WORLD RESOURCES INSTITUTE

TECHNICAL NOTE

COMPACT OF MAYORS EMISSIONS SCENARIO MODEL

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EXECUTIVE SUMMARY

The Compact of Mayors is an international coalition of cities committed to addressing the challenges of climate change. Since its launch in September 2014, hundreds of cities have joined. To improve understanding of the collective impact of cities, World Resources Institute and the Compact of Mayors jointly developed a model to estimate its cities collective emission trajectories. This technical note outlines the methodology used in the model.
The model provides methodologies to aggregate the greenhouse gas (GHG) reduction targets reported by cities and to estimate the likely GHG reduction of cities that have signed up but not yet formally reported their GHG reduction targets to the Compact of Mayors.

This robust model produces results in different formats, timeframes, and for different categories of cities, such as business-as-usual (BAU) scenario emissions and avoided emissions for Compact-compliant cities, cities with reported targets, cities without targets, and so on. The quality and accuracy of the results depend on the choice of input data and the purpose of analysis.

The model's main limitation is that it estimates the emission reductions based solely on top-down emission-reduction targets without considering the emission-reductions potential of cities' financial, technology, renewable energy, and other resources. A focus of future research is to estimate the emission reductions of these cities based on bottom-up approaches.

CONTENTS

Technical notes document the research or analytical methodology underpinning a publication, interactive application, or tool.

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1. INTRODUCTION

The Compact of Mayors is an international coalition of cities committed to addressing the challenges of climate change. Since its launch in September 2014 at the UN Climate Summit in New York City, hundreds of cities have joined.

Increased interest in and recognition of climate actions by cities have spurred new research to put city contributions in a global perspective. Several recent reports aggregate the impacts of cities and other subnational actors to provide context for urban commitments and capacities to fight global climate change.[1,2,3,4,5]

To improve understanding of the collective impact of Compact of Mayors cities, World Resources Institute and the Compact of Mayors developed a model to estimate its cities' collective emission trajectories. This model builds on earlier efforts and focuses on the cities signed on to the Compact of Mayors. This technical note outlines the methodology used in the model.

2. PURPOSE AND OUTPUTS OF THE MODEL

The model described here is a first-phase model developed to address the limited data available during the Compact of Mayors' first year. At this stage, although more than 300 cities have committed to the Compact of Mayors, not all have reported GHG inventories and emission reduction targets. The model provides robust methodologies to aggregate GHG reduction targets reported by cities and/or to estimate the likely GHG reductions for cities that have signed up but not yet formally reported their GHG reduction targets to the Compact of Mayors.

2.1 Model Outputs

This robust model can produce emissions results for different assumptions and timeframes, and for different categories of cities. Among the model results are:

- **TIMEFRAME OF THE ANALYSIS:** This model can produce results for any year(s) from 2010 to 2050.
- **BUSINESS-AS-USUAL (BAU) AND TARGET SCENARIOS:** It can estimate BAU and target scenario emissions for each of the analysis years.
- **ANNUAL AND CUMULATIVE AVOIDED EMISSIONS:** It shows annual and cumulative avoided emissions for any year(s) within the analysis timeframe.
- **CATEGORIES OF CITIES:** It yields results for all Compact of Mayors cities and for subsets of cities including fully Compact-compliant cities, cities with targets, and cities without targets. Subsets of cities by region and by target period are also available.

2.2 Input Data

The quality of analysis results depends on the choice of input data. The following considerations are important when choosing input data:

- The model provides methodologies for aggregating cities' emissions targets as well as estimating likely emission reductions for cities without targets. If data input includes only cities with emissions targets, the model will yield more accurate aggregation results. If the data include cities without targets, there will be uncertainties in the model results (see section 5.4).
- If city GHG inventory data are provided, the model will prioritize them for the analysis. The model can also approximate current emission levels for cities without GHG inventories, which will lead to some uncertainties (see section 5.4).
- For cities with GHG inventory data, the model can include scope 1 or scopes 1 and 2 data (see Box 1). If scopes 1 and 2 data are included, there is a possibility of double counting between cities depending on how many cities are in the same electricity grid and whether any city contains fossil fuel power plants. The decision on whether to include scope 1 or scopes 1 and 2 data for reference cities will determine the scope(s) approximated for cities without data. Currently it is not recommended to include scope 3 data as it may lead to significant double counting. Incorporation of scope 3 emissions may be an area of future research.
- Ideally, all GHG data should be based on a common GHG accounting protocol. Using GHG data from different protocols leads to greater uncertainty. As required by the Compact of Mayors, in future years all cities will use the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories to develop GHG inventories, which is expected to minimize data inconsistency issues.
- It is unlikely that all cities will have complete GHG data for all emission sources and all types of GHGs. Incomplete GHG data will also lead to greater uncertainty.

Box 1 | **Scope Definitions According to the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories**

SCOPE 1: GHG emissions from sources located within the city boundary.

SCOPE 2: GHG emissions occurring from use of grid-supplied electricity, heat, steam, and/or cooling within the city boundary.

SCOPE 3: All other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary.

Source: WRI, C40, ICLEI, 2014.

2.2 Results Presentation

Considering the robustness of the model and how the analysis results may vary depending on the choice of input data and methodologies, it is important to ensure that the analysis results are presented in a transparent way, acknowledging the uncertainties and quality of the data. Regardless of whether the analysis result is presented in a report, an infographic, a communication brochure, or in other forms, the following guidance for data presentation should be followed:

- A link to this technical note should be attached to the results.
- There should be a description of the data use and an acknowledgment of the data quality.
- There should be a description of the methodologies used. When multiple methodologies are used (e.g., methodologies for estimating emission reductions for both cities with and without targets), the fraction of result for each methodology should be provided to ensure transparency.

3. METHODOLOGY OVERVIEW

Producing the model results described in section 2 involves three major steps:

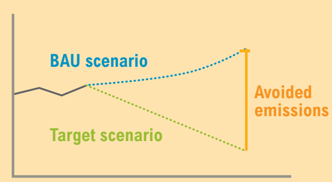
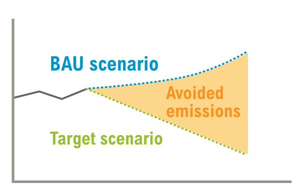
- Estimating BAU scenario emission levels.
- Estimating target scenario emission levels.
- Calculating avoided emissions.

Section 3.1 provides an overview of the calculation methodologies for estimating avoided emissions. It explains why BAU and target scenarios are needed to calculate avoided emissions. Subsequently, sections 4 and 5 describe the methodologies used for estimating BAU and target scenario emission levels.

3.1 Calculating Avoided Emissions

A BAU scenario is a projection of cities' future GHG emissions assuming no action is taken to cut emissions. A target scenario is a projection of the cities' future GHG emissions based on established GHG emissions targets or on likely reduced emission levels for cities that have not yet reported targets. The difference between a city's BAU scenario and target scenario equals the avoided emissions or emissions savings.[6] Annual and cumulative avoided GHG emissions are illustrated in Table 1.

Table 1 | **Calculating Annual and Cumulative Avoided Emissions**

TYPE	CALCULATION	DIAGRAM
Annual avoided emissions of a given year	$GHG_i = BAU\ scenario_i - Target\ scenario_i$	
Cumulative avoided emissions over a given number of years	$GHG = \sum_{i=1}^{n} (BAU\ scenario_i - Target\ scenario_i)$	

Source: Authors.

Calculating annual and cumulative avoided emissions is not difficult. However, accurately estimating BAU emissions and target emissions into the future is very difficult, especially if data are missing or not comparable. The rest of this note discusses how to collect and estimate data for the two scenarios.

4. BUSINESS-AS-USUAL EMISSIONS SCENARIO

A BAU scenario represents the future conditions most likely to occur without policies or actions to reduce GHG emissions. Ideally, the BAU scenario analysis would simply use the BAU scenario data from each city's action plan. However, some city action plans contain detailed scenario projections, whereas others do not, and not all city data are comparable. The most practical way to do a collective study is to normalize the BAU projection method by identifying one or more parameters that are consistently and accurately available across all cities.

4.1 Methodological Options

Developing a BAU scenario requires selecting the factors that drive emissions and making assumptions about how these emission drivers will change over time. Common factors include economic activity, energy intensity, and population growth. Detailed BAU scenarios may also take into account expected changes in technology and structural shifts in economic sectors, among other things. In this first year of the Compact of Mayors, however, when many cities have signed up but not yet fulfilled their requirements of reporting GHG inventories, GHG reduction targets, and action plans, most of the factors mentioned above are not easily available.

Based on reported and external data, it was found that population and GDP data are most consistently available for all cities:

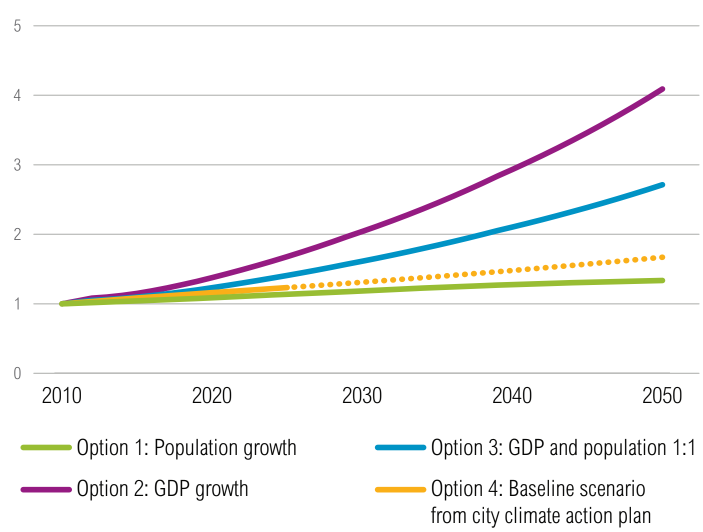
- **POPULATION DATA:** The United Nations Department of Economic and Social Affairs, Population Division's *World Urbanization Prospects:* 2014 gives population data and trends for urban centers.
- **GDP DATA:** Under the World Bank's *World Economic Prospects,* national GDP annual growth rates are available for 2010 to 2017. PricewaterhouseCoopers' *The World in 2050* provides national average annual real GDP growth rates for 2010 to 2050.

Considering the available data, the following BAU scenario projection options were considered:

- **OPTION 1:** Apply population as a common factor for BAU scenario projections for all cities.
- **OPTION 2:** Apply GDP as a common factor for BAU scenario projections for all cities.
- **OPTION 3:** Apply both population and GDP at 1:1 weightage.
- **OPTION 4:** Apply given BAU scenarios for cities with available data then apply one of the above options for the remaining cities.

Sensitivity analysis was undertaken by applying all the above options to Mexico City; Rajkot, India; Jakarta; Cape Town; Rio de Janeiro; Philadelphia, United States; and London, England. Figure 1 shows the analysis results for Mexico City, which were typical for all the cities studied. Option 2 (GDP) leads to the highest BAU scenario followed by Option 3 (population and GDP), Option 4 (scenarios in the city action plans), and Option 1 (population).

Figure 1 | **BAU Sensitivity Analysis Based on Mexico City**



Source: Author's analysis of Mexico City metro-level population projections from UN World Urban Prospects, national GDP projections from PricewaterhouseCoopers' *The World in 2050,* and the baseline projection from Mexico City's climate action plan, normalized to 2010.

4.2 Chosen Methodology

After broad consultation with stakeholders (see List of Contributors), it was decided to use a population factor across all cities because it is most consistently and reliably available across all cities and it produces the most conservative result. The application of the conservativeness principle prevents overestimating BAU emission scenarios that would lead to overestimating avoided emissions.

Population trajectories use United Nations urban population projections[7] for urban agglomerations of over 300,000 people up to the year 2030, and national-level projections of urban population growth up to 2050. Absent alternative data sources, United Nations urban growth projections from 2010 to 2050 were used for cities not included in the United Nations metropolitan region data set.

Each city's BAU scenario was based on projections of population growth and regional per capita emission trends to 2050. Regional per capita emissions trends were adapted from Stockholm Environment Institute's *Advancing Climate Ambition: How City-Scale Actions Can Contribute to Global Climate Goals,*[8] which draws on the scenarios presented in the International Energy Agency's *Energy Technology Perspectives* series. These data, which account for expected changes in urban per capita emissions due to ongoing technological changes, were transcribed into vectors to integrate with the population and base-year per capita emissions. See Tables 2a and 2b.

Thus, the BAU scenario is based on population growth, projections of carbon dioxide equivalent (CO_2e) emissions per capita from the base year, and a per capita adjustment vector to account for expected emissions trends as shown in equation 1:

$$\text{BAU emissions}_i = \text{base year emissions per capita} \times \text{projected population}_i \times \text{per capita adjustment vector}_i$$

4.3 Advantage and Limitation of the Chosen Methodology

The advantage of using a population factor is that UN population projections provide greater consistency, are more granular, and produce more conservative growth rates than available GDP projections. Applying an adjustment vector to account for expected changes in urban per capita emissions due to ongoing technological changes should also avoid overestimation of the BAU emission scenarios.

The limitation is that using the population factor oversimplifies the emission drivers. Although adjustment factors should account for ongoing technological changes, the diversity of cities and the dynamic interrelationships between population, economics, energy efficiency, and other factors are still oversimplified. However, at this stage population is the most reliable and consistent type of data applicable across all Compact of Mayors cities.

Table 2a | **Urban Per Capita Emissions Under Business-as-Usual Scenario (tCO_2 per capita), 2010-2050**

REGION	2010	2015	2020	2025	2030	2035	2040	2045	2050
WORLD	3.5	3.4	3.2	3.2	3.1	3.0	2.9	2.8	2.7

Table 2b | **Adjustment Vectors 2010-2050**

REGION	2010	2015	2020	2025	2030	2035	2040	2045	2050
WORLD	1.0	1.0	0.9	0.9	0.9	0.9	0.8	0.8	0.8

Source: Projections of carbon dioxide equivalent (CO_2e) emissions per capita from 2010, adapted from Stockholm Environment Institute's *Advancing Climate Ambition: How City-Scale Actions Can Contribute to Global Climate Goals*, and the associated adjustment vector which shows the trend normalized to 2010 (shown in Table 2b) calculated by authors. Although only the global example is shown here, data on regional per capita emissions projections covers OECD and non-OECD regions, and country-level projections for Brazil, China, India, Japan, Russia, and the United States.

5. TARGET EMISSION SCENARIO

Target scenarios are the projected emissions inferred from cities' targets to limit or reduce their emissions. However, since not all Compact of Mayors cities have reported their GHG targets, target emission scenarios for some cities are approximated.

5.1 Target Normalization

Established and reported city GHG targets fall into four categories as classified in the GHG Protocol Mitigation Goal Standard (see Box 2).

Calculating potential and avoided emissions from Compact of Mayors cities requires normalizing the data according to the target category. Table 3 shows the equations used to calculate target-year emissions inferred by each target category. Target year emissions from base-year intensity and baseline scenario targets are inferred from the BAU scenarios.

The model provides options to either keep cities' chosen base years (if applicable) or to normalize all cities' base years to 2010. In the former case, the start year of a city's BAU and target scenarios is determined by the city's chosen base year, which may take into account savings from policies made since the target was established. However, for the collective GHG impact, both the BAU and target scenarios start at 2010 and emission savings are calculated from 2010 onward.

Box 2 | **Target Categories According to the GHG Protocol Mitigation Goal Standard**

- **BASE-YEAR TARGET:** Reduce, or control the increase of, emissions by a specified quantity relative to a base year. For example, a 25 percent reduction from 2010 by 2030.
- **FIXED-LEVEL TARGET:** Reduce, or control the increase of, emissions to an absolute emissions level in a target year. One type of fixed-level goal is a carbon neutrality goal, which is designed to reach zero net emissions by a certain date.
- **BASE-YEAR INTENSITY TARGET:** Reduce emissions intensity (emissions per unit of another variable, typically GDP) by a specified quantity relative to a base year. For example, a 40 percent reduction in emissions intensity from the base year of 2000 by 2030.
- **BASELINE SCENARIO TARGET:** Reduce emissions by a specified quantity relative to a projected emissions baseline scenario. A baseline scenario represents future conditions most likely to occur in the absence of activities taken to meet the target. For example, a 30 percent reduction from the 2025 baseline scenario emissions.

Source: WRI, 2014.

Sensitivity analysis on data from three cities assessed the appropriateness of keeping cities' chosen base years. Sensitivity analysis on data from Vancouver, New York City, and Rio de Janeiro found that using their chosen

Table 3 | **Calculation of Inferred GHG Emission Levels for Different Categories of Targets**

TARGET CATEGORY	EQUATION FOR GHG EMISSION LEVEL INFERRED IN TARGET YEAR
Base year emissions target	*Target year emissions = Base year emissions – (Base year emissions × Percent reduction)*
Fixed-level target	*Target year emissions = Absolute quantity of emissions specified by the target*
Base-year intensity target	*Target year emissions = Base year emissions intensity (1 – percent reduction) × projected level of output*
Baseline scenario target	*Target year emissions = Projected baseline emissions in the target year (1 – percent reduction)*

Source: WRI, 2014.

base years produced BAU scenarios similar to those in their action plans. Normalizing the base years to 2010 may omit the action taken by these cities prior to 2010. Sensitivity analysis was also carried out for 140 cities (including cities belonging or not belonging to the Compact of Mayors) with chosen base years. Most chosen base years are between 2005 and 2010. Of these cities, 44 from developing countries had a median base year of 2010 while 110 from developed countries had a median base year of 2007. Considering that most Compact of Mayors cities without targets are from developing countries, 2010 was used as the common base year. This is in line with the principle of conservativeness to avoid overestimating the BAU scenario levels.

5.2 Interpolation for Emissions Between GHG Data Points

Emissions for years between data points were calculated via linear interpolation. Linear interpolation from historical emissions data (i.e., base year data and emission inventory updates) to infer future emission levels (i.e., interim targets and long-term targets) assumes continuous progress toward targets. Equation 2 shows the calculation for this target scenario emission level for year *i*.

$$Target\ GHG_i = GHG_{inventory} + (Year_i - Year_{inventory}) \frac{GHG_{target} - GHG_{inventory}}{Year_{target} - Year_{inventory}}$$

The limitation of this method is that it over simplifies the emission trajectories because it does not account for emissions peaking, variance from weather and economic impacts, or the ratcheting up of ambition over time. However, a linear interpolation is the most practical approach for this application that involves analyses for hundreds of cities.

5.3 EXTRAPOLATION FROM TARGET PERIOD TO END OF STUDY PERIOD

The study period of this model is 2010 to 2050. A number of Compact of Mayors cities have committed to long-term targets for 2050; for example, Boulder, Bristol, Des Moines, New York City, Portland, Toronto, and others have committed to an 80 percent reduction of GHG emissions by 2050. However, many have a shorter target period: common target years are 2020, 2025, and 2030.

One output of the model is an extrapolation of emissions in the target scenario from any target date to 2050. This is accomplished by assuming the trend of the BAU scenario from the city's chosen target year until the end of the study period. The BAU scenario, described in section 4, rises or falls based on the city's projected population growth and regional projections of per capita emissions. Extrapolating the effect of meeting targets allows for the GHG impacts of targets for different time periods to be considered together in the cumulative target scenario. This extrapolation can be calculated by multiplying the inferred GHG emissions in the target year by the ratio of the forecast BAU to the target year BAU as shown in equation 3:

$$Target\ scenario_{year\ i} = Target\ scenario_{target\ year\ i} \times \frac{BAU\ scenario_{year\ i}}{BAU\ scenario_{target\ year}}$$

5.4 Estimating Emission Reductions for Cities without Targets

Upon joining the Compact of Mayors, cities initiate a three-year process to measure emissions, set a target, and make a plan for delivering on their commitments. Over time, cities will report their targets and emissions to the Compact of Mayors, but at this point many cities have not yet provided information.

A model was constructed to provide an approximation of the BAU and target scenario emissions of these cities to indicate the collective impact of all Compact of Mayors cities. Cities without a GHG inventory, a GHG reduction target, or either require proxy data to estimate potential emissions and targets. This was accomplished by assuming GHG emissions per capita and targets for cities that are statistically similar based on a set of variables.

These variables, or city typology data, are a set of socioeconomic and climate indicators to assess the similar energy and emission profiles of cities for the purpose of matching and generating proxy emissions data and targets for the scenarios. The city typology approach is built from an initial analysis and framework developed for the *Global Aggregation of City Climate Commitments* report.[9] The estimated emissions for cities without GHG inventory data or targets are based on finding the reference city with the most similar profile through a nearest neighbor's algorithm.[10] The variables used for this approach are outlined in Table 4.

Table 4 | **City Typology Variable Summary**

VARIABLE	DESCRIPTION
Region	Regional typology categorizes the geographic location of a city. Cities in this study are grouped under their geographical region: Africa, East Asia, Europe, Latin America, North America, and South Asia, Southwest Asia, Southeast Asia, and Oceania.
Population and population growth rate	Population figures and population growth rates give an indication of a city's overall size and the rate of urbanization experienced. Population data are supplied by cities and local governments, and the urban growth rates are from the United Nations dataset mentioned in section 4.1.
GDP, GDP per capita, and GDP growth rate	GDP per capita is the gross domestic product (GDP) divided by the number of people in the city. GDP growth illustrates the speed of economic change experienced in the city. Rapidly industrializing countries and developing countries tend to generate more GHG emissions as their economies grow associated with increased industrial output and energy demands. Data for this typology are available through the Brookings Institution, 2015 *Brookings Metro Monitor.*[11] Additional data sources were required to complete this information, and occasionally a national GDP growth rate was applied.
Area	City area typology is the surface area of a city, as defined by physical boundaries and administrative jurisdictions, measured in square kilometers (km^2). Information on city area size is provided by local governments through their respective reporting platforms, and available through *Brookings Metro Monitor,* 2014 and the *Atlas of Urban Expansion.*[12]
Population density	The number of people per square kilometer. For this report, the data are self-reported by city officials.
Human Development Index (HDI)	HDI is a composite statistic of life expectancy, education, and per capita income indicators at the national level used to rank countries into four tiers of human development. The HDI forms part of the 2014 *Human Development Report* of the United Nations Development Programme. The HDI is the geometric mean of normalized indices that measure economic and social welfare.
Heating and cooling degree days	Heating degree days (HDD) and cooling degree days (CDD) are indicators of energy required to manage the thermal load of buildings to maintain indoor temperatures of 65° F / 18° C. They relate each day's temperatures to the demand for fuel or energy to heat or cool a building. Measured as "degree days," this index demonstrates the actual energy demand to keep indoor temperatures within ideal thresholds. Widely used in the energy sector to calculate energy consumption, this weather data is calculated from daily air temperature, and correlates with energy used in buildings for thermal load management. The degree days were taken from the airport or weather station closest to each city for the year 2014.
Fuel price	Cost of gasoline from the German Society for International Cooperation (GIZ) fuel prices 2014. The price index for gasoline, in U.S. dollars per liter, was calculated from retail prices taken from a survey of 174 countries in November 2014.

Reference city data provides a basis to map emission levels for cities that have insufficient data.

The nearest-neighbors approach identifies the “training cases” (i.e., reference cities) closest to a “testing case” (i.e., non-reference city) based on Euclidian distance between the variables in the testing case and the variables in each of the training cases. To improve the data coverage of the reference cities, cities that have not yet joined the Compact of Mayors but have sufficient GHG emissions and target data, were used as potential matches in the algorithm (see Annex). Cities assume the mean GHG per capita emissions intensity of their three nearest neighbors, and the GHG reduction target of the nearest neighbor. Cities with insufficient data were matched with cities that share the same typological profile to generate a proxy emissions profile to determine BAU and target scenarios. This methodology presents an estimate of what the GHG target scenario could be if cities with similar characteristics adopt targets in line with the targets of their statistical peers.

6. LIMITATIONS AND FUTURE RESEARCH

These results should not be interpreted as a forecast of city GHG emissions reductions, but rather as an indication of GHG emissions avoided under specific assumptions and conditions. Predictions of future conditions inherently have some degree of uncertainty and depend on the assumptions and data used. This methodology provides a simplified model of emission trajectories of cities and can be the basis for more granular research. It represents only one possible scenario for emission reductions whereas ambition and implementation of future targets can vary from existing targets. The accuracy of results depends on the quality of input data. Results will be more accurate if all cities use a common protocol to report their GHG inventories. Furthermore, the inclusion of scope 2 and scope 3 emissions may lead to double counting between cities.

This model will be updated and improved as more city data become available. WRI and the Compact of Mayors aim to continually improve the data and methodology and welcome any feedback and suggestions on how to advance development of city target modeling.

Data completeness and data availability were a significant challenge overall. Joining the Compact of Mayors initiates a three-year process, and WRI and the Compact of Mayors anticipate significant improvements in data quality and availability as cities progress through the Compact of Mayors’ requirements.

ANNEX: CURRENT REFERENCE CITIES

Reference cities as of November 2015

Africa

Cape Town (South Africa)
Durban (South Africa)
Johannesburg (South Africa)
Tshwane (South Africa)

East Asia

Akita (Japan)
Aomori (Japan)
Gangneung (South Korea)
Hiroshima (Japan)
Kaoshiung (Chinese Taipei)
Kobe (Japan)
Kumamoto (Japan)
Kyoto (Japan)
Nagasaki (Japan)
Nagoya (Japan)
Nara (Japan)
New Taipei (Chinese Taipei)
Osaka (Japan)
Sapporo (Japan)
Seoul (South Korea)
Suwon (South Korea)
Taito (Japan)
Tinan City (Chinese Taipei)
Yeosu (South Korea)
Yokohama (Japan)

Europe

Almada (Portugal)
Antwerp (Belgium)
Arendal (Norway)
Barcelona (Spain)
Berlin (Germany)
Bilbao (Spain)
Birmingham (UK)
Bologna (Italy)
Bristol (UK)
Copenhagen (Denmark)
Freiburg (Germany)
Ghent (Belgium)
Gothenburg (Sweden)
León (Spain)
Lisbon (Portugal)
London (UK)
Ludwigsburg (Germany)
Madrid (Spain)
Malmö (Sweden)
Manchester (UK)
Milan (Italy)
Mouscron (Belgium)
Oslo (Norway)
Padova (Italy)
Paris (France)
Sofia (Bulgaria)
Stockholm (Sweden)
Växjö (Sweden)
Warsaw (Poland)
Zaragoza (Spain)
Zürich (Switzerland)

Latin America

Amacuzac (Mexico)
Axochiapan (Mexico)
Belo Horizonte (Brazil)
Bogotá (Colombia)
Buenos Aires (Argentina)
Cali (Colombia)
Caracas (Venezuela)
Chacao (Venezuela)
Cuernavaca (Mexico)
Florianópolis (Brazil)
Guadalajara (Mexico)
Hermosillo (Mexico)
La Paz (Bolivia)
Mazatepec (Mexico)
Mexico City (Mexico)
Monteria (Colombia)
Puebla (Mexico)
Quito (Ecuador)
Rio de Janeiro (Brazil)
Santiago (Chile)
Santiago de Cali (Colombia)
São Paulo (Brazil)
Tlalnepantla de Baz (Mexico)
Toluca de Lerdo (Mexico)
Zapopan (Mexico)

North America

Aspen (USA)
Atlanta (USA)
Austin (USA)
Boston (USA)
Boulder (USA)
Chicago (USA)
Cleveland (USA)
Columbus, OH (USA)
Des Moines (USA)
Lakewood, CO (USA)
Los Angeles (USA)
Minneapolis (USA)
Montréal (Canada)
New York City (USA)
Oakland, CA (USA)
Philadelphia (USA)
Pinecrest (USA)
Pittsburgh (USA)
Portland (USA)
Salt Lake City (USA)
San Francisco (USA)
San José, CA (USA)

Santa Monica (USA)
Seattle (USA)
Toronto (Canada)
Vancouver (Canada)
Washington, D.C. (USA)

Southeast Asia and Oceania

Auckland (New Zealand)
Balikpapan (Indonesia)
Bandung (Indonesia)
Central Australian Territory (Australia)
Cimahi (Indonesia)
Jakarta (Indonesia)
Lampang (Thailand)
Melbourne (Australia)
Semarang (Indonesia)
Singapore (Singapore)
Sydney (Australia)
Wellington (New Zealand)

South and West Asia

Amhedabad (India)
Coimbatore (India)
Gandhinagar (India)
Gwalior (India)
Hyderabad-Greater (India)
Kota (India)
New Delhi (India)
Rajkot (India)
Seferihisar (Turkey)
Shimla (India)
Tbilisi (Georgia)
Thane (India)

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ABOUT WRI

World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

Our Challenge
Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

Our Vision
We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

Our Approach
COUNT IT
We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

CHANGE IT
We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

SCALE IT
We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.