

A²Zero Investment Plan

OVERVIEW

This document outlines an investment approach for the A²Zero Carbon Neutrality Plan. It includes an alternative framing around our community's commitment to carbon neutrality, a look at the historical impact of our community's greenhouse gas emissions, and a projected investment scenario, highlighting investments and costs specific to actions identified as falling under the responsibility of the City of Ann Arbor, and a presentation of the cost of inaction. As there is no way to know exactly what the funding landscape will look like 10 or 11 years into the future, the investment scenario should be viewed as directional and only one possible scenario of what the future may look like. Many things will inform what resources are actually available to do this work and staff will continue to aggressively pursue funding opportunities, collaborations, and innovative financing mechanisms to lower the upfront cost to the city and our residents.

FRAMING

To-date, the financial conversation around A²Zero has focused on the costs to implement the plan. While there will be costs, nearly all actions are investments. What this means is that investing in nearly all of the actions return benefits to the City, to our residents, to our businesses, or to society as a whole. As illustration, data shows that \$1 invested in energy efficiency saves between \$4 and \$5 in energy costs (DTE's figures are closer to \$5).^{1,2} Moreover, every one dollar invested in preparedness and resilience shows a return on investment of \$7 in avoided costs.³ Onsite renewable energy installations, such as rooftop solar, have a payback of 10-12 years but are warranted for 25 years meaning 13-15 years of direct cost savings.⁴ Operating an electric vehicle is at least 50% less than an internal combustion engine.⁵

Entities regularly make investments in order to create an opportunity or to reduce future costs. In much the same way, A²Zero is an opportunity for Ann Arbor to make an investment in our community. A²Zero is a proposal to spend money over the next ten years to reduce the community's greenhouse gas emissions and thereby eliminate future social costs of carbon and to reap benefits for residents, businesses, and the surrounding area which will more than pay back the initial investment.

A PROJECTED INVESTMENT SCENARIO

At the request of Council, City staff put together a projected investment scenario for A²Zero. There are many possible scenarios for how the A²Zero Plan could be funded so the attached document should be viewed as one possible scenario, amongst many. Additionally, the scenario should be considered directional as it is impossible to know what types of federal, state, or philanthropic grants, or public-private partnership may exist for all 7 strategies identified in the Plan over the next 10 years. Moreover, costs for the plan were modeled using today's dollars. It is highly likely, however, that major advances in technology will help lower some of the costs within the plan.

¹ A 2015 MPSC study estimated the return as \$4.38 per \$1 spent; see:

https://www.michigan.gov/documents/mpsc/2015_Energy_Optimization_Report_501548_7.pdf

² Based on DTE's and Consumers Energy's EE programs, the figure is closer to a 5-fold return; see:

<https://www.nrdc.org/experts/ariana-gonzalez/michigan-utilities-plan-most-energy-efficiency-ever>

³ See <https://www.securitymagazine.com/articles/89754-every-1-spent-on-natural-disaster-preparedness-is-11-in-return>

⁴ See <https://news.energysage.com/understanding-your-solar-panel-payback-period/>

⁵ See <https://avt.inl.gov/sites/default/files/pdf/fsev/costs.pdf> and a [2018 study](#) from the University of Michigan's Transportation Research Institute, which found that electric vehicles cost less than half as much to operate as gas-powered cars. The average cost to operate an EV in the United States is \$485 per year, while the average for a gasoline-powered vehicle is \$1,117.

Underlying the Investment Scenario are the following assumptions:

- That all actions would start in 2021 and 2022. This may not be physically possible, but it allowed us to front load the costs to identify an optimal scenario to maximize our chance to achieve carbon neutrality by 2030.
- The Office of Sustainability and Innovation’s annual budget is \$2,000,000 (all inclusive) – meaning an 11 year budget of roughly \$22,000,000 which can be applied to achieving A²Zero.
- Charges to the Solid Waste Fund can be absorbed by other structural changes (per the SWRMP) that make these programs possible, should those changes be implemented (total impact of nearly \$45,000,000 over 10 years).
- Pertinent projects will be placed into the CIP but it was assumed that for those projects, outside capital would need to be secured to complete the project. This may mean we over-estimated the impact of debt the City might take on if some of these projects could be covered through existing funding sources.
- \$1,100,000 in funds for Tree Planting already exist through the Stormwater Fund meaning this wouldn’t be a new cost to the City.
- Existing City staff such as planners, building code inspectors, and folk in fleet and facilities, are assumed to have a portion of their time allocated to advancing actions in A²Zero that clearly fall under their existing job descriptions.
- Where possible we estimated the cost savings from measures, but only savings accruing to City operations. We included notes that highlighted which actions had well established paybacks for residents or businesses.
- Where possible private sources of funding may exist, those were indicated. The years in which those sources are attributed to the budget are best estimates.
- A federal stimulus and/or federal dollars will help build the park and rides. This is similar to how previous park and rides have been built.
- An estimate for how much of existing City budgets could be allocated for each action is included. Where gaps in City budget exist, the City could 1) reprioritize existing City resources; 2) fundraise; or 3) take on debt. If not otherwise indicated, any gaps were assumed to be filled by reprioritizing the City budget.

Using these assumptions, staff created a A²Zero Draft 10-Year Investment Scenario. This document is one possible scenario, amongst many, of potential investment amounts, sources, and funds between 2020 and 2030 that could occur to achieve the goals as outlined in the living A²Zero Carbon Neutrality Plan. This investment Scenario will certainly change as actions start to be implemented, new sources of funding become available, and as new actions are identified.

How Much Investment is Required to Deliver the Plan?

The attached matrix, “A²Zero Draft 10-Year Investment Scenario” presents one possible path for how to fund the City portions of the A²Zero plan. Looking specifically at the years 2021-2023, the scenario outlines operational costs (A), operational credits (aka, savings to the City from implementing actions) (B), the amount of debt service payments we’d have to make (C), the total net city impact (D), the total capital or debt we could issue (E), and potential external funding (F). The large amount of external funding in 2022 is related to potential federal stimulus dollars specifically focused on park and ride infrastructure.

		2020	2021	2022	2023
A	TOTAL City Operating Costs	\$793,281	\$8,491,870	\$7,119,461	\$6,847,486
B	TOTAL City Operating Credits	-\$17,500	-\$1,305,748	-\$1,078,896	-\$686,682
C	TOTAL City Debt Service	\$0	\$10,894,794	\$4,292,781	\$3,655,281
D	TOTAL Net City Impact	\$775,781	\$18,080,916	\$10,333,346	\$9,816,085
E	TOTAL City Capital	\$0	\$42,875,075	\$3,612,500	\$0
F	TOTAL Other (i.e., philanthropic, state, federal, pro bono, public-private partnership)	\$150,000	\$3,259,500	\$87,588,500	\$455,000

Using this scenario as a starting point, the City would need to generate \$18 million in 2021 to implement all the identified actions in the carbon neutrality plan (NOTE: this scenario assumes all the city-based debt for the plan is issued

¹ The figures in this chart were updated after updates to costs were provided by the City’s bond agencies.

in 2021 and 2022). As of right now, roughly \$6.8 million exists within the 2021 budget, meaning that a one-time gap of \$11.2 million needs to be closed. There is the potential that a federal stimulus could help eliminate some of this gap.

As can also be seen from the above matrix, 2021 is the year with the largest net city impact. This is because of the issuing of bonds for all projects are assumed in 2021 & 2022. Looking forward, 2022 and 2023 are projected to have net city impacts around \$9.5 million. Assuming City budgets stay comparable to the projected 2021 budget, this means that the gap needing to be closed with be \$2.7 million for those years.

In summary, the City’s portion of the cost of the plan is an estimated one-time need of \$11.2 million and a recurring \$9.8-\$9.0 million each year afterward for the duration of the plan. Of this total, \$6.8 million is already estimated to exist meaning that a recurring gap of \$2.2 - \$3.0 million. To put this in context, a survey of residents asking how much they’d pay to support such a plan resulted in an average (and median) response of approx. \$10/month (which totals \$5.724 million per year assuming 47,700 households). The affordability of the plan in total is driven by the assumption of significant federal and state monies to support the larger infrastructure investments. Whether the city utilizes existing funds or seeks new funds for its portion of the funding plan is subject to contemporary needs and priorities.

Finally, as noted above, this investment scenario only focuses on costs and paybacks to the City of Ann Arbor. It does not look at the paybacks for residents and businesses.

PROPOSED 3-YEAR SLIDING INVESTMENT PLAN

As mentioned, the figures within the Investment Scenario should be viewed as only one possible scenario for how funding and investments may materialize. Staff proposes a 3- year financial plan that would be revisited every 2-years so that it could remain up-to-date and more responsive to changes in federal, state, and philanthropic interests as well as innovative financing opportunities and new public-private partnerships. Updating the Investment Scenario on a 2-year process would allow the Plan to be in alignment with the City’s budgeting process.

SOCIAL COST OF CARBON / COST OF INACTION

Climate change is a tragedy of the commons with high social costs. In this case the atmosphere, a shared-resource, is used by individual entities acting independently according to their own self-interest, behaving contrary to the common good of all users by depleting or spoiling our shared atmosphere. With climate change, individuals and organizations despoil the atmosphere by emitting greenhouse gas emissions through their actions. The result is climate change – which causes devastating impacts that effect all areas of society and life.

The social cost of carbon (SCC)⁶ is a measure of the economic harm from those impacts, expressed as the dollar value of the total damages from emitting one ton of carbon dioxide equivalent greenhouse gas into the atmosphere (\$/MTCO₂e). Studies do not agree on the true social cost of carbon with a 2019 meta-analysis of 578 estimates of the SCC from 58 studies finding a range between -\$13.36 to \$2,385.91/ ton CO₂e, with a mean value of \$55 / ton CO₂e. Studies do agree that the true SCC is expected to increase over time as the impacts of climate change get more pronounced (estimated increase of 2 to 4% per year).

Year	Est. Emissions	SCC
2000	2,468,337	\$135,800,000
2001	2,446,337	\$134,500,000
2002	2,424,337	\$133,300,000
2003	2,402,337	\$132,100,000
2004	2,380,337	\$130,900,000
2005	2,358,337	\$129,700,000
2006	2,336,337	\$128,500,000
2007	2,314,337	\$127,300,000
2008	2,292,337	\$126,100,000
2009	2,270,337	\$124,900,000
2010	2,248,337	\$123,700,000
2011	2,226,337	\$122,400,000
2012	2,204,337	\$121,200,000
2013	2,182,337	\$120,000,000
2014	2,160,337	\$118,800,000
2015	2,138,337	\$117,600,000
2016	2,116,337	\$116,400,000
2017	2,094,337	\$115,200,000
2018	2,072,248	\$114,000,000
	TOTAL	\$2,372,400,000

Table 1: Estimated cost from Ann Arbor’s community-wide emissions between 2000-2018. Assumes a \$55/ton social cost of carbon.

⁶ See <https://www.rff.org/publications/explainers/social-cost-carbon-101/> for a primer on SCC.

Applying a \$55/ton SCC to the City’s emissions between 2000 and 2018 (the years for which we have data), we find that the Ann Arbor community is responsible for over \$2.35 billion dollars in societal impacts (Table 1). This is, of course, an underestimation of Ann Arbor’s historical impact as we don’t have specific greenhouse gas emissions information for years pre-dating 2000.

The A²Zero Plan outlines 7 strategies that will help reduce the social cost of carbon by near \$540,000,000 over the next 10 years (Table 2) (note, SCC values have been rounded to only two significant digits to reflect the potential range of actual value/costs). And the benefit of this will be extended far beyond 2030 as all future years for which we remain at zero emissions will reap over \$100,000,000 in societal savings. And this doesn’t account for the return on investment noted above (i.e., investments in energy efficiency or renewable energy).

The social cost of carbon was not factored into project cost estimates for the actions outlined in A²Zero. It is, however, an important element to consider in the framing of A²Zero as an investment as opposed to strictly a cost to the City of Ann Arbor and its residents.

Year	Est. Emissions w/ A2Zero	Change from Baseline	SCC
2019	1,990,412	81,836	\$4,500,000
2020	1,942,442	129,806	\$7,100,000
2021	1,755,115	317,133	\$17,000,000
2022	1,647,336	424,912	\$23,000,000
2023	1,600,461	471,787	\$26,000,000
2024	1,553,050	519,198	\$29,000,000
2025	1,489,777	582,471	\$32,000,000
2026	1,425,156	647,092	\$36,000,000
2027	584,158	1,488,090	\$82,000,000
2028	525,087	1,547,161	\$85,000,000
2029	466,017	1,606,231	\$88,000,000
2030	0	2,072,248	\$110,000,000
		TOTAL	\$539,600,000

Table 2: Estimated savings from A²Zero using a \$50/ton social cost of carbon calculation.