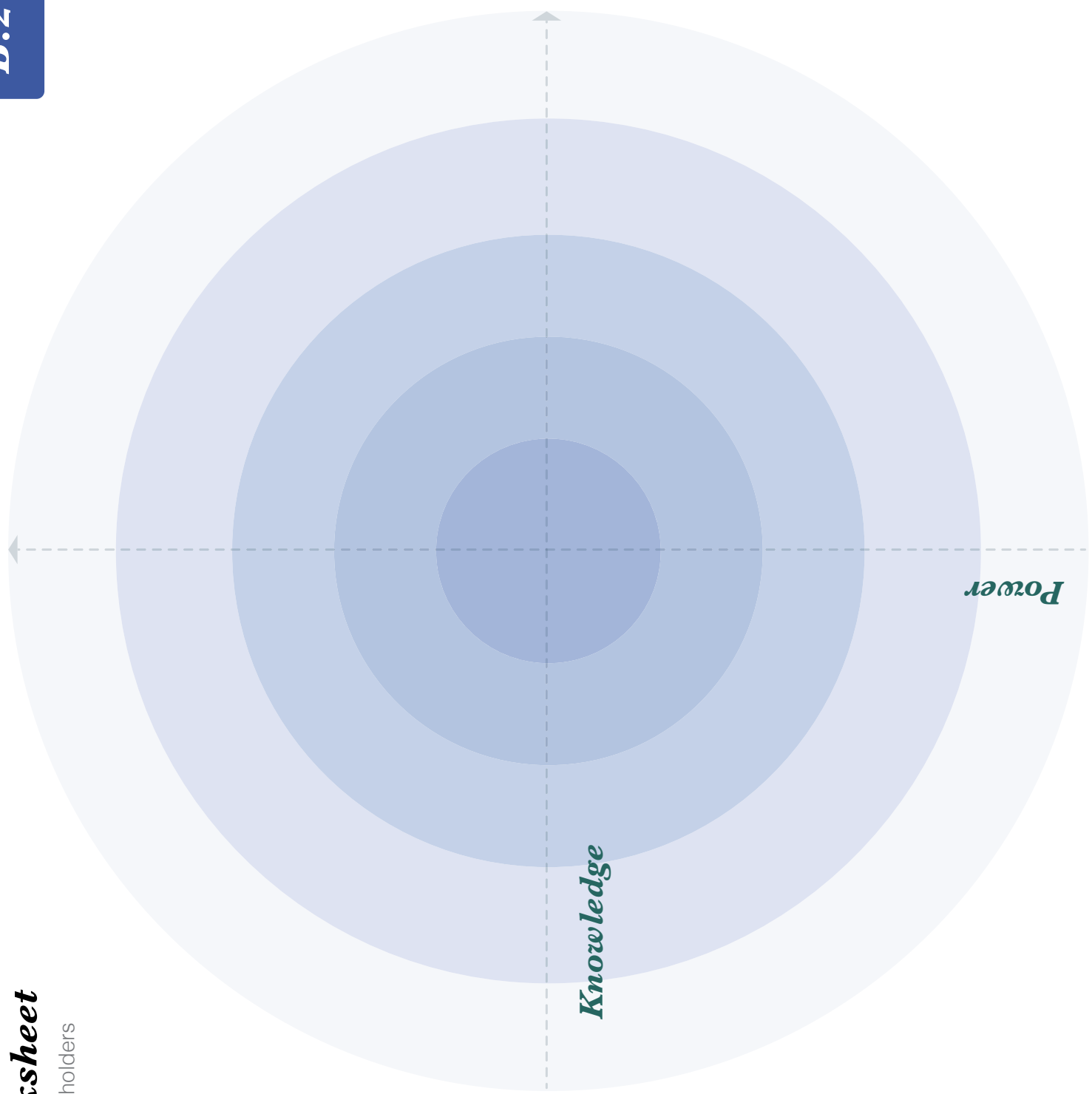
Interpreting the Principles

Define what the principles of a climate action plan mean to you

Systemic

Direct

Flexible

Proportional

Optimal Climate Strategy

Effective

Complementary

How will the principles affect the way you build your climate plan?

Define what each of these terms mean to you

1. Proportional

2. Complementary

3. Flexible

4. Effective

5. Direct

6. Systemic

D

Success Criteria

Define what the principles of a climate action plan mean to you

The Criteria

1. The end product is a living document
2. Ownership is necessary or it will never come to fruition
3. Include tangible activities that your residents can see, feel, and experience
4. Evolution of the city, not a project
5. Made for all with all: Government, businesses, and citizens
6. Measure success, or it will stagnate
7. Timelines change activity from a promise to an action
8. Everything gets measured
9. Stay within your capacility. Don't over-promise.

If you currently have a climate action plan:

1. Is there anything on this list that your city climate plan doesn't have?

2. What changes would you have to do to incorporate those criteria into your climate action plan?

If you currently do not have a climate action plan:

1. How will this list inform your decision-making?

2. Are there any that surprised you? If so, why?

E

Time Machine Worksheet

Determining and gathering stakeholders

Next up, we are going to do a writing-based activity based on all of the information we gathered thus far. It's a tool from Foresight work that focuses on making the future feel real based on artefacts. In this case, we are going to do a written Time Machine that focuses on your sensory experience: what do you see, feel, hear, smell, touch, think, and do in this "world".

1. If [insert city name] stays on its current trajectory with its environmental action and goals, what would a day in the life be like for you in 2035 [insert city name]?

2. If [insert city name] updates its environmental action based on climate forecasts, what would a day in the life be like for you in 2035 [insert city name]?

F

Constraints Worksheet

Defining the constraints to environmental action that exist in your city

Types

| Budgetary | Human Resources | Urgent Priorities | Urgent Priorities | Lack of awareness of the value | |
| Knowledge | Policy | Technical Capacity | Existing Infrastructure | Conflicting strategic priorities | |

List of Constraints

Constraint Name	Type	How does it hold you back?	How could you work within it? Mitigate? Creatively adapt?
1.			
2.			
3.			
4.			
5.			
6.			

G

Strategic Pillar Worksheet

Build out one strategic pillar per worksheet

Strategic Pillar Name

Summary

Strategies

Description

Co-benefits

Targets

H

Strategy Worksheet

Build out one strategy per pillar per worksheet

Strategy Name & Pillar it's in

Strategic Actions

Action Name	DescriptionP	Owner	artnership	KPIG	HG ReductionT	ype	Time line
1.							
2.							
3.							
4.							

Goal

Constraints

Economic Considerations

Co-benefits

Projected GHG Emission Reductions