TACOMA CLIMATE ACTION PLAN

SECTION 4, FINANCIAL ANALYSIS

A high-level financial analysis was undertaken to identify the community-wide costs, savings, net present value (NPV), and marginal abatement costs of the Net-Zero Scenario targets from 2020 to 2050. In both the No New Actions Scenario and Net-Zero Scenarios, expenditures are made and savings occur. The financial information presented here shows the incremental additional expenditures required and additional savings resulting from the implementation of the Net-Zero Scenario compared to those that are expected in the No New Actions Scenario.

SUMMARY OF COSTS AND SAVINGS

Modeling of costs and savings considered upfront capital expenditures, operating and maintenance costs (including fuel and electricity). The table below summarizes the expenditure types that were evaluated. One item to note is that the financial impacts of the recently-implemented state-wide cap-and-trade system are not included in this analysis, and therefore financial savings of the Net-Zero Scenario are likely to be even greater than those presented here.

Table 1. Categories of expenditures evaluated.

CATEGORY	DESCRIPTION
Building construction, retrofits, and equipment	Cost of dwelling construction and retrofitting (incl. equipment); operating and maintenance costs (non-fuel)
Building fuel	Energy costs for heating, cooling, and operating buildings, as well as for commercial and industrial production
Personal, commercial & municipal/transit vehicles	Cost of vehicle purchase; operating and maintenance costs (non-fuel)
Vehicle fuel	Energy costs for transportation fuel
Transportation infrastructure	Investments in expanding active transportation infrastructure
Waste diversion	Investments in increased processing/handling of recycled materials

Figure 1 shows costs and savings for Net-Zero Scenario actions compared to the No New Action Scenario. The costs, or investments, vary year-over-year, based on the timelines and levels of ambition of the targets. By 2050 the cumulative costs to implement the Net-Zero Scenario is $2.49 billion, with $6.67 billion in savings (at a discount rate of 3%). Once savings are applied, the result is a net savings of $4.18 billion. It should be noted that capital investment for the Net-Zero Scenario targets end in 2050, however the NPV includes the energy, maintenance, and carbon costs savings as well as revenue projected over the full life of the measures, which in some cases extend as far as 2089. It should also be noted that a discount rate of 3% is used to reflect that which would be incurred for the government. Actual investments will be taken on by multiple players in addition to the government, including institutions, private businesses, and the public. Since these are often subject to higher discount rates, results are shown in the table below for both 3% and 6% rates. The figures in this report primarily show results for a 3% rate, as a more conservative estimate, and as it reflects the types of major investments that will be needed from government incentives/programs. Under both rate structures significant net savings are seen.

Table 2. Summary of Net-Zero Scenario financial metrics.

	NET PRESENT VALUE OF THE ZERO CARBON SCENARIO	
FINANCIAL ESTIMATE	**3% DISCOUNT RATE**	**6% DISCOUNT RATE**
Total incremental capital investment ($billions)	-$2.49	-$1.66
Total savings ($billions)	$6.67	$3.41
Net savings from the Net-Zero Scenario ($billions)	$4.18	$1.74
Average $ saved for each ton of CO2e reduced	$180	$75

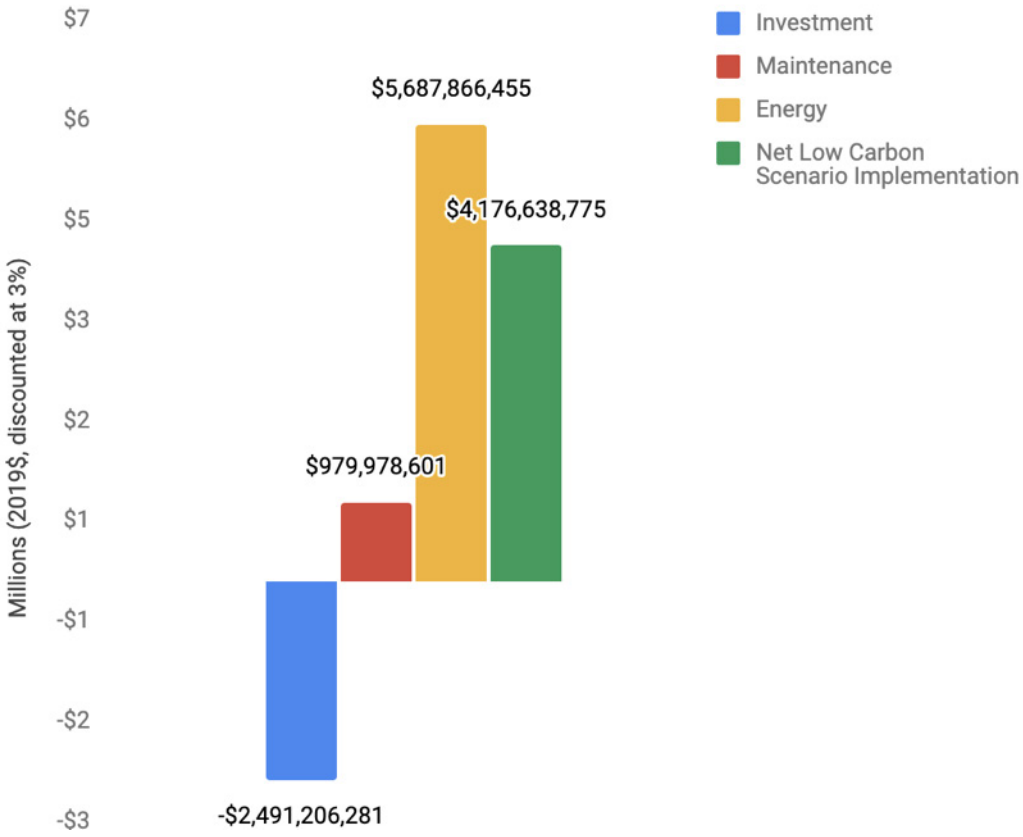

Figure 1. Net present value of costs (negative) and savings (positive) of Net-Zero over the No New Action Scenario.

CASH FLOW ANALYSIS

The annual City/Community costs, savings and revenue associated with fully implementing the targets in the Climate Action Plan are shown in detail in Figure 2, with capital expenditures shown in full in the years in which they are incurred. The capital expenditures in the early years gradually increase over time as targets' ambitions increase. In early 2030, the net annual cost of the Net-Zero Scenario levels off at around $100 million per year.

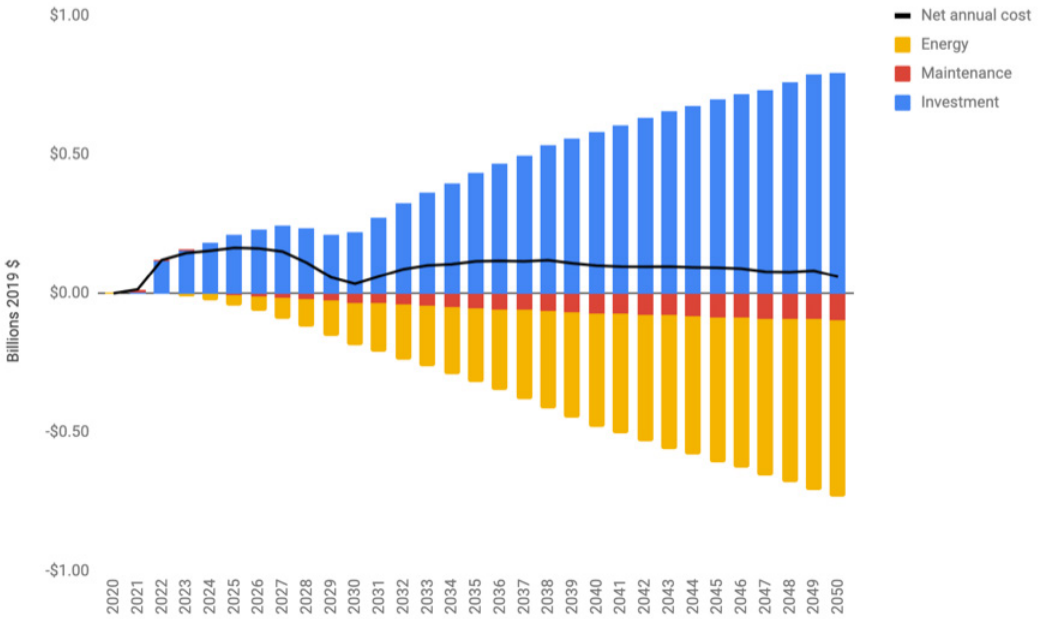

Figure 2. Capital expenditures (above the x-axis) vs. savings (below the x-axis) from the Net-Zero Scenario relative to the No New Actions Scenario, 2020-2050.

Figure 3 presents the same costs and benefits, but with the capital expenditures amortized over 25 years at 3%. This approach is likely to more accurately reflect actual approaches for financing the Net-Zero Scenario (where interest is both paid and earned on debts and savings). Annualized capital payments are outweighed by the savings as early as 2025.

Community savings steadily increase all the way through to 2050. This tapers off as the Scenario measures cease to be implemented after 2050; however, the City will likely continue with further actions down the road. By 2050, the annual net benefit of the Net-Zero Scenario reaches $530

million in savings.

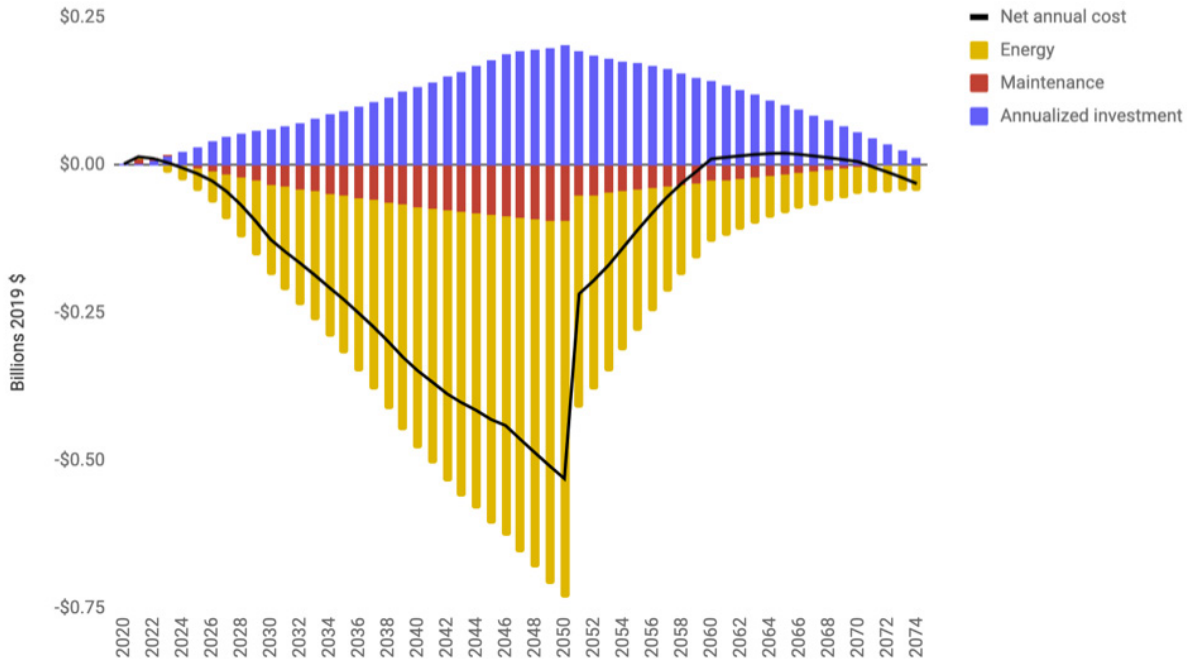

Figure 3. Annualized capital expenditures (above the x-axis) vs. savings (below the x-axis) from the Net-Zero Scenario relative to the No New Actions Scenario, 2020-2050.

MARGINAL ABATEMENT COSTS/SAVINGS

The abatement cost of an action is the estimated cost for that action to reduce one ton of greenhouse gas emissions ('GHG') and is calculated by dividing the action's net present value ('NPV') by the total GHG emissions it reduces (tCO2e) over its lifetime. Figure 4 shows the abatement costs/savings for the Net-Zero Scenario measures. The actions with the highest cost savings per ton of GHGs reduced are on the far left of the graph (below the x-axis), and the actions with the highest cost per ton of emissions reduced are at the far right (above the x-axis). The widths of each of the bars along the x-axis represent the total GHG emissions reduced by each action. In this case, electrifying personal vehicles and industrial process improvements generate the greatest amount of GHG emissions reductions of all of the actions (7,400 MtCO2e and 6,900 MTCO2e, respectively).

The highest cost for one ton of GHG emissions reduction is the expansion of active mode shares (I.e. increasing walking and cycling infrastructure) at $4,071, followed by retrofitting homes at $2,078. It should be noted that these high costs are in part due to the time sequencing of the actions in the model; in both cases these actions occur after significant GHG reductions to the source GHG being addressed have already occurred. In the case of walking and biking, the action is sequenced after the electrification of vehicles, so the GHG benefits appear to be less than they would be if no vehicle electrification occurs.

The lowest cost for GHG reductions applies to expanding transit mode shares (for example, through promotional programs), at an estimated net of $788 in savings in fuel costs per ton of GHG emissions saved. Again, the extent of the savings seen is in part due to model sequencing,

where the savings are being calculated before new electric buses are being considered, therefore, the benefit appears greater than it otherwise would.

While the Marginal Abatement Cost Curve (MACC) below illustrates the financial profile of the suite of Net-Zero Scenario measures, it is an imperfect indicator, since (as illustrated above), many measures either impact or depend on another, and should not be considered for implementation individually. Another important message is that in order to achieve the City's target, all the actions need to be undertaken as soon as possible. While there can be a tendency to wait for technological improvements, this has the effect of reducing the value of the savings that can be achieved for households and businesses, and reducing potential new employment opportunities.

The MACC can be used as a tool to help consider important questions about implementation planning, including:

- Can high cost and high savings measures be bundled to achieve greater GHG emissions reductions?
- How can the City help reduce the costs of the high-cost actions by supporting innovation or by providing subsidies?
- Which actions both save money and reduce the most GHG emissions? These can be considered the big moves.
- Which actions are likely to be of interest to the private sector, assuming barriers can be removed or supporting policies introduced?

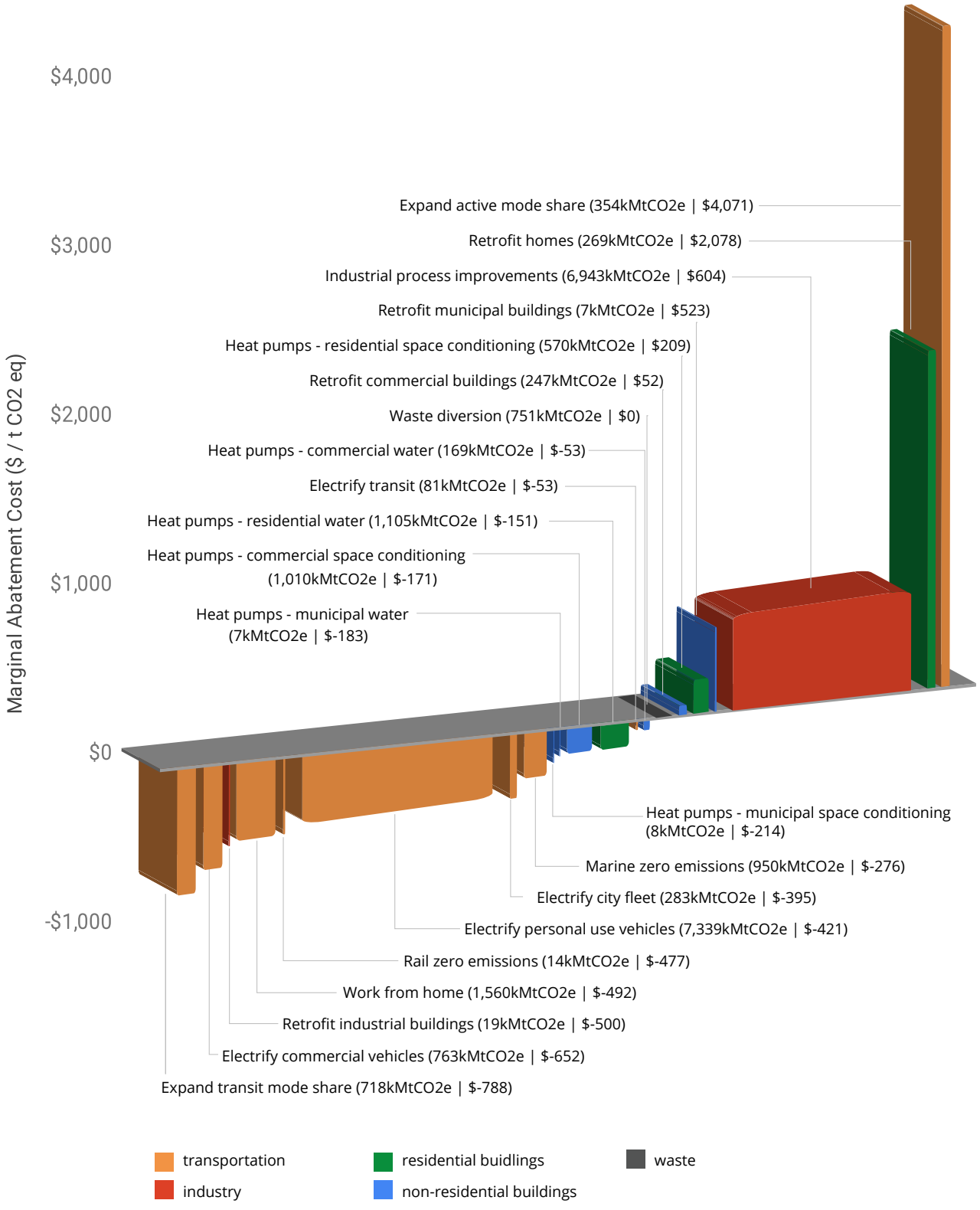

Figure 4. Marginal abatement savings (below x-axis) and costs (above x-axis) of the Net-Zero Scenario measures.

NEW JOB OPPORTUNITIES

The investments in the Net-Zero Scenario result in increased employment. This includes new opportunities in design and construction of zero-carbon and resilient buildings, retrofits to existing buildings, installing active transportation infrastructure, improving industrial processes, and managing diverted waste. Some jobs will also be lost or will have to transition to other sectors as investments are shifted, for example, reduced operations and maintenance for electric vehicles compared to conventional ones. However, investments made across all sectors, create a net of approximately 40,000 person years of employment[1] in Tacoma from 2019-2050, an average of nearly 1,300 jobs per year.

The majority of jobs added are in the building sector, with significant retrofits (including heat pumps and water heating systems) targeted for all buildings. Investments in industrial improvements also generate a significant number of new jobs for the city, as new technologies are developed, manufactured, and/or installed. Increased investment in active infrastructure results in a significant increase to jobs as well, at approximately 530 per year.

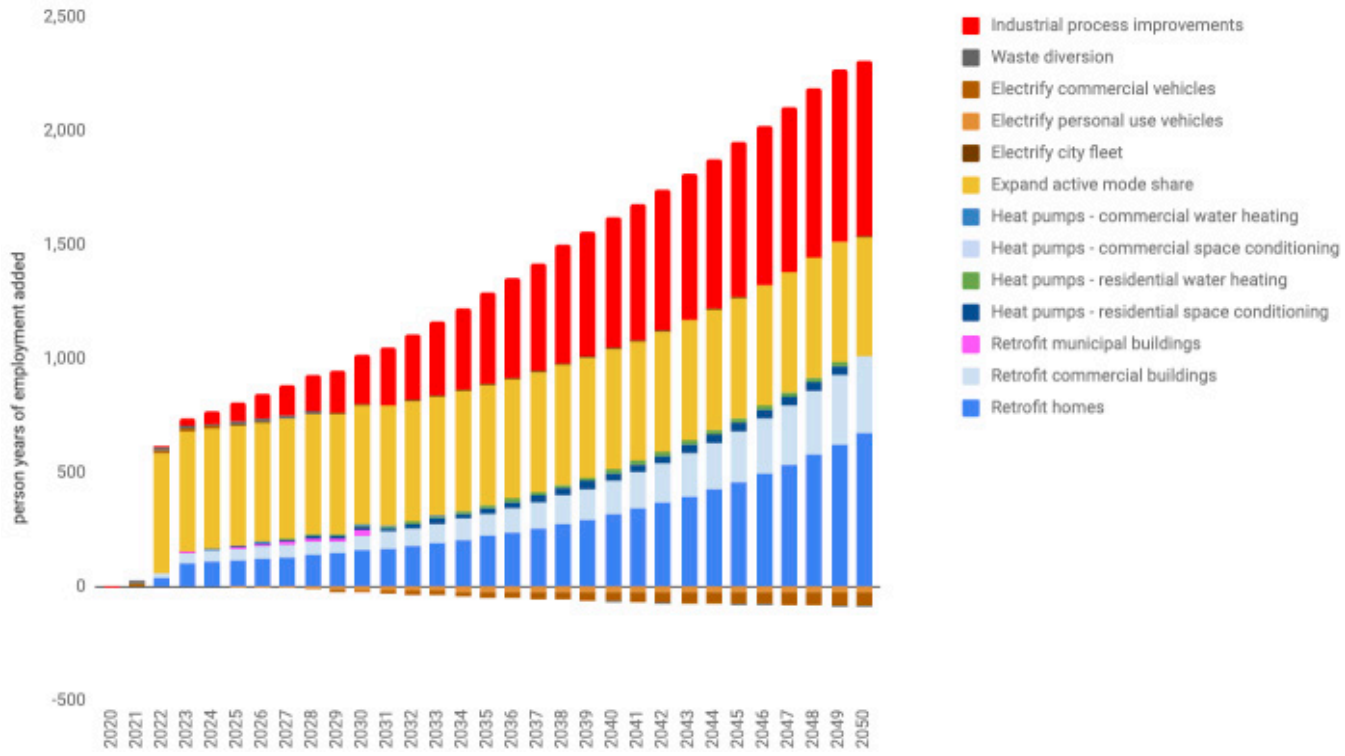

Figure 5. Person-years of employment (jobs) added in the Net-Zero Scenario compared to the Business As Planned Scenario.

[1] A person year of employment is equivalent to 1 person working a full-time job for 1 year. Person years of employment were calculated using known numbers of jobs created per dollar invested across different sectors, and applying these to the investments required to implement the actions in the plan.