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Context: Ottawa's GHG reductions

Building Ottawa's Energy Evolution is a collective impact effort in Ottawa to work on bringing stakeholders together to massively reduce greenhouse gas emissions from buildings in Ottawa.

This project works in synergy with the City of Ottawa's (The City) Energy Evolution renewable energy planning process, which gathered over 100 influential and relevant stakeholders in 2016 and 2017 to create a community held vision of a "Thriving City run by Renewable Energy". The city commissioned "pathway" reports to delve into the data of Ottawa's energy use and opportunities for various renewable generation strategies. The City of Ottawa has created a three year, 33-action plan which includes advancing the implementation of the smart grid and virtual net metering, and adding new renewable energy generation from small hydro. The City of Ottawa is spending \$500,000 on the plan and plans to leverage funding from provincial and federal sources as well as the community.

Our collective impact effort was developed alongside Energy Evolution and aims to continue and expand the stakeholder engagement beyond the timeframe of the Energy Evolution planning process, and assist the City by leveraging funding opportunities and convening more dialogues on finance, business models, technology implementation, education and scaling up impact and resources. The value of the collective impact process is to continue to convene influential stakeholders and create a long term plan for the community as a whole to address the complex issues of climate change. The theory of change is a foundational document that expresses how we believe an ambitious long term goal can be achieved. This document explains the process and content of the theory of change for this project.

Purpose and process of the theory of change

A theory of change is a framework for developing a cohesive strategy to achieve a long-term outcome. The purpose of a collective impact theory of change is to align multiple stakeholders in congruent actions and develop a shared measurement practice.

The process of exploration and discussion is intended to build trust and understanding of each other's perspectives as well as understanding the systemic current reality of the complex issue.

There are three steps to the theory of change

1. Define the PATHWAY of change
2. Define the INDICATORS that will help us measure our impact
3. Consider the INTERVENTIONS that are needed to create the desired change

The pathway of change starts with a long term outcome that is aspirational, yet attainable and measurable. Preconditions are then identified which are necessary and sufficient (not too many, not too few) to achieve the outcome. The result resembles an organizational chart with the future at the top.

(image)

The indicators are how progress is measured for each condition and precondition. An indicator has a population of change, a timeline and an amount of change required.

Example: if the outcome is greenhouse gas (GHG) emissions are reduced by 80%, the indicator is the current GHG emission levels(2700 kt/year) reduced to 500 kt/year by 2050.

Interventions are the actions that move us from the current reality to the required condition. An intervention can be an program, a project, a campaign etc.

Example: An intervention to achieve the state of "80% greenhouse gas reduction projects implemented in almost all existing buildings" could be a program in partnership with Hydro Ottawa and major investment firms that links all facility managers with technology implementation expertise, feasibility studies, financial modeling and access to invested capital, to complete deep energy retrofits with bulk buying power of solar panels, windows and heat pumps⁶ for a massive transition throughout the city. This program crosses many pre-conditions at once to move the goal into the realm of the possible.

Ottawa Energy Collective Impact Theory of Change Process

Several meetings were held from May to November 2017 to bring stakeholders together, introduce Collective Impact and work on the theory of change.

May 31st Fellowship event

The first fellowship event focused on the problem statement and state of the city with regards to energy and climate change. Roger Marsh (Hydro Ottawa) presented about innovative business models for implementing energy saving LED lights around the city. The steering committee suggested a focus on buildings based on data from Ottawa's Air Quality and Climate Change Prevention plan demonstrating that buildings account for a majority percentage of greenhouse gas (GHG) emissions. Very few initiatives or commitments were being discussed at the city level for improving and changing building GHG emissions. The opportunity present is to boost Ottawa's economy with green economy innovation in the building sector and create a healthier city. The 26 stakeholders present agreed that a buildings focus was appropriate and encouraged us to keep a lense of culture change for the initiative.

September 6th Stakeholder Mapping event

With the guidance of Knowing Fields Designs consultant Diana Claire Douglas, we conducted a constellation system map to test a draft long-term outcome proposed by the steering committee in relation to the relevant actors and stakeholders. This was a process where 15 community members each represented a stakeholder group and we arranged ourselves in a large room to play out the dynamics of the system and gain insights. The stakeholders were citizens, city managers, civil society facility managers, business community, Gaia and the Spirit of Ottawa. The main insights were that the community will be the most energetic supporter at first and we ought to put time and effort into attracting them to the project with a simple, clear rally cry - like Vibrant Ottawa Built Together. The Businesses are key but reluctant to participate in a long talking process. The facility managers need support as most of the hard work falls on them to drastically change their buildings. We must also make power dynamics visible and clear. We may have to build and tear down walls of communication and negotiation throughout the process. We saw that the Spirit of Ottawa had a past or reputation of non-possibility that was holding it back and needed to be transformed. The spirit of Ottawa was able to move the players into a strong hub, each with a hand on the others' shoulders with Gaia at the centre. Stakeholder engagement and dialogue emerged as a necessary condition for success of the project.

September 14th Theory of Change Core Group Meeting :

We invited a reduced list of key stakeholders from the building, renewable, and local businesses sectors, as well as representatives from the City of Ottawa and a number of NGOs to participate in the Collective Impact Theory of Change workshop. The workshop served as a foundation for a larger event on Oct. 4th.

During the event, we began with an introduction about Ottawa's greenhouse gas emissions within the context of the Pan-Canadian Framework on Climate Change. The methodology behind the Theory of Change was explained and we discussed the scope of the Outcome Statement and the top level conditions are necessary to achieve the different scopes. We explored three levels of scope for the Outcome Statement - a broad scope that encompassed a fully thriving, socially, environmentally and financially sustainable Ottawa, a narrow scope of 80% greenhouse gas reductions and an in-between scope of an innovative leadership in buildings leading to greenhouse gas reductions. Each Outcome Statements had a different arrangement of top level conditions. The steering committee was able to synthesize the results from each exploration to the in-between scope with all the necessary components.

<image>

Oct 4th Event:

This was a larger event with around 40 participants from building, renewable, and local businesses sectors, as well as representatives from the City of Ottawa and a number of NGOs. The purpose of the event is to agree on the outcomes and indicators that will make the biggest difference in helping the Ottawa community as a whole, and building sector specifically, meet its ambitious greenhouse gas reduction targets that align with Ontario's and Canada's requirements.

Speakers presented material on the State of the City, Energy financing models, and Renewable Energy CO-OPs. This was followed by a brief explanation of the synthesized version of the Outcome Statement and the pathway of change.

Several multi-stakeholder groups were tasked to choose a pathway based on their interest and expertise. The groups, aided by a facilitator, worked on refining the pathway of change by making sure that the top-level conditions are necessary to get to the outcome statement and indicators that will track their progress.

November 10th Focus Group Session:

This event involved members from the core group of the Collective Impact in addition to a contingent from the City of Ottawa and the energy manager at the Ottawa Hospital.

By this stage, the theory of change map was starting to take form and the core group was familiar with the brainstorming process. The focus was on debating the pre-conditions and determining the indicators and interventions that are required to get to the top-level conditions.

Results

Each event was followed by a steering committee synthesis meeting, in which all the data from the events are interpreted and compiled. The following is the theory of change based on consultations with 60 stakeholders over seven months. We developed the theory of change, a first draft of indicators and very roughly brainstormed actions. In phase 2 of the Trillium funding we plan to move into action planning based on the theory of change fundamentals.

Pathway of Change

The pathway of change is built by agreeing on the scope of the long term outcome and then building the conditions required to create that outcome. We work backwards through time to build the pathway of change, and then start at the bottom and work up with our interventions.

Long term outcome

The collective impact effort began with a broad greenhouse gas reduction outcome in mind. The steering committee reviewed the greenhouse gas inventory of Ottawa and assessed the actions being planned for Ottawa to identify a gap in action and commitment to reduce greenhouse gas emissions from buildings in Ottawa. From our work on the problem statement, we also recognized that a vision of economic prosperity in building the green economy in Ottawa was the second important theme of the long term outcome. Through stakeholder mapping we realized that the third element is bringing stakeholders together in a vibrant process of culture change.

These elements combine to create our Long Term Outcome VOLT - Vibrant Ottawa buiLt Together. A vibrant culture of transition is active in Ottawa to meet or exceed municipal and community greenhouse gas reduction targets through leadership and innovation in green buildings.

Top level Conditions

The top level conditions have been synthesized as follows:

1. Existing Building Stock achieves 80% reduction in GHG emissions overall by 2030
2. New Buildings are designed and built to be carbon neutral or carbon sinks
3. Stakeholders are communicating, collaborating and taking action (Citizens, political leaders, businesses)
4. Financing: Capital and business models are accessible that scale up implementation of green building tech
5. Smart Economy is spurred and jobs created through Green Building Technology Leadership and Implementation

These conditions are all considered necessary and when taken together, they are sufficient to reach the long term outcome. Existing buildings will make up 80% of the buildings standing in 2050, so they are a priority item to retrofit. New buildings are easier to build net zero now, and can become cost competitive in the near future. The sooner we can have net zero legislation approved and enforced the better for the long term outcomes. If citizens start demanding and paying premiums for net zero homes and technology costs decrease exponentially as use scales up, the transition can happen sooner than the proposed 2030 net zero legislation.

If the City of Ottawa, Invest Ottawa and Sustainable Development Technology Canada put a focus on green building infrastructure as a priority for Ottawa, we could scale up our smart, green economy. Deep retrofits have large upfront costs and long payback periods so innovative financing will be a very important element to get the hundreds of millions of dollars flowing that are needed to make these improvements. None of this innovation and change can happen without the influential stakeholders being willing to take a fresh look at priorities, business and financing models, sharing power and taking risks. Stakeholders must speak, explain, build trust and be open to changing how the system currently works.

Pre conditions

The following are the preconditions necessary to get to the top level conditions. Each section is discussed with our latest baseline information in the space to explain why these are the crucial levers of change.

1. Existing Building Stock achieves 80% reduction in GHG emissions overall by 2030

1.1 80% greenhouse gas reduction projects implemented in almost all existing buildings

1.1.1 Building Managers prioritize GHG reduction projects as part of strategic direction

1.1.1.1 Business Model is attractive and clearly understood

1.1.1.2 Fuels Switching, Heat pumps and Renewable energy tech are financially viable and available

1.1.2 Homeowners incentivized to pursue deep energy retrofits

1.1.2.1 Investment is clearly understood and easy enough to implement for average home owners

1.2 Occupant behaviour supports GHG reductions

1.2.1 Users understand energy saving behaviours & are adequately motivated.

The 2030 goal of this plan is ahead of the city and provincial targets. There are approximately 400,000 buildings in Ottawa that would need to be retrofit to a deep level. (ref) Public Service and Procurement Canada are dedicated to reducing energy use in Federal buildings and are on track for 80% reductions by 2030 so we believe with large scale-effort, the rest of the community can follow suit. The City of Ottawa is investing 0.5 million in a community innovation fund to spur green innovation in Ottawa.

Most private facilities focus on the low hanging fruit first achieving 10% gains in efficiency by changing light bulbs and build up slowly over time to deeper retrofits. To get faster, deeper retrofits widely adopted, an attractive and innovative business model would need to be presented and understood by the facility managers and building owners. Part of this model would mean having an affordable way to switch off of natural gas, since that is Ottawa's largest source of heating and cooling GHG's. It is also noted that we must generate more renewable energy at the same time as switching to heat pumps to account for the extra electricity required to run them.

Similarly, homeowners and renters need a tailored solution for a simple program or investment that has little to no upfront costs and does not negatively affect the value and salability of the house. A coordinated, scaled up implementation of deep energy retrofits may have the effect of significantly lowering the cost per retrofit as demonstrated by the Energiesprong project in the Netherlands, France and the UK. We can assume a net zero home will be highly valued in the future as carbon pricing makes energy efficiency more attractive.

Finally, high efficiency buildings can only perform well if the residents adapt behaviours to uphold the energy saving features. This might mean having windows and doors closed more often, turning off lights, using less water than the average Canadian and conserving energy at certain times. Ottawa Community Housing is running a pilot program to address this issue in their social housing units where green retrofits have been installed.

2. New Buildings are designed and built to be carbon neutral or carbon sinks

2.1 Government Champions Support from municipality and other levels of government

2.2 Builders are skilled and ready to implement net zero homes and commercial buildings with a working business model by 2025

2.3 Official Plan, zoning and council decisions enforce sustainable communities with green building requirements

2.3.1 Building Codes that step to net zero (phased) are implemented by 2025 and upheld in practice

2.4 Renewable Energy Generation is supported with a smart grid and virtual net metering

To significantly reduce the GHG emissions of the city it is important to avoid adding new net annual emissions as the city grows. Government support and championing is a strong lever to ensure the net-zero building codes come into effect and are monitored and enforced.

For local builders, net zero houses and buildings are possible now but not yet at a large scale. (ref) A pilot project by Minto developers in Kanata called Arcadia, demonstrated that mass produced, beautiful, large, net zero homes are possible and desirable in Ottawa. Through a federally funded pilot project they were able to reduce costs of implementation of future net-zero homes. Ontario Building Code changes are planned to make all new buildings net zero starting 2030. (add ref 3) Builders would need to be organized and ready a few years in advance of the legislation. In Ottawa there is a small network of green builders, but work would need to be done to bring the main builders into the fold and train many installers before the 2030 implementation target. Carbon pricing may help change the business model to make net-zero homes more in demand compared to contemporary mass produced housing.

At the municipal level, official plans and zoning are fundamental building blocks that must support sustainable neighbourhoods, green-buildings, dense living and good public transport. The City of Vancouver is implementing net-zero building requirements by 2030 and changing their Official plan, zoning, by-laws and processes to facilitate the change. The City of Ottawa can learn a lot from and follow their example. Council decisions that support and uphold the codes and bylaws are critical for long-term success.

Supporting renewable energy generation applies to new and existing buildings being greenhouse gas neutral. The City of Ottawa's energy pathways analysis by Leidos Canada (ref 4) calculated that 43% of the current energy needs of Ottawa could be met by renewable energy by 2050, mainly by solar, switching from natural gas heating and cooling to heat pumps and some biomass gas from waste and sewage. An important part of creating a market for locally generated renewable energy will be a virtual net metering program with Hydro Ottawa, so generators of renewable energy can sell credits to organizations who would like to buy renewable energy and it will pay for their energy bill with Hydro Ottawa. This is an important leverage point since the Ontario Ministry of Energy and the Independent Energy System Operator (IESO) is closing the premium price Feed in Tariff program and the new framework is net metering per building at market rates.

3. Stakeholders are communicating, collaborating and taking action (Residents, political leaders, businesses)

3.1 Strong influential leadership in stakeholder groups

3.1.1 Influential Stakeholders (Prominent Citizens, Business leaders, City Mayor) understand the urgency climate change and possibility of innovation leadership for Ottawa

3.2 A vibrant and engaged culture of transition who demand and drive action

3.2.1 Public engaged and motivated in energy and climate conversation and education

3.3 Effective collaboration and alignment among stakeholders

When stakeholders meet and discuss the real issues and share information we have a chance at tackling such a complex challenge as climate change. It helps the whole process move ahead if influential leaders in the business, government and community all champion the new direction and are prepared to take decisive and bold action. Currently many people understand the threats of climate change but it is still a big leap to change our business models and living patterns for it. We need strong, influential leaders to make it real. If we take an innovation and economic prosperity lens to the issue we can engage more players, focus more funding and development to the issues and make a larger impact.

Many cities around the world are showing bold leadership for GHG reductions and committing to 100% renewable energy by at least 2050 (5), such as Victoria and Vancouver B.C., Woodstock Ontario(6), New York City, California USA, with a total of 118 U.S. Mayors signing a formal pledge support 100% renewable energy. In Germany, a leader in renewables, Großbardorf pledges to produce 400% renewable energy. Unsurprisingly, Fukushima City, Japan (7) has joined the pledge for 100% renewable energy by 2050 as well. Some cities that have made these goals as top-down from the political leaders and others have had a groundswell of

demand from citizens, but always a conversation about economic advantages is an important factor.

The city of Ottawa has made a significant pledge to reduce community-wide GHG emissions by 80% by 2050 (ref) to align with Federal and Provincial goals and access funding from those sources. Ottawa is also taking on a large and expensive project to increase light-rail mass transit. Ottawa is lacking senior staff that are mandated to prioritize environmental sustainability. The Renewable Energy strategy is currently a small budget item on busy agendas within several departments. The Chair of the Environment and Climate Protection Committee, David Chernushenko (Councillor for Old Ottawa South) is a passionate advocate for the urgency of climate change, 100% renewable energy and supporting the community actors in sustainability. In a speech following the committee approval of the first phase of the Energy Evolution Renewable Energy Strategy, he reflected that the municipality takes a measured and careful approach and are making good progress. In some ways Ottawa is making better progress than some cities who were quick to make a bold pledge and slow to follow up with their analysis and plans. (8) We know from voting patterns, that some Ottawa councillors are very supportive of green initiatives, and some are indifferent or against spending too much money on GHG reductions, favoring better roads and economic infrastructure for their constituents. The Mayor is concerned, but not urgently motivated around the issues of climate change and generally prioritizes prudent financial management. Engaging citizens and their councillors in constructive dialogue will be an important part of the leadership picture.

A vibrant culture of transition means people are excited and motivated to work together on these tough issues and are willing to spend time working on a the collective impact process and actions. It is the opposite of creating a divisive debate around the issues and blaming the bad-guys. In cities like New York, three-quarters of residents say they are worried about climate change, with more than 80% wanting carbon dioxide to be regulated.(10) That enables the Mayor of New York to confidently make pledges and prioritize funds to GHG reductions. We do not currently have any specific information on Ottawa's sentiment. However, national Canadian survey in 2015 shows three quarters of Canadians believe climate change is real and caused by human activities. A general, anecdotal assumption is that rural area and small town residents of Ottawa are less concerned and knowledgeable about climate change and urban residents are more aware and concerned, but studies by Environics and the David Suzuki Foundation show that rural Canadians across the country are more aware and concerned than in previous years, Canadians in general accept that climate change is real, and support exists for cap and trade programs. (11) Discovering the Ottawa specific engagement numbers and fanning a movement of concern and action would be likely steps forward. This can be in social and traditional media, podcasts and events all targeted at demonstrating a strong demand with the public on green buildings and renewable energy.

Stakeholder engagement has been very good on the Energy Evolution planning process and the collective impact process, and it shows in the completion of a plan that was widely praised

by the environmental community and partners, and which actors are excited to help enact. Hydro Ottawa is an excellent partner, who's strategic vision is to lead in the development of smart technologies for energy services and renewable generation. Hydro Ottawa is a subsidiary of the City of Ottawa, and pay a dividend which will add to the new Community Energy Innovation Fund.

The Environment Committee received 500 thousand dollars in the 2018 City of Ottawa budget for environmental programs. This is a large amount of money but is very small compared to the total budget of 3.7 billion whereas 202 million is spent on solid waste services and 100 million is spent on road services. (9) The Energy Evolution plan also commits significant resources from Buildings and Energy Management of the City of Ottawa. If there is more community demand for green action we suspect environmental initiatives could receive significantly more municipal funding. Ecology Ottawa is working on a campaign to ask for increased environmental funding for 2018. Community citizens groups were vocal in their support of a full time dedicated team at the City of Ottawa to handle this important file.

Prominent business leaders also show fairly good understanding of the urgency of climate change are generally willing to help out if there is an organized opportunity or campaign. Jim Basilie, former CEO of Blackberry is the chair of Sustainable Development Technology Canada, Don Anderson former chair of the Chamber of Commerce Ottawa expressed his willingness to be a champion for the collective impact project and to connect to the business community. Invest Ottawa works closely with Hydro Ottawa and the Planning, Infrastructure and Economic Development section of the City of Ottawa on the Smart Cities 2.0 strategic plan. There are opportunities to focus more on green buildings as part of the smart cities projects.

The municipal plans for Energy Evolution are to be more targeted and specific in their stakeholder engagement going forward, so the collective impact process will be primed to engage the broader community to ensure a vibrant culture of transition is growing in Ottawa and focus on large scale building retrofit programs in Ottawa. The collective impact processes can help align these stakeholders for bolder action than a municipality can comfortably commit to alone.

4. Financing: Capital and business models are accessible that scale up implementation of green building tech

4.1 Ottawa leverages government financing and funding and scales up access to capital

4.2 Community financing opportunities allow investors to scale up investments and promote rebates in Ottawa

4.2.1 Regulatory environment supports community investments

4.3 Carbon pricing means business case for deep energy retrofits and analysis is attractive

4.4 Private impact investors contribute 100's of millions dollars to green building project investments

4.4.1 Investor awareness and confidence is high in Life Cycle Cost and ROI Analysis of green building and retrofit projects

4.4.1.1 Tools and standards are clear on measuring ROI and Life Cycle Cost

The federal, provincial and municipal governments are all aligned at this time, on climate change mitigation and funding major projects for GHG reductions. It is important to leverage this funding for Ottawa and also use these investments to create structures that will continue to fund GHG reductions in a big way if these favorable conditions change. That is why we want to help scale up Ottawa community funded investing co-ops as well as create financial instruments that move larger private investments into Ottawa GHG reduction projects through impact investing. In order to create these, we need the rules and guidelines in place that make the investments accessible and trust-worthy. One of our stakeholders, Ottawa Renewable Energy Co-operative, OREC is working with funding from the City of Ottawa to build and grow a community funded energy retrofit program similar to their successful solar panel installation investment co-op. Carbon pricing should make net zero buildings more financially favorable over time. Investors often look at payback period and life cycle cost analysis as a way to justify an investment in GHG reducing technologies. A predictably increasing price on carbon will speed up the payback period and encourage investors.

To retrofit nearly all buildings in Ottawa, 100's of millions of dollars of investment will be needed. New financial products will need to be created to aggregate risks and provide a stable rate of return and be RRSP eligible. Left to a building by building approach, low hanging fruits will be done first such as changing light-bulbs and more efficient fans and furnaces, but to meet these ambitious targets, we really need large scale investments like a smart grid, district energy, ground source heat pumps, building envelop and window upgrades, large scale renewables and sophisticated control systems. The Toronto Atmospheric Fund finances large projects in Toronto and is trying to expand this program to other cities in Canada such as Ottawa with Sustainable Innovation Centres. Future actions may include a summit about financing green projects in Ottawa, creating an ongoing working group who could develop a framework for massive financing in Ottawa.

5. Smart Economy is spurred and jobs created through Green Building Technology Leadership and Implementation

5.1 Innovation and new tech implementation prioritized by the facility managers in municipal and private sector

5.2 Local green building industry is supported to scale up, hire more workers, and run pilot programs to test new technologies in Ottawa

5.2.1 Knowledgeable graduates ready to contribute, from post secondary institutions

5.3 Existing Contractors are knowledgeable and skilled in implementing green building tech to keep up with demand

5.4 Expertise network established, who can prioritize, manage and measure outcomes of green building projects

Innovation for green building performance must be a top priority for building managers, coming from top executives. Innovation is risky and there is a legitimate fear of spending a lot of money and not getting the results that pay back for the company. Green technology businesses report that it is difficult to convince Canadian businesses to take a risk on a pilot project or an innovative technology.(12)

Innovation and scaled uptake of renewable technologies pushes the envelope on what's possible and reduces the cost of implementation. Energiesprong is an innovative program that uses high tech processes such as drones to measure a block of houses, fabricates a new building envelop at a factory and then installs a new energy system, cladding and solar panels all in a matter of days. (13) Residents pay the same amount they used to for utilities to pay off the upgrades. It is used in the Netherlands, the U.K. and France. It is also being piloted in a few cities in the USA including New York City, coordinated by the Rocky Mountain Institute and is being studied by Ottawa by Sustainable Buildings Canada for possible adoption in Toronto and Ottawa. (13)

If we take on massive scale projects, we will need many skilled tradespeople to install many solar panels, windows, envelopes and heat pumps. There is an active network of solar installers and green builders now in Ottawa, but additional workers need to be trained and certified if our goals are to be met. An 'all at once' project could also help us book certified installers from further afield for a few months for a special project.

For the long-term, we would want to see a steady stream of green skills trades ready to work. The federal government is investing 24 million of cap and trade income to fund green jobs training in Canada. (14) Internships, work placements and apprenticeships are an important way to transition the workforce. Untrained construction workers sometimes install new technology improperly, losing the potential energy gains. There is currently not much training available or invested in for the employed workforce.

Building mangers/owners who want to complete deep retrofits need to do a building analysis, feasibility study, financial investment ROI analysis, and project plan. It is important to be able to access the experts who can provide credible and informed analysis. Energy Ottawa is developing expertise in this area and other consultants could become a part of a network that

work with common definitions and standards to help prioritize which buildings and area should be retrofit first with which technologies.

INDICATORS

The top level indicators form the basis for shared measurement in collective impact. Indicators should demonstrate movement towards the desired conditions and be able to be measured without too much extra effort from participants. Indicators should have a date, an amount of required change and the type of change by who.

The measurable indicators for the top level conditions are as follows

1. Existing Building Stock achieves 80% reduction in GHG emissions overall by 2030

Indicator: Kilo-tonnes of CO2 equivalent emissions for Ottawa buildings per year. Reduced from 2700 KT to 500 kt by 2030

2. New Buildings are designed and built to be carbon neutral or carbon sinks

Indicator: Percentage of new builds in Ottawa that are net zero or better

10% by 2020

50% by 2030

100% by 2050

3. Stakeholders are communicating, collaborating and taking action (Citizens, political leaders, businesses)

Indicator: Level of engagement from influential leaders from each sector increased to 4 or 5 in each category

(5 point subjective engagement scale based on targets and actions - Federal, Provincial, Municipal, Developers, Civic Managers, Community, Academic)

4. Financing: Capital and business models are accessible that scale up implementation of green building tech

Indicator: Canadian Dollars of capital invested each year in GHG saving measures for buildings.

150 Million/year by 2020 until 2030 for a total approx. 2 Billion by 2030

5. Smart Economy is spurred and jobs created through Green Building Tech Leadership and Implementation

Indicator: Number of people employed in Ottawa doing GHG reducing work.

Indicators were identified for each precondition, as outlined in appendix X. These will be reviewed in further detail in phase 2.

<image>

INTERVENTIONS

If we can prototype a few standard solutions for the majority of retrofits, we may be able to significantly reduce the cost per installation, as in the scanning and 3D printing example described previously. There may be a way for green bonds or even alternative Earth-based currencies to be developed to enable the projects. A general strategy for Ottawa was outlined in a fellowship meeting.

1. Set the baseline analysis for buildings in Ottawa to prioritize retrofits and potential for district solutions.
2. Work on a citizen up-swelling of support for green building deep retrofits in Ottawa including advocating for energy labeling on houses and a accompanying marketing campaign
3. Convene a circle of champions to support bold action on sustainable housing development and retrofits
4. Scale-up education and training for green construction operators and city councilors
5. Create a financing framework to massively up-scale deep retrofits across the city
6. Implement massive upgrades across Ottawa using a model similar to EnergieSprong, but tailored for our conditions.

Conclusion

In Conclusion ..

Appendix

- A. Problem statement
- B. Meeting report May 31st
- C. Meeting report Sept 14th
- D. Meeting report October 4th
- E. Meeting report November 10th
- F. Steering committee meeting notes
- G. Aspen Institute Theory of Change Framework
- H. Indicators for each precondition

5. <http://vancouver.ca/green-vancouver/renewable-city.aspx>
6. <http://www.renewablecities.ca/dialogues-projects/global-learning-forum-2017/session%20/canadian-municipalities-committed-100-renewable-energy>
7. <http://www.go100percent.org/cms/index.php?id=19>
8. Speech by David Chernushenko, Chair of Environment Committee on passing of Energy Evolution Strategy, November 21, 2017
9. City of Ottawa Draft 2018 budget. Accessed from City of Ottawa website, Dec 5th 2017. <http://app05.ottawa.ca/sirepub/cache/2/cad5imrpc15ynlrbomztca0f/48933912052017105152208.PDF>
10. <https://www.theguardian.com/cities/2017/jun/12/climate-change-trump-new-york-city-san-francisco-houston-miami>
11. <https://www.theglobeandmail.com/opinion/are-canadians-on-side-with-trudeau-in-fighting-climate-change/article27506540/>

12. Sustainable Development Canada. CleanTech summit dialogue. April 7th, 2017

- 13 Canadian Sustainable Buildings. Energy Sprong Report. <http://sbcanada.org/wp-content/uploads/2017/09/Energiesprong-Summary-Report.pdf?x41824>

14. 24M in Capa and Trade cash to fund provincial green skills training. CBC News. <http://www.cbc.ca/news/canada/london/24m-in-cap-and-trade-cash-to-fund-provincial-green-skills-training-1.4241857> Accessed Dec 4, 2017

ASSUMPTIONS

Many of the assumptions in this model are coming from an environmentalist point of view. We believe climate change is real based on international scientific data and that human activities affect greenhouse gas levels which warm the air and sea causing raised water levels, extreme storms and drought. We assume municipal political leaders need to see a demonstrated will of the voters before taking strong leadership and actions. We assume people will not pay significantly more for buildings unless there is a return on investment. We assume carbon pricing will change business models in favour of more green building technology implementation such as making solar panels, energy storage and smart grids more financially competitive. We will further explore assumptions as we move into action planning in collective impact phase 2.