



Energy Technologies Area

Lawrence Berkeley National Laboratory

# Low Carbon City Action Planning: Focus on Chinese Cities

Beahrs Environmental Leadership Training Program

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# Lawrence Berkeley National Laboratory



*Managed by the University of California for the United States Department of Energy*

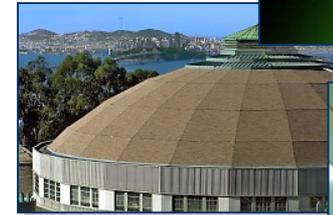
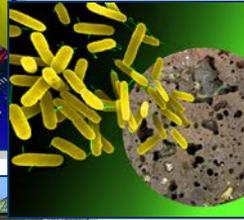


Lawrence Berkeley National Laboratory



- Solve the most pressing and profound scientific problems facing humankind
- Build and safely operate world-class scientific facilities
- Train the next generation of scientists and engineers
- ~\$800 million annual budget

<b>Employees</b>		<b>~4,000</b>
<b>Scientific</b>	<b>1,686</b>	
<b>Postdoctoral</b>	<b>475</b>	
<b>Students</b>	<b>560</b>	



# Twelve Nobel Laureates



**1939:**  
Ernest Orlando  
Lawrence



**1951: Glenn T.  
Seaborg**



**1951: Edwin M.  
McMillan**



**1959: Owen  
Chamberlain**



**1959: Emilio  
G. Segrè**



**1960: Donald  
A. Glaser**



**1961: Melvin  
Calvin**



**1968: Luis W.  
Alvarez**



**1986: Yuan T.  
Lee**



**1997: Steven  
Chu**



**2006: George F.  
Smoot**



**2011: Saul  
Perlmutter**

# Intergovernmental Panel on Climate Change wins 2007 Nobel Peace Prize

- Awarded for “their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change”
- Many LBNL scientists were authors of the IPCC reports, including two from the China Energy Group
  - Mark Levine: Buildings
  - Lynn Price: Industry



To be a global innovation hub for science, technology, and policy solutions to the world's most critical energy and environment challenges.



Scientific Integrity  
Innovation  
Impact  
Sense of Urgency  
Collaboration and Partnership

## Mission:

- Bringing impactful, science-based energy solutions to China
- Strengthen capabilities of Chinese institutions to promote energy efficiency and low-carbon development

## Founded in 1988 – have worked collaboratively in China for 28 years

- Worked with Energy Research Institute (ERI) under NDRC since 1988; helped to set up Beijing Energy Efficiency Center (BECon) under ERI
- Trained the first generation of researchers and policy makers in China in building energy efficiency and appliance energy efficiency standards from early 90's, and expanded to industry and other areas in late 90's
- Brought various tools, case studies, best practice policies and programs to China to improve the energy efficiency
- ~ 20 staff members; ~ 20 visiting researchers from China; > 50 current projects
- Budget \$5M/year



**Nan Zhou**

Staff Scientist

Group Leader, China Energy Group  
Director, U.S.-China Clean Energy  
Research Center for Buildings



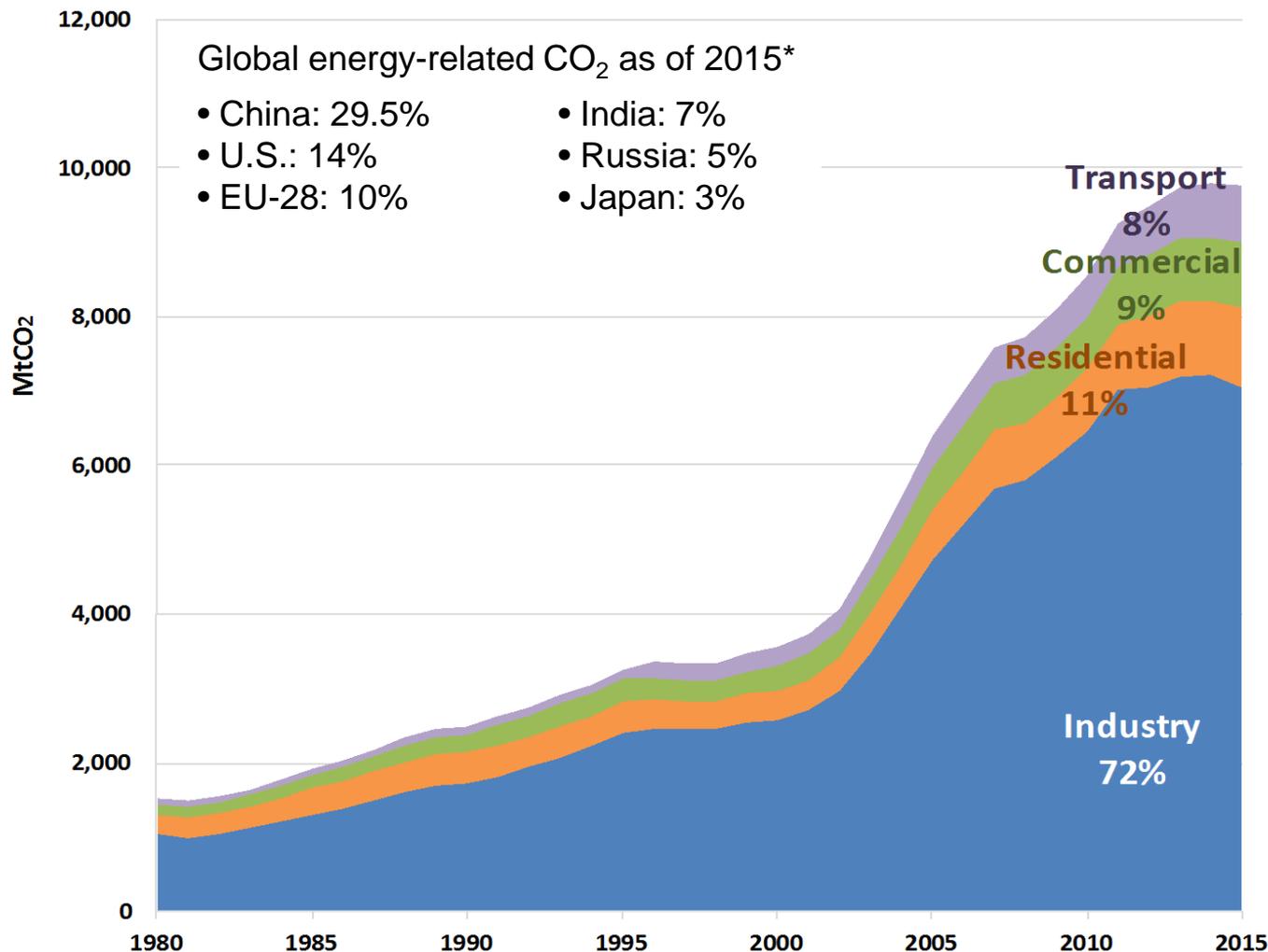
## Host of Centers and Secretariats

- U.S.-China Clean Energy Research Center for Buildings
- Berkeley Tsinghua Joint Research Center on Energy and Climate Change
- Secretariat for the U.S.-China Eco Partnerships Program
- Secretariat for the U.S.-China Climate Change Working Group-Smart Cities

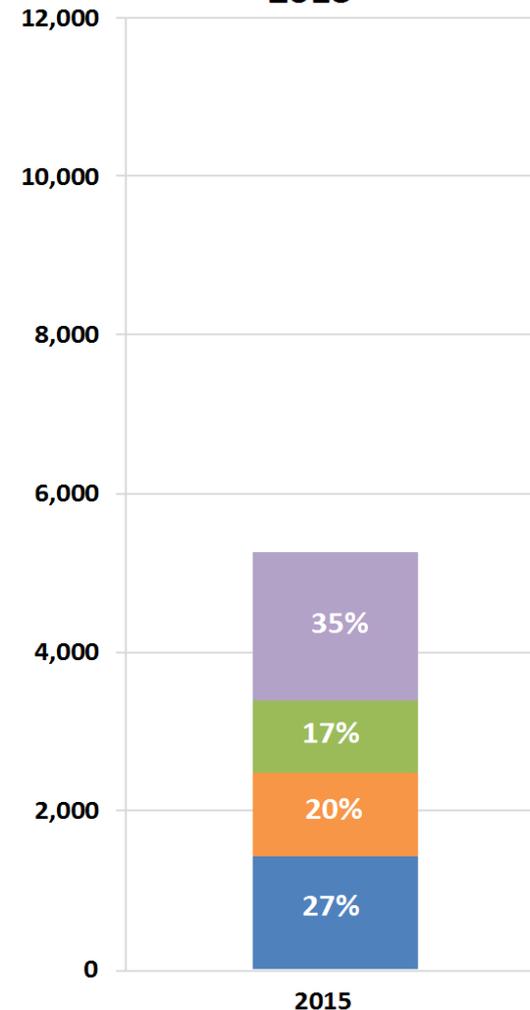


# China & U.S. Energy-Related CO<sub>2</sub> Emissions

## China, 1980-2015



## United States 2015



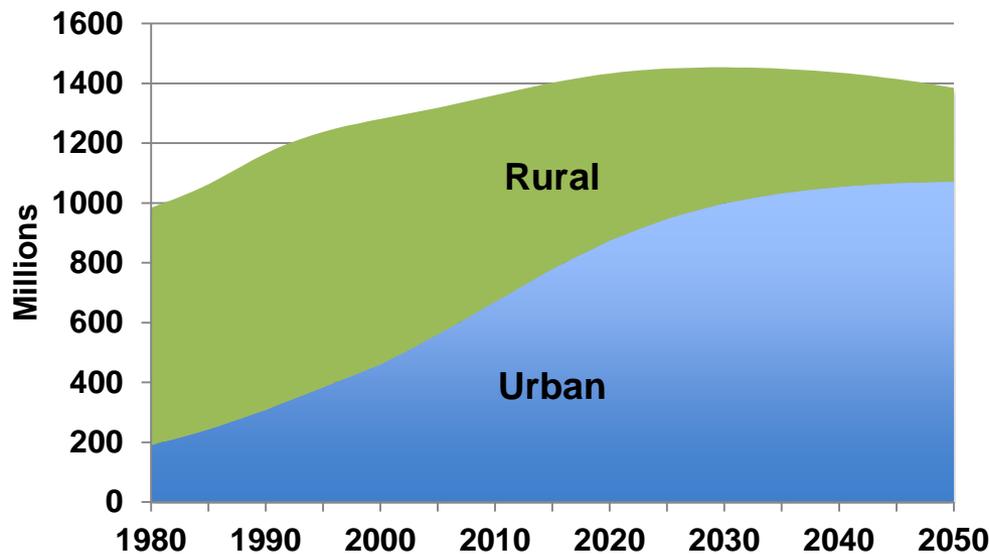
# China's Urbanization Trends

China's urban population growth:

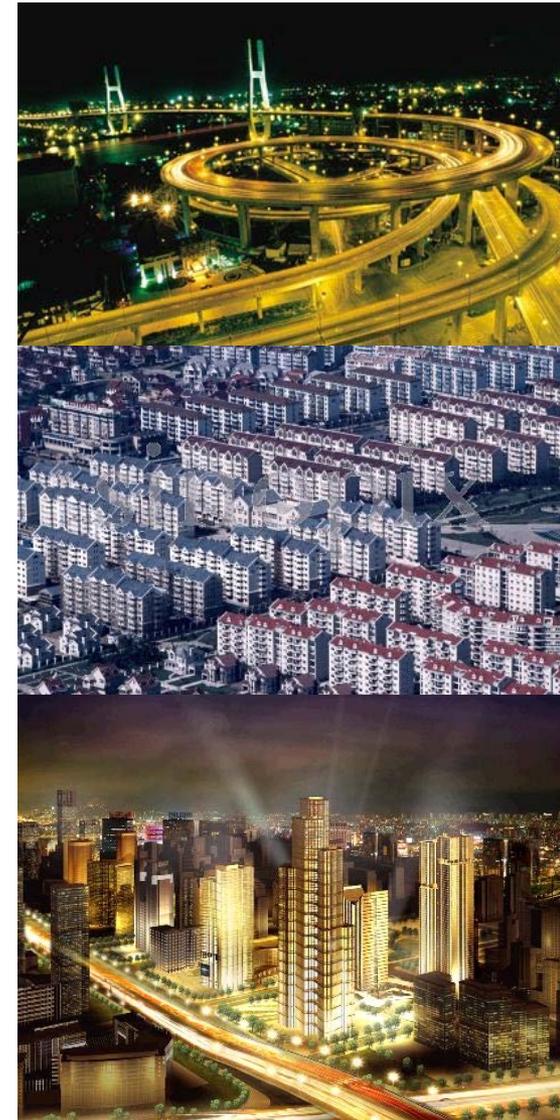
About 20% of the total population in 1980

About 50% in 2010

Expected to be about 80% in 2050



Source: United Nations, Department of Economic and Social Affairs, Population Division (2013).  
World Population Prospects: The 2012 Revision.



Globally, cities are at the forefront of action on climate change and low-carbon economic development



CHINA HAS OVER **100 CITIES** WITH A POPULATION OVER **1 MILLION PEOPLE**

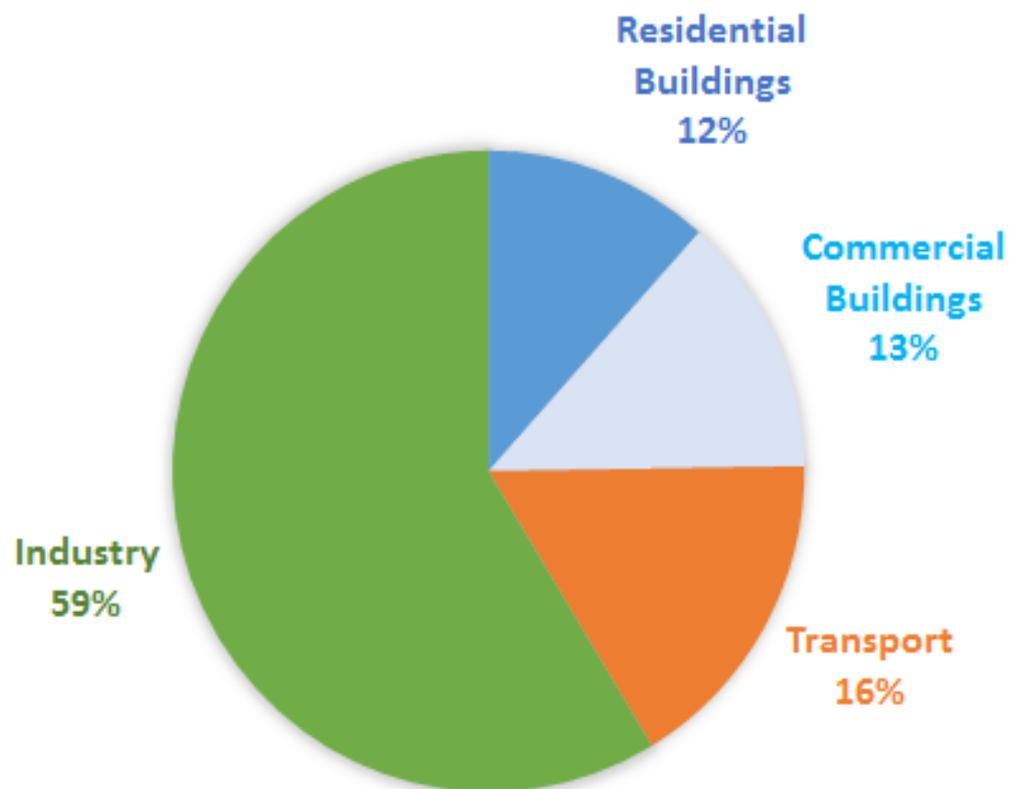


CHINA'S URBAN POPULATION OF **742 MILLION PEOPLE** IS **10% OF THE WORLD**

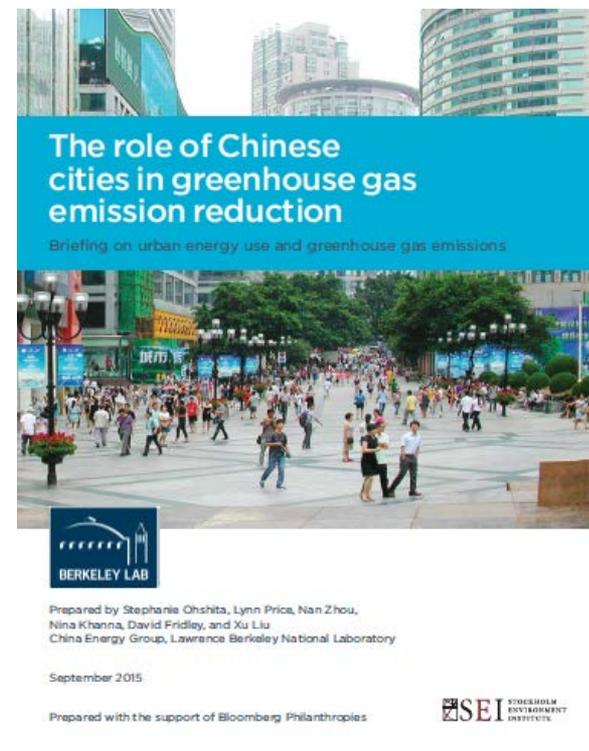


# CO<sub>2</sub> Emissions from Chinese Cities

## 2015 URBAN CO<sub>2</sub> EMISSIONS BY SECTOR



Source: LBNL, China 2050 DREAM Model



# China's Energy and Emissions Targets

- **13<sup>th</sup> Five Year Plan (2016-2020): 2020 Targets**
  - Reduce energy intensity (energy/GDP) by 16%
  - Reduce carbon intensity (CO<sub>2</sub>/GDP) by 18%
- **2009 Copenhagen Agreement Commitment: 2020 Targets**
  - Reduce carbon intensity (CO<sub>2</sub>/GDP) by 40-45% by 2020 compared to 2005
  - Increase share of non-fossil fuels in primary energy to around 15% by 2020



- **2014 U.S.-China Joint Announcement on Climate Change**
- **2015 Paris Agreement Nationally Determined Contributions: 2030 Targets**
  - Peaking of CO<sub>2</sub> emissions around 2030 and to make best efforts to peak early
  - Increase the share of non-fossil fuels in primary energy to around 20% by 2030

# China's Goals and Progress to Date

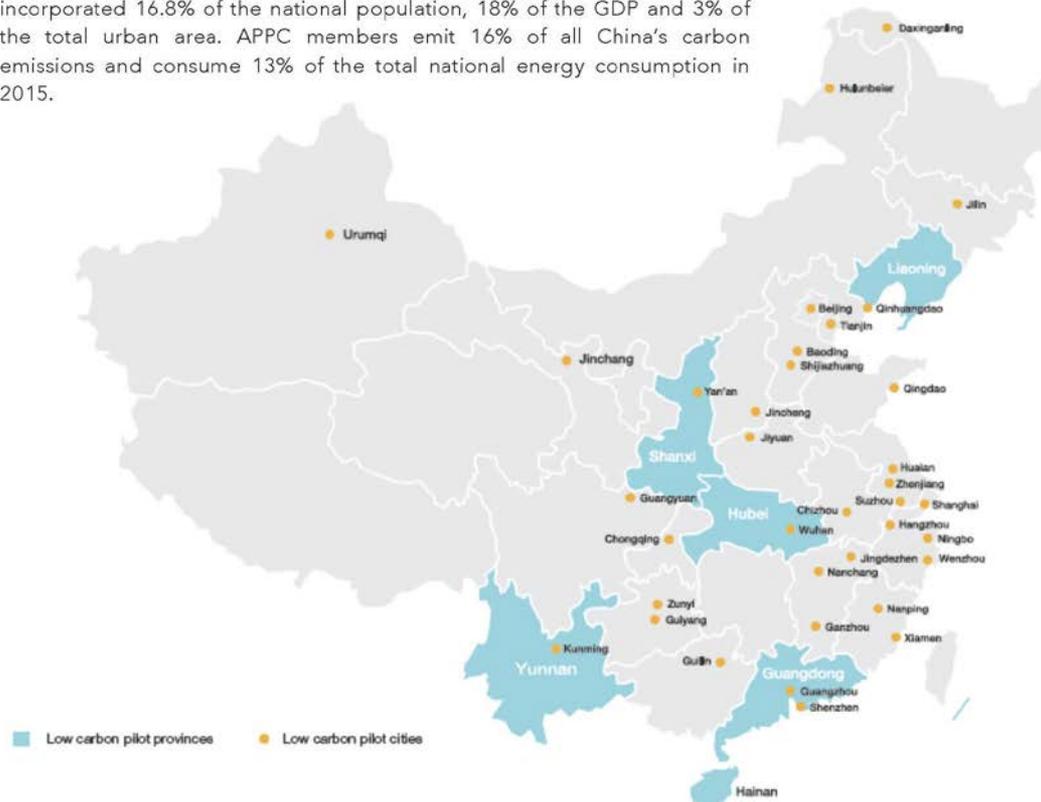
	12 <sup>th</sup> Five-Year Plan (2011-2015)		13 <sup>th</sup> Five-Year Plan (2016-2020)
	2015 Goals	2015 Achievement	2020 Goals
Energy intensity reduction (E/GDP)	16%	18.4%	15%
Carbon intensity reduction (CO <sub>2</sub> /GDP)	17%	>20%	18%
Cap on total energy use	4,000 Mtce	4,300 Mtce	5,000 Mtce
Share of coal in primary energy use	~65%	64%	<58%
Share of natural gas in primary energy use	7.5%	5.9%	10%
Share of non-fossil energy in primary energy use*	11.4%	12% (13.3%)**	~15%
Hydropower	260 GW	320 GW (330 GW)**	380 GW
Wind power	100 GW	131 GW (149 GW)**	210 GW
Nuclear power	40 GW	27 GW (34 GW)**	58 GW
Solar power	35 GW	42 GW (77GW)**	110 GW (incl. 5 GW CSP)
Biomass power	13 GW	10.3 GW	15 GW

\* Using China's power plant coal consumption calculation methodology

\*\* 2016 ENERGY TECHNOLOGIES AREA

# China's Key City Programs

China's 42 low-carbon pilots covered 37.33% of the national population, 53.39% of GDP and 21.21% of total urban area. In 2015, APCC member cities incorporated 16.8% of the national population, 18% of the GDP and 3% of the total urban area. APCC members emit 16% of all China's carbon emissions and consume 13% of the total national energy consumption in 2015.



## • Low Carbon Cities Pilot Program

- 2010: 8 Pilot Cities (Tianjin , Baoding, Hangzhou, Chongqing, Nanchang, Guiyang, Xiamen and Shenzhen) and 5 Pilot provinces (Yunnan, Guangdong, Hubei, Shaanxi, and Liaoning).
- 2012: 28 cities (Beijing, Shanghai, Shijiazhuang, Qinhuangdao, Jincheng, Hulunbuir, Jilin, Great Khingan area, Suzhou, Huaian, Zhenjiang, Ningbo, Wenzhou, Chizhou, Nanping, Jingdezhen, Ganzhou, Qingdao, Jiyuan, Wuhan, Guangzhou, Guilin, Guangyuan, Zunyi, Kunming, Yan'an, Jinchang, Urumchi) and Hainan province.
- Cover 21% of China's urban area
- Cover 37% of China's population
- Account for 53% of China's GDP

# China's Key City Programs

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- **Alliance of Peak Pioneering Cities (APPC)**

- 2015: 9 cities (Beijing, Sichuan, Shenzhen, Wuhan, Guiyang, Zhenjiang, Jilin, Yan'an, Jinchang) and 2 provinces (Hainan, Guangzhou)
- 2016: 30 cities, 2 districts, and 2 provinces added



# International City-Level Actions



C40 is a network of the world's megacities committed to addressing climate change

<http://www.c40.org/>



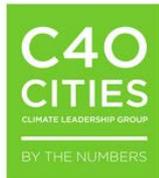
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● Steering Committee ● Innovator City ● Megacity ○ Observer City

<p><b>C40 CITIES</b> account for</p>	<p>91 affiliated cities</p>	<p>25 % of global GDP</p>	<p>1 in 12 people worldwide</p>	<p>10,000 actions to combat climate change</p>	<p>TAKE ACTION IN YOUR COMMUNITY</p>
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**C40 is a data-driven organization**

Our mayors know firsthand that if you can't measure it, you can't manage it and you can't fix it, and we adhere to that philosophy. 2017 marks the 12-year anniversary of C40 Cities Climate Leadership Group, and below you will find some of our most important metrics, as well as the results we have achieved in this time



**90+ megacities**

C40's global network consists of 90+ megacities and our chair, Mayor Anne Hidalgo, is committed to including more cities



**650+ million people**

C40 represents more than 650 million urban citizens around the world, and this number is set to grow. By 2050, more than two-thirds of the world's population is expected to live in cities



**25%**

The combined economies of the C40 cities network account for one-quarter of global GDP

**3 times more likely**

When it comes to climate change, cities are 3 times more likely to take action if a goal or target has been established.



**30%**

of all climate actions in C40 cities are now being delivered through city-to-city collaboration

**14,000 climate actions**

are required from 2016 to 2020 across C40 cities to determine if it is possible for cities to get on the trajectory required to meet the ambition of the Paris Agreement



**70%**

of C40 cities report that they are already experiencing the effects of climate change

**17 networks**

for peer-to-peer exchange on key mitigation and adaptation topics

**2.4 Gt of CO<sub>2</sub>e**

C40 cities are taking actions that reduces global greenhouse gas emissions - together C40 member cities combined community emissions represent 2.4 Gt of CO<sub>2</sub>e



**1.5°C**

C40 cities are required to have a plan to deliver their contribution towards the goal of constraining global temperature rise to no more than 1.5 degrees Celsius above the pre-industrial average Agreement



Read more about our achievements at: [www.c40.org](http://www.c40.org)

# International City-Level Actions



On June 22, 2016, the [Compact of Mayors](#) and the [Covenant of Mayors](#) announced the [Global Covenant of Mayors for Climate & Energy](#), a newly merged initiative to bring these two efforts together.

The Compact of Mayors was a global coalition of mayors and city officials pledging to reduce local greenhouse gas emissions, enhance resilience to climate change, and to track their progress transparently. The Compact was launched in September of 2014 by UN Secretary-General Ban Ki-moon and his Special Envoy for Cities and Climate Change, Michael R. Bloomberg.

The Global Covenant of Mayors for Climate & Energy is an international alliance of cities and local governments with a shared long-term vision of promoting and supporting voluntary action to combat climate change and move to a low emission, resilient society.

<http://www.globalcovenantofmayors.org/>



**ICLEI - Local Governments for Sustainability** is the leading global network of over 1,500 cities, towns and regions committed to building a sustainable future.

<http://www.iclei.org/>

- **ICLEI Tools dedicated to sustainable local change**
- ICLEI provides a broad range of concrete and globally accessible tools to help cities transit to more sustainable urban management, covering the areas of urban design, eco-budgeting, urbanization, sustainability management and eco-procurement.  
<http://www.iclei.org/activities/resources/tools.html>



We Are Still In Press Release — 06/05/2017

FOR IMMEDIATE RELEASE

## Leaders in U.S. Economy Say “We Are Still In’ on Paris Climate Agreement

### Climate Declaration Represents 120 Million Americans and \$6.2 Trillion of the U.S. Economy

**Washington DC** - A grand total of 1,219 governors, mayors, businesses, investors, and colleges and universities from across the U.S. or with significant operations in the U.S., representing the broadest cross section of the American economy yet assembled in pursuit of climate action, today [declared](#) their intent to continue to ensure the U.S. remains a global leader in reducing carbon emissions.

Together, these leaders are sending a strong signal to the international community and the 194 other parties to the Paris Agreement about the continued commitment of the U.S. to ambitious action on climate change absent leadership at the federal level. In the aggregate, the signatories are delivering concrete emissions reductions that will help meet America’s emissions pledge under the Paris Agreement.

Signatories include leaders from 125 cities, 9 states, 902 businesses and investors, and 183 colleges and universities. Participating cities and states represent 120 million Americans and contribute \$6.2 trillion to the U.S. economy, and include Oregon and cities like New York, Los Angeles, and Houston as well as smaller cities like Pittsburgh, Pennsylvania and Dubuque, Iowa. A mixture of private universities, state schools and community colleges, both small and large, have added their institutions to the statement. In total the undersigned businesses and investors account for a total annual revenue of \$1.4 trillion and include over 20 Fortune 500 companies, including Apple, eBay, Gap Inc., Google, Intel, Microsoft, and Nike, in addition to hundreds of small businesses, have also signed the statement.

The statement calls “The Trump administration’s announcement [one that] undermines a key pillar in the fight against climate change [and a move which is] out of step with what is happening in the United States.” The signers all understand that the Paris Agreement is a blueprint for job creation, stability and global prosperity and that accelerating the United States’ clean energy transition is an opportunity - not a liability - to create jobs, spur innovation, promote trade and ensure American competitiveness. By declaring that “we are still in,” the signatories are putting the best interests of their constituents, customers, students and communities first while assuring the rest of the world that American leadership on climate change extends well beyond the federal government.

In addition to this statement, since President Trump’s announcement to withdraw from the Paris Agreement, 211 [Climate Mayors have adopted](#) the Paris Agreement goals for their cities, 13 Governors have formed the bipartisan U.S. Climate Alliance, and 17 governors have released [individual statements](#) standing by Paris. Today’s statement embraces this rapidly growing movement of subnational and civil society leaders, by announcing that not only are these leaders stepping forward, they are stepping forward together.



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**China Energy Group:** [china.lbl.gov](http://china.lbl.gov)

**Smart and Resilient Cities and Urban Infrastructure:**

<https://china.lbl.gov/research-projects/smart-and-resilient-cities>