

# Croton100 Climate Action Master Plan

Last updated November 16, 2019

*“Limiting global warming to 1.5°C would require rapid, far-reaching and unprecedented changes in all aspects of society.”*

- IPCC Summary for Policymakers, October 8, 2018

*“The climate and the biosphere don’t care about our politics and our empty words for a single second.”*

- Greta Thunberg, Climate Activist

## Introduction

The purpose of this document is to propose a framework for a long-term Croton climate plan to draw down net greenhouse gas (GHG) emissions in Croton-on-Hudson (zip code 10520, population 12,810) to zero. While New York state has committed to 100% clean electricity by 2040, there is much to be done at the municipality and community level to achieve climate goals *economy-wide*. We make a distinction here between just the electricity system and economy-wide goals, with the latter including transportation, heating, cooling, industrial processes and AFOLU (Agriculture, Forestry and Land Use). *Every day of inaction means another 700+ tons of Croton emissions in the atmosphere!*

## Background

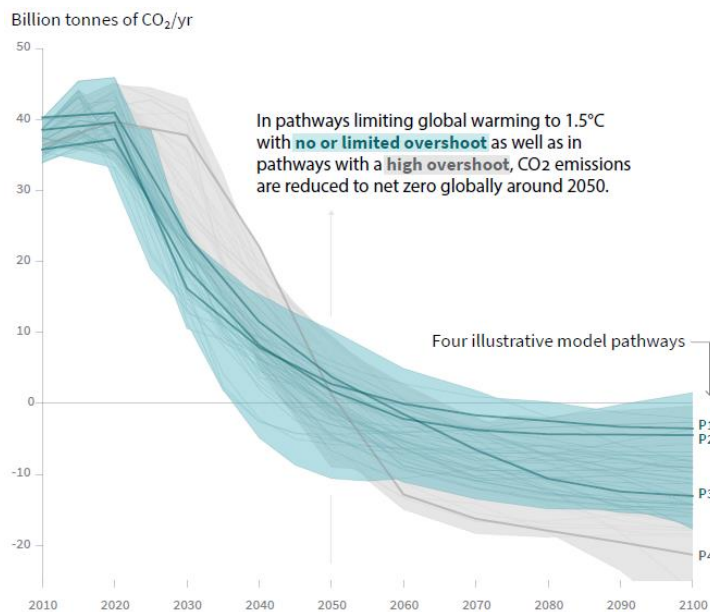


Figure 1 Global total net CO<sub>2</sub> emissions, grey pathways are unsuccessful in preventing 1.5°C overshoot

In keeping with the United Nations Intergovernmental Panel on Climate Change (IPCC) report issued in October of 2018, we seek to achieve net zero GHG by 2040 as our part towards preventing overshoot beyond 1.5°C of global warming. We recognize the urgency of the crisis. The report makes it clear that successful pathways involve *drastic emission reductions in the short-term*, and there is no wiggle room to allow for a slow start (see Figure 1). Hence, we have two top-tier goals: 50% GHG reduction by 2030 and 100% reduction by 2040. Other intermediate checkpoints and goals will be established along the way. All goals must be measurable and validated.

The IPCC calls for a quick start of this journey. In the short-term, we believe that there is “low-hanging fruit” that we can go after, due to the wasteful nature of our emissions today. In the medium-term, improved technology, lower prices and better expertise will accelerate the transformation. In the long-term, we believe that legislation will kick in to complete our transformation to 100% emissions-free living for all.

## Goals and duration

We propose a 20-year climate plan starting January 1, 2020 and ending December 31, 2039, during which we achieve 5% GHG reduction every year with 2019 as the baseline. Emission per household in Croton is 52.6 metric tons per year (see <https://coolclimate.berkeley.edu/maps>), which implies a reasonable estimate of per-capita CO<sub>2</sub> emission at 20 metric tons per year (compared to about 5.3 metric tons per year per capita worldwide).<sup>1</sup> Hence the simple (and easy-to-remember) goal is a *reduction of 1 metric ton of CO<sub>2</sub> per person per year*. We will use a point system whereby 1 ton = 1,000 points, so each point represents 1 kg of CO<sub>2</sub> emissions reduction annually. In a particular year, whether 5% of the population goes cold turkey with a 20-ton reduction, or 100% of residents reduce their emissions by 1 ton each, the village-wide goal will be met for that year. Thus, progress will be made on two dimensions every year:

1. Behavior change by reaching more people;
2. Deeper behavior changes touching ever more aspects of energy use.

Thus, emission reduction goal per person per year = 1 metric ton CO<sub>2</sub> equivalent  
= 1,000 kg of CO<sub>2</sub> equivalent  
= 1,000 points (hence, 1 point = 1 kg).

We point out that reduced emissions bring additional benefits:

- Improved health primarily from reduction of particulate emissions.
- Cost savings due to efficiency measures.
- Cost savings due to reduced Total Cost of Ownership of cars, furnaces, etc. (more on this later).
- Croton becomes a more attractive place in which to live, leading to higher property values.

## Leadership

Croton would like to be the first U.S. community<sup>2</sup> to announce an economy-wide zero emission goal by 2040 and therefore serve as a shining exemplar to the rest of the world, worthy of emulation.

## Consortium of towns and villages

A historic meeting was held on September 10, 2019, in which Bedford 2020 leadership explained how they had achieved a 20% emission reduction goal ahead of target. At the meeting, it was clear that Bedford and Croton share a common vision, and both are looking for an accelerated path forward. Croton can learn best practices from Bedford, some of which are already adopted in this document. In a similar vein, as Croton achieves success, other towns and villages will want to emulate the system. We propose a consortium that enables sharing of best practices, sharing of web sites and digital applications, sharing of expertise, and so on, among municipalities with a shared vision.

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<sup>1</sup> The Croton Sustainability Committee benchmarked GHGs in 2013 (see <https://www.crotononhudson-ny.gov/sustainability-committee/pages/energy-and-emissions-reports>), however, the study was limited to the Municipal Building, DPW Garage and 3 fire houses. This document is very clear about a Croton-wide scope.

<sup>2</sup>60 countries are aiming for net zero by 2050, Norway being the most ambitious (2030), but the big three (China, U.S., India) are silent on the subject. The Croton Sustainability Committee also inventoried GHGs in 2009 (see <https://www.crotononhudson-ny.gov/sustainability-committee/pages/greenhouse-gas-emissions-inventory-december-2009>), but once again, the scope of that document is limited to Village Government activities and facilities.

## Branding

We propose the name “Croton100” to indicate the march towards 100% emissions-free living by 100% of the population. We will use the logo shown in Figure 2. If other towns/villages join the consortium, they can have their own “TownName100” plans with “TownName100.org” web sites. We propose calling the consortium CURE100 (**C**ommunity **U**rgent **R**eduction of **E**missions **100%**).



Figure 2 Croton100 logo

## The five Es

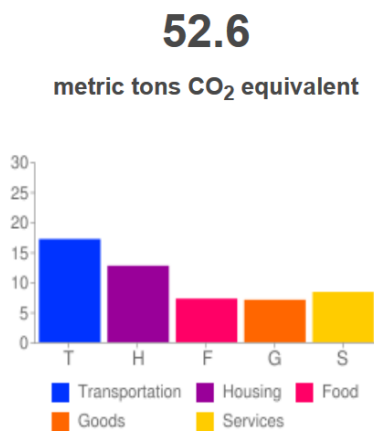


Figure 3 Emissions per-household in zip code 10520

As of 2013, the per-household emission in zip code 10520 was 52.6 metric tons per year as show in Figure 3, slightly lower than Bedford! This information is available for any zip code in the country at <https://coolclimate.berkeley.edu/maps>. It is clear that attacking transportation (with efficiency and electric vehicles), housing (with efficiency, heat pumps, solar panels, etc.,) and food/waste will be the top three priorities.

Croton has a population of 12,810 and 5,540 housing units, thus confirming our estimate of about 20 tons of emission per year per capita. Per-year emissions reductions need to total to 12,810 metric tons or 12.81M points. One suggestion is to have a 100-strong volunteer corps running Croton100, each of who is challenged to bring in 100,000 points (or 100 metric tons of emissions reductions) per year.

In Croton100, credit for reduction of emissions will be gathered under five pillars as shown in Figure 4, each overseen by a volunteer sub-committee. As each Croton resident makes progress on each pillar, a point system will be used to calculate the (approximate) emissions reduction at a person, family, street and village levels. A home efficiency upgrade is worth ‘a’ points, the switch to a hybrid plug-in car is ‘b’ points, installing heat pumps fetches ‘c’ points, following meatless Mondays for a year is worth ‘d’ points, and so on. See the Appendix for how points are computed.

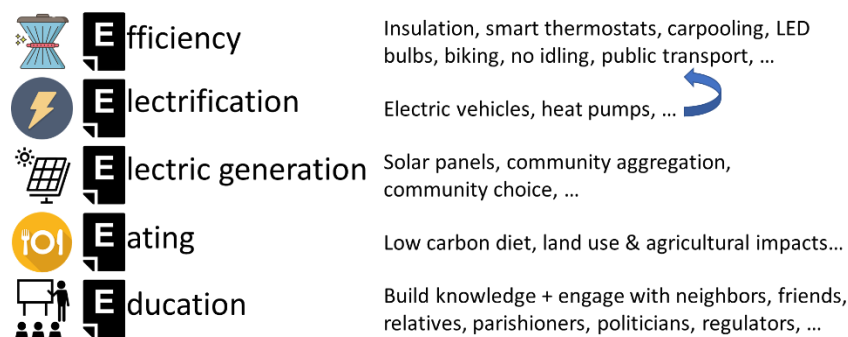


Figure 4 The five Es

We should plan an annual event where citizens are recognized for the most progress in each of the five Es, the street with the highest reduction wins a prize, etc. We will set aside 5% of the points for “Education,” with the recognition that while Education does not directly reduce emissions, it is an

essential ingredient of behavior change. So, every time a resident organizes an event or shows off their heat pumps to neighbors or gives a seminar or attends an environmental event or committee planning

event, he or she gets a certain number of points of credit. Similarly, building charging stations does not directly contribute to emissions reductions, but instead advances an ecosystem for electric mobility – such activities can qualify for points as well. Thus, a point is strongly correlated to reduction of 1 kg of CO<sub>2</sub> but is to be thought of as an incentive system rather than a careful measurement of emissions reductions, i.e., we should not get lost in the minutiae of carbon accounting. It is important that the point system maintain a correlation to actual CO<sub>2</sub> savings as much as possible, *without double counting*.

A specialized point system will be required for different classes of users: renters, owners, businesses, and public spaces (e.g., schools, houses of worship).

## Accounting system and digital support thereof

We recognize that we can only achieve what we measure in an objective and transparent manner. At the same time, accounting for every ton of carbon emission is tricky and complex. We should not let perfection come in the way of progress. We propose a volunteer accounting committee that sets rules of thumb for emission estimation along the lines of the five Es. As our knowledge grows, the sophistication of these models will continuously improve.

The EPA carbon footprint calculator (<https://www3.epa.gov/carbon-footprint-calculator/>) for households and businesses is a good resource for the accounting committee. The household calculator zooms in on 3 categories of emissions: Home Energy, Transportation, and Waste. It translates higher gas mileage (from a plug-in hybrid for example) or investment in heat pumps into emissions reductions. As New York state makes progress towards its 100% clean electricity goal, the fraction of clean electricity will increase and every Croton resident will earn points every year accordingly. As of year-end 2018, New York state had 29.3% clean electricity.

We propose a digital app. for iOS and Android that is available free of charge to all Croton residents. Residents can download this app. on their smartphones, tablets or laptops. The purpose of the app. is:

- Inform and educate about emission reduction opportunities.
- Inform and educate about activities and meetings in the community.
- Tracking system for progress against annual goals at the individual, family, street and village level.
- Conduit for recording progress in any of the five Es, thus obtaining “credit” for emission reduction activities.
- Periodic newsletter to keep up a strong level of engagement.

The cost of developing and hosting the digital app. can be shared by sister cities and towns who join the consortium to achieve 100% emission-free living. We expect many towns and villages to join this “franchise” and learn from our best practices.

We suggest public displays charting the village’s progress, like the one shown in Figure 5, but instead using a “reverse thermometer” to show draw-down to zero emissions.

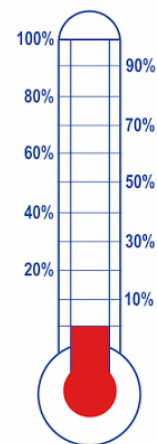


Figure 5 Public display of progress

## Pocketbook considerations

What’s good for the planet is good for its residents. Reducing emissions will not only contribute to human health (primarily in the form of reduced particulate emissions) but will help us save money. All of the emission reduction techniques proposed above, will save Croton residents, businesses and

establishments significant amounts of money. Some of the techniques require almost no up-front investment, while others require an up-front investment which pays for itself over time.

Here are relevant pocketbook considerations for steps that residents, businesses and establishments can take, from simple to more involved:

- Avoiding food waste is a simple matter of being thoughtful in planning meals and grocery shopping. The savings can add up over time, to say nothing of reducing emissions that would be expended for the needless cultivation, harvesting, transportation and processing of wasted food.
- “Meatless Mondays” and “Vegan Wednesdays” can contribute to long-term health and also save money.
- A home efficiency audit is available for free courtesy of the local utility in most parts of the country. Many items identified by such audits (e.g., better caulking of windows, insulating attics, fixing door jambs, installing exhaust fans, better windows) pay for themselves in a matter of one season, and low-cost financing is often available for such repairs.
- Investing in solar panels makes a homeowner eligible for a credit from NYSERDA (New York State Energy Research and Development Authority), as well as an income tax credit from both New York State and the Federal Government. Net out-of-pocket costs are typically recovered in about 7 years in the form of reduced utility bills, and after that, electricity produced for the lifetime of the panels is a free gift from the sun.
- Signing up for community solar or arrangements by which a 3<sup>rd</sup> party owns the solar panels installed in a homeowner’s property generate savings from day one.
- Installing a more efficient HVAC (Heating, Ventilation and Air Conditioning) system means energy savings every single season. Ground source heat pumps also qualify for a 30% Federal tax credit. The Total Cost of Ownership (TCOE) of a more efficient furnace or heat pump system is lower than a traditional oil furnace taking into account initial cost plus maintenance plus fuel cost over the lifetime of the equipment.
- Moving to a hybrid or electric vehicle saves money! While the initial cost may be higher (and with the availability of options like the Nissan Leaf, even this notion is being challenged), consider that the TCOE of a Tesla Model 3 works out to no more than a Camry or Accord once you include fuel cost over the lifetime of the car. To say nothing of oil changes!
- Croton100 will have buying power to negotiate special prices from vendors/suppliers.

Croton100 volunteers will be able to advise Crotonites in detail about available subsidies, recommended brand and vendor choices, and return-on-investment calculations so that residents can make informed decisions.

## Public/private partnership and governance

Learning from Bedford’s experience, we propose a **Croton100** 501(c)(3) not-for-profit that works closely with (but separately from) the Village administration. The benefits of this are numerous:

- Continuity across political terms.
- Ability to consistently execute a very long-term plan.
- Ability to be free of governmental processes and restrictions.
- Ability to raise funds.

- Most importantly, the ability to move with a sense of urgency and purpose, far faster than legislation can be enacted or, in some cases, than government efforts can move.

## Funding

Croton100 will be stronger and more effective with regular funding. Funds will be needed for:

- Software development and web hosting.
- Carbon accounting.
- Administrative staff.
- Ability to finance energy transformation projects for those who cannot afford it.
- Education efforts.

Since Croton100 will soon be a 501(c)(3) organization, it can accept donations. Like most non-profits, we envision multiple sources of funding:

- Private donations and a Croton Environmental Hero program.
- Grants based on submitting grant proposals.
- Corporate donations and sponsorships.

The Croton Environmental Hero program recognizes community contributions, both in terms of donations and progress in reducing emissions, in much the same way that donors to not-for-profits are recognized with various titles (e.g., “Gold Patron,” “Diamond Sponsor” for donors; “Absolute Zero” for those who achieve net zero carbon lifestyles, and so on).

## Voluntary nature of the plan

From time to time, there will be helpful legislation like banning of plastic bags, or New York’s Renewable Portfolio Standard (RPS) to get to 100% clean electricity by 2040. While we will lobby for and support such legislation, much of the work of Croton100 will rely on voluntary efforts by members of the community in an honor system. In many cases, community members will save money by moving to cleaner solutions. Making education available about these solutions and making the move to new solutions frictionless will help them with the transition. As the dire nature of climate change becomes more obvious to residents, we expect voluntary enthusiasm to continuously rise. Croton100 will work closely with the Village administration, schools, civic, business and faith-based communities.

## Tricky questions

What happens as residents move in and move out of the village? What if there are hold-out residents who do not volunteer to be part of the transformation? What if residents have a second residence somewhere else or rent an internal combustion vehicle on vacation? If a restaurant serves “meatless Monday” and “vegan Wednesday” meals, should the restaurant get some of the points even if out-of-village resident dine there? If village residents dine at such restaurants, how do we make sure not to double count? Are there already apps. out there that we could re-use? Should we consider partnerships with or sponsorships by local for-profit companies (banks, Patagonia, IBM, Pepsi) aimed at accelerating our efforts? While some of these questions are tricky, we should simply get started and let them get resolved in a sensible manner over time. Time is not our friend, urgency is the need of the hour! Remember, every passing day means that Croton just added another 702 tons of emissions to the atmosphere!

## Conclusion

This document suggests a framework for community action (“neighbors influencing neighbors”) to achieve net zero emissions in Croton over a 20-year period in a measured and deliberate manner, thus positioning the village as a shining example worthy of emulation. The scope is zip code 10520 in an “economy-wide” approach (not just electricity and not just municipal operations). Advantages include cost savings, health benefits and making Croton a more attractive place in which to live.

## Appendix: emission reduction examples

### Transportation

Making use of the EPA carbon footprint calculator, we consider an average car that is driven 11,398 miles per year at an average fuel economy of 21.6 mpg, emitting 4.765 metric tons of CO<sub>2</sub> per year. This leads to the following table of emission reduction opportunities.

| Type of car                             | Mileage (mpg)                  | Tons of CO <sub>2</sub> per year | Point reduction from previous line | Quota of credit for an individual |
|---|--------------------------------|----------------------------------|------------------------------------|-----------------------------------|
| Large SUV (GMC Savana or Chevy Express) | 11.9                           | 8.650                            | N/A                                | N/A                               |
| Family car                              | 21.6                           | 4.765                            | 3,885                              | 3.885 years                       |
| Hybrid                                  | 43.2                           | 2.383                            | 2,383                              | 2.383 years                       |
| Plug-in hybrid                          | 86.4                           | 1.191                            | 1,191                              | 1.191 years                       |
| Fully electric                          | ∞ (assuming clean electricity) | 0                                | 1,191                              | 1.191 years                       |

Any vehicle transition above would buy an entire household sufficient point credits for more than a year! Emissions “step down” by choice of car is illustrated in Figure 6.

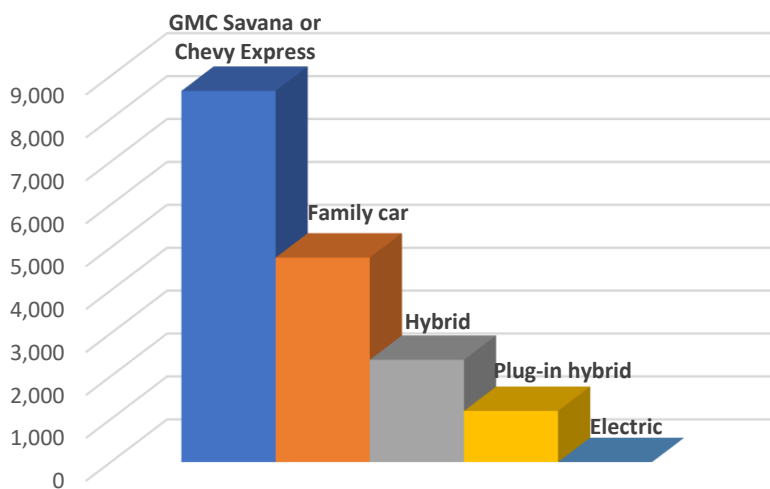


Figure 6 Emissions “step down” (in annual kg of CO<sub>2</sub>e) from transportation choices

### Home heating

The average home uses 66,000 cubic feet of natural gas or 551 gallons of fuel oil for heating or 464 gallons of propane annually. This leads to the following table of emission reduction opportunities.



| Type of heating | Consumption                    | Tons of CO <sub>2</sub> per year | Point reduction from previous line | Quota of credit for an individual |
|-----------------|--------------------------------|----------------------------------|------------------------------------|-----------------------------------|
| Fuel oil        | 551 gallons                    | 5.664                            | N/A                                | N/A                               |
| Natural gas     | 66,000 cubic feet              | 3.587                            | 2,077                              | 2.077 years                       |
| Propane         | 464 gallons                    | 2.621                            | 966                                | 0.966 years                       |
| Heat pump       | 0 (assuming clean electricity) | 0                                | 2,621                              | 2.621 years                       |

Again, any of the transitions above will buy a household credit for a full year! We also believe that the average utilization numbers for Croton are higher, thereby increasing the opportunities. Emissions “step down” by heating choices is illustrated in Figure 7. The benefits of natural gas are nullified by leakage in the gas pipeline system and the fact that methane is a powerful greenhouse gas.

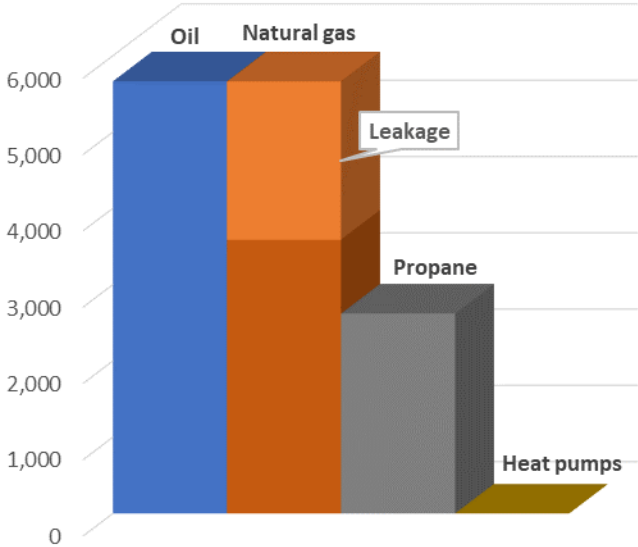


Figure 7 Emissions "step down" (in annual kg of CO<sub>2</sub>e) from heating choices

**Electricity**

The average home uses 11,320 kWh of electricity per year for an average household size of 2.57. This leads to the following table of emission reduction opportunities.

| Type of electricity                              | Percent clean electricity | Tons of CO <sub>2</sub> per year | Point reduction from previous line | Quota of credit for an individual |
|--|---------------------------|----------------------------------|------------------------------------|-----------------------------------|
| Dirty electricity from grid or diesel generators | 0%                        | 6.373                            | N/A                                | N/A                               |
| Cleaner grid                                     | 25%                       | 4.780                            | 1,593                              | 1.593 years                       |
| Community choice                                 | 50%                       | 3.187                            | 1,593                              | 1.593 years                       |
| Solar panels                                     | 75%                       | 1.593                            | 1,593                              | 1.593 years                       |
| Clean  | 100%                      | 0                                | 1,593                              | 1.593 years                       |



Again, any of the above transitions will help a household meet its annual target and then some. Emissions “step down” from electricity choices is illustrated in Figure 8.

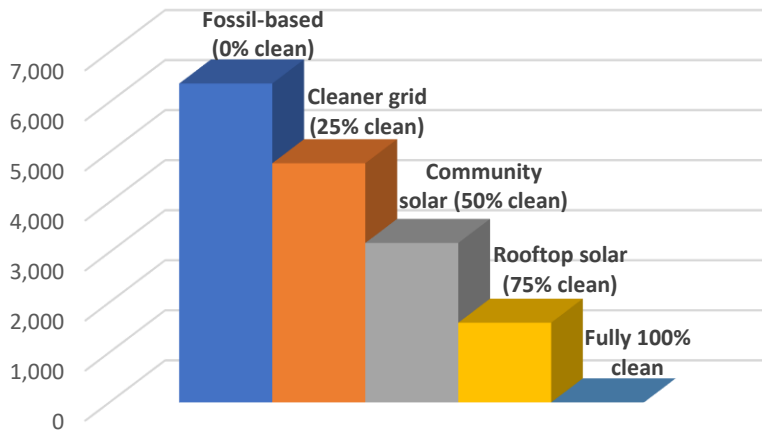


Figure 8 Emissions step down (in annual kg of CO<sub>2</sub>e) from electricity choices

### Waste

The average household generates 808.4 kg of CO<sub>2</sub> (about 8/10 of a metric ton) per household annually by the way waste is processed. So, there is not enough “low hanging fruit” in waste for a household to achieve even one year’s quota of emissions reduction. Nonetheless, every bit counts as shown in the table below.

| Type of recycling                                | Tons of CO <sub>2</sub> per year | Point reduction from previous line | Quota of credit for an individual |
|--|----------------------------------|------------------------------------|-----------------------------------|
| None   | 0.808                            | N/A                                | N/A                               |
| Newspapers only                                  | 0.676                            | 132                                | 0.132 years                       |
| Newspapers + metal                               | 0.572                            | 104                                | 0.104 years                       |
| Newspapers + metal + plastic                     | 0.530                            | 42                                 | 0.042 years                       |
| Newspapers + metal + plastic + magazines         | 0.498                            | 32                                 | 0.032 years                       |
| Newspapers + metal + plastic + magazines + glass | 0.469                            | 30                                 | 0.030 years                       |

Emissions “step down” from recycling choices is illustrated in Figure 9.

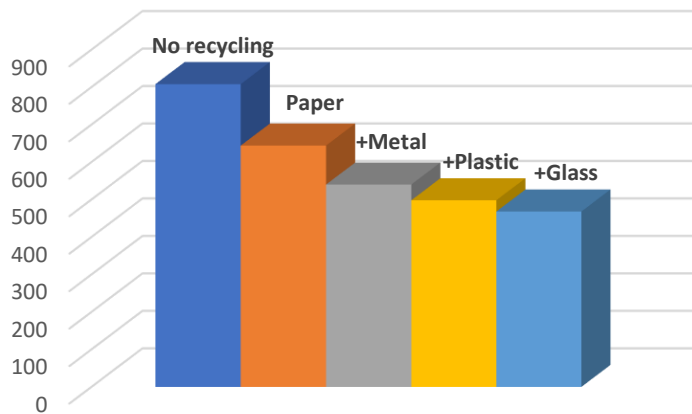


Figure 9 Emissions step down (in annual kg of CO2e) from recycling choices

It is interesting to note that almost every emission “step-down” also saves money. This is particularly true in the case of transportation, heating and electricity when one considers “Total Cost of Ownership” over the lifetime of the vehicle or furnace/heat pump or solar panels.