



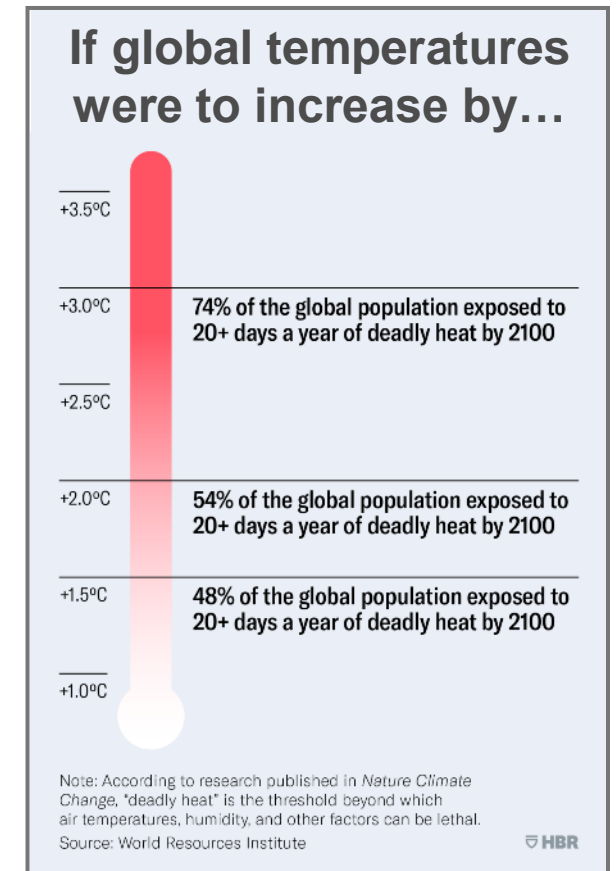
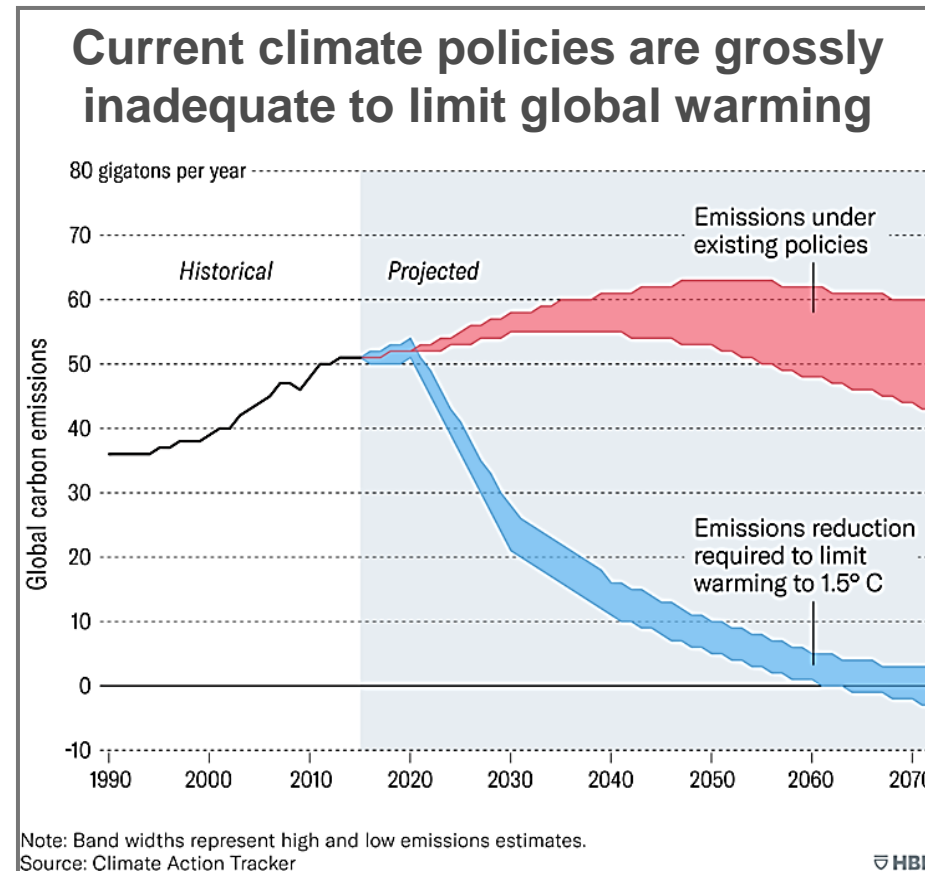
**slowing climate change and making cities more livable – while saving money**

[www.smartsurfacescoalition.org](http://www.smartsurfacescoalition.org)

# Broad, transformative policies must be implemented now if we are to limit the worst effects of climate change.

Smart surfaces address *both* climate mitigation and adaptation.

To hold global warming to 1.5°C and prevent the worst impacts of climate change, the world must cut carbon emissions to zero by mid-century. Under existing policies, temperatures will increase by about 3°C – with catastrophic effects.

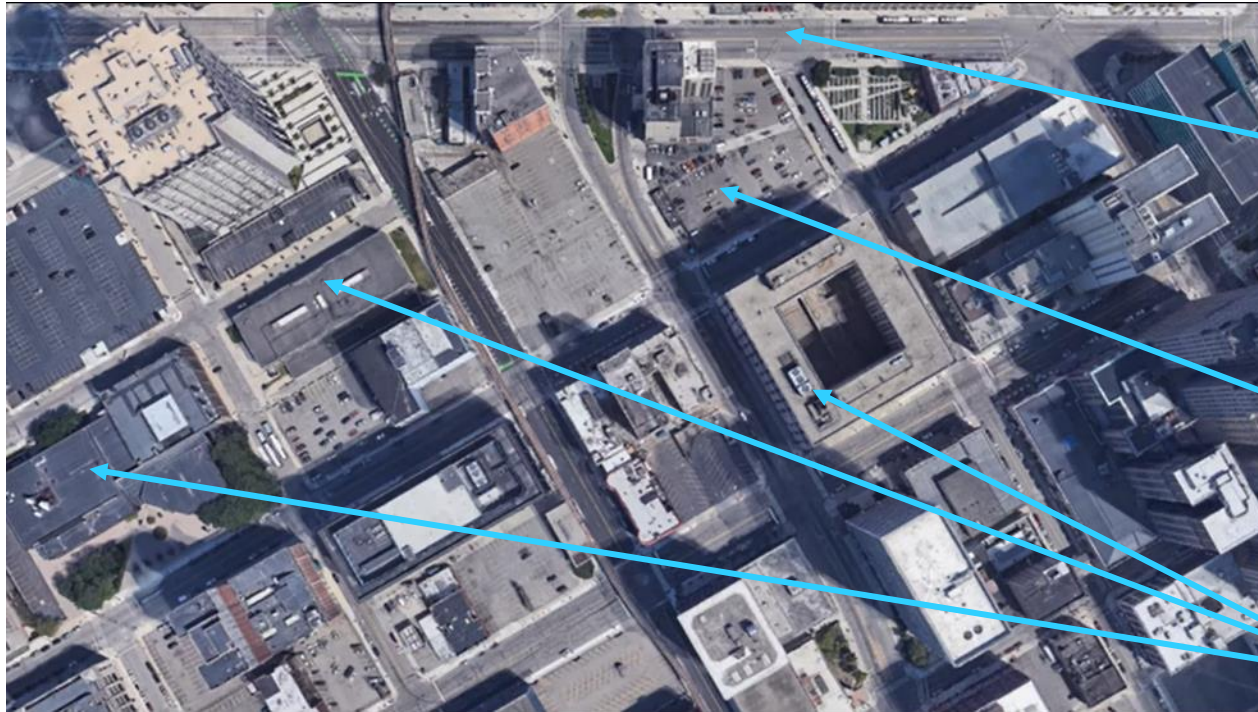


# The Opportunity

40 leading organizations  
with a transformative action plan  
that enables cities to better manage sun and rain  
to cost-effectively cut CO<sub>2</sub>-equivalent by 10-15%  
and cool cities by 5°F,  
with an initial focus on  
the US, India and Southern Europe

# Current City Norm:

Overwhelmingly covered in dark, impervious surfaces with few trees and little green space → much improvement can be made.



Dark, impervious road, due for resurfacing

- ↑ Reflectivity
- Add shade trees
- Make parking lanes pervious

Dark, impervious parking lot

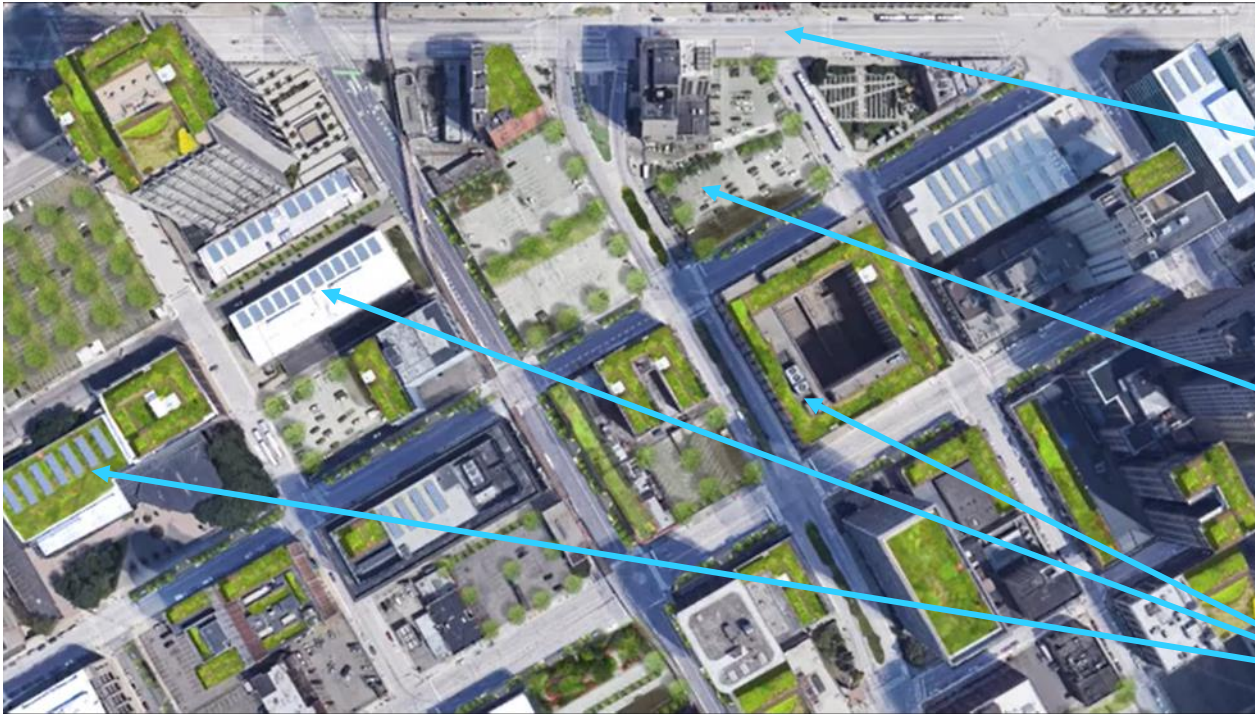
- ↑ Reflectivity
- Add trees, bioswales

Dark, impervious roofs

- ↑ Reflectivity
- Add solar PV
- Add bioswale to absorb rain runoff

# Future Smart Surface City Norm:

Covered in light-colored/reflective, porous, and green surfaces, trees, and rooftop solar PV → a cost-effective solution for more livable cities.



Light-colored, reflective road:

- Reduced heat absorption, reduces ambient temperature
- Porous parking lanes manage stormwater and reduce runoff

Porous, reflective parking lot with trees:

- Increased thermal comfort
- Shading and stormwater management

Reflective, green and PV roofs:

- Reduced building and city temperature
- Reduced runoff
- Generating clean renewable energy

# Smart surfaces allow cities to better manage sun and rain to cut costs and increase livability.



**Reflective roofs** are light colored and reflect most light and heat, much of which exits the atmosphere, slowing global warming.



**Green roofs** provide shading, reduce building energy use, clean the air, and absorb and clean water.



**Porous pavements** allow rain to recharge ground-water - and reduce pollution, storm water runoff, and flood risk.



**Solar PV** converts sunshine into electricity and provides shading for buildings, sidewalks, and other public areas.



**Trees** reduce temperature by providing shade, clean air pollutants, reduce flooding risk, and sequester carbon.



**Combined Solutions** such as solar PV on green roofs help manage both sun and rain, while increasing energy output.

# The Smart Surfaces Coalition:

Forty leading NGOs from the key sectors necessary to drive a tenfold acceleration of urban smart surface adoption, including:

<p><u>Architecture and Design</u></p>  <p><b>The American Institute of Architects</b></p> 	<p><u>Health</u></p>  <p><b>APHA</b> AMERICAN PUBLIC HEALTH ASSOCIATION <i>For science. For action. For health.</i></p>	<p><u>Planning</u></p>  <p><b>American Planning Association</b></p>	<p><u>City Policy</u></p>  <p><b>NLC</b> NATIONAL LEAGUE OF CITIES CITIES STRONG TOGETHER</p>
<p><u>Downtowns</u></p>  <p><b>IDA</b> INSPIRED LEADERS SHAPING CITIES</p>	<p><u>Urban Data Analytics</u></p>  <p><b>WORLD RESOURCES INSTITUTE</b></p>  <p><b>THE TRUST FOR PUBLIC LAND</b></p>  <p><b>Portland State UNIVERSITY</b> College of Urban and Public Affairs</p>		<p><u>Equity/low-income</u></p>  <p><b>Habitat for Humanity</b></p>
<p><u>Energy</u></p>  <p><b>ACEEE</b> American Council for an Energy-Efficient Economy</p>  <p><b>NASEO</b> National Association of State Energy Officials</p>	<p><u>City &amp; Urban Sustainability</u></p>  <p><b>USDN</b>   urban sustainability directors network</p>   <p><b>EcoDistricts</b></p>		
<p><u>Urban Law</u></p>  <p><b>Columbia Law School</b> SABIN CENTER FOR CLIMATE CHANGE LAW</p>	<p><u>In India</u></p>  <p><b>teri</b> The Energy and Resources Institute</p>		

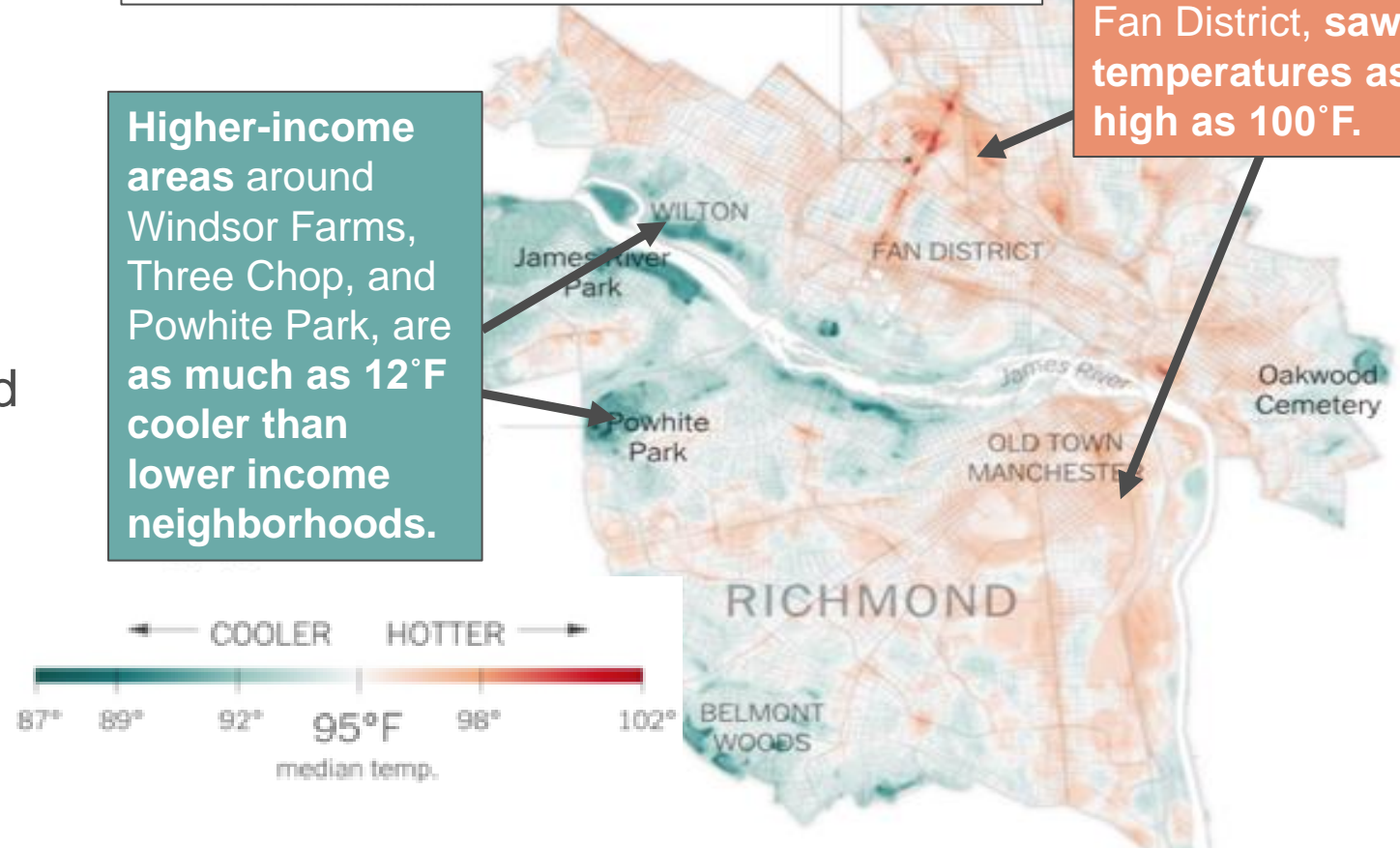
# Cities are getting hotter and less livable — especially lower-income areas.

- Dark urban surfaces absorb, rather than reflect most of the sun's heat — heating the city and increasing air pollution
- Lack of vegetation and trees to absorb heat, reduce pollution, and provide shade
- Dark surfaces make cities ~9°F (~5°C) degrees warmer on average, but this effect is aggravated in low-income neighborhoods with less vegetation and more dark surfaces

In this Portland State University (SSC Partner) study, the disproportionate impact of urban heat islands on low-income areas is clear.

Lower-income areas around Oak Grove and the Fan District, saw temperatures as high as 100°F.

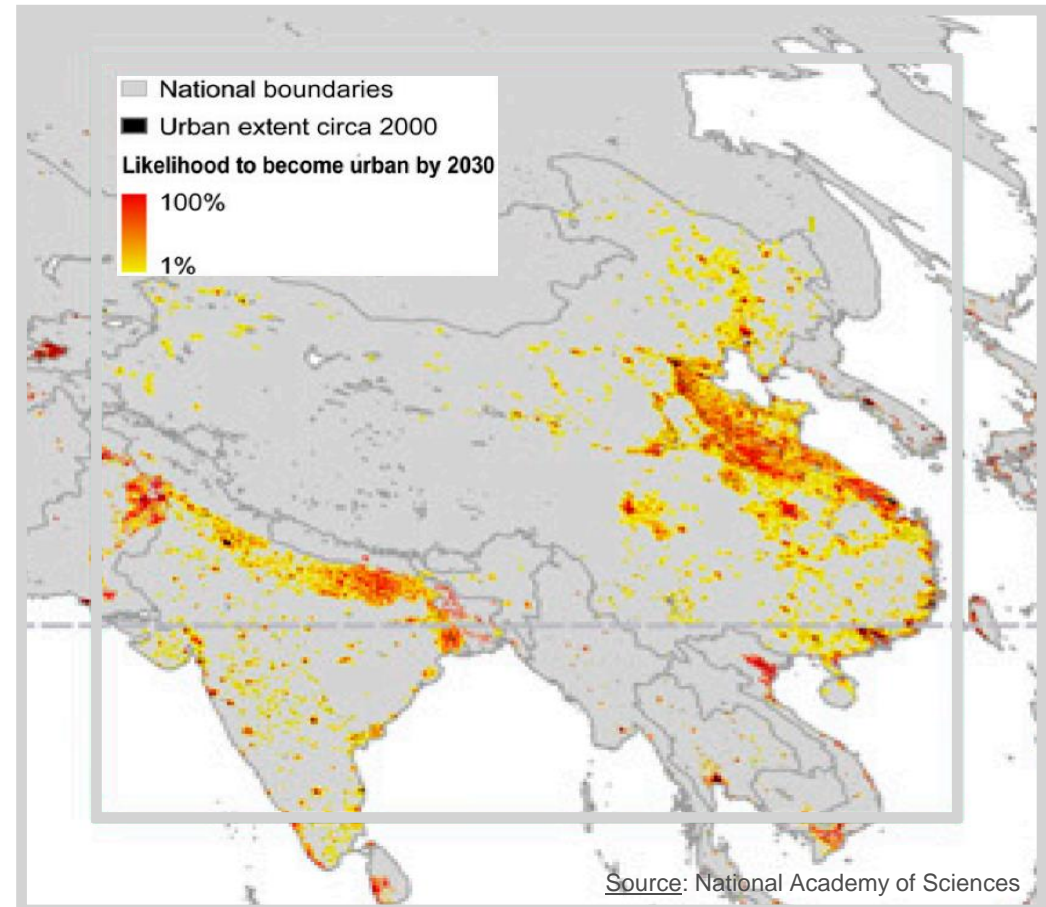
Higher-income areas around Windsor Farms, Three Chop, and Powwhite Park, are as much as 12°F cooler than lower income neighborhoods.





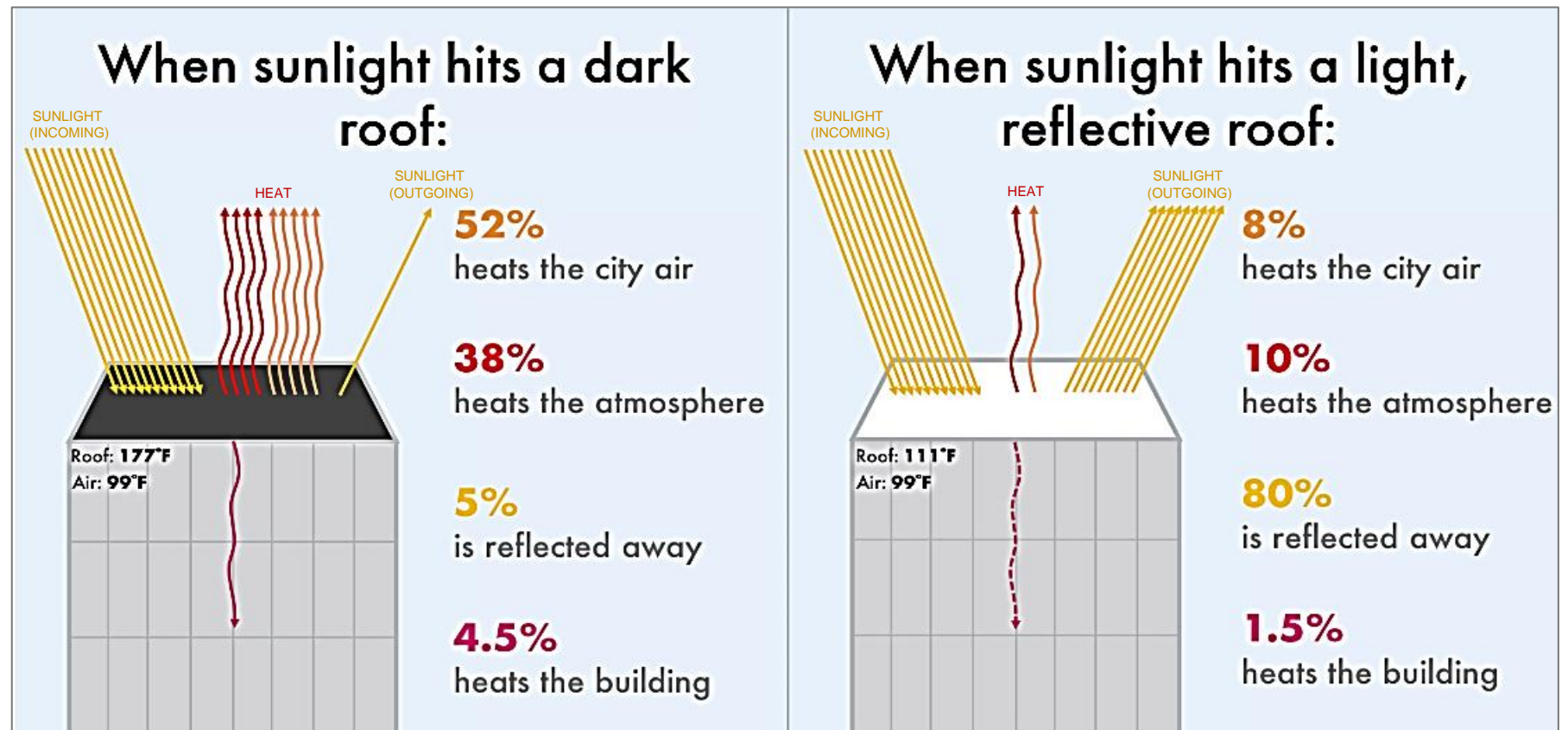
# Rapid growth in urban areas, if built as usual, will accelerate climate change and expose hundreds of millions to increasing urban temperature and worsening air quality.

- Urban areas account for about 70% of global greenhouse gas emissions, and by 2030 cities will be home to 60% of the global population.
- By 2030, global urban area is projected to increase by 1.2 million sq. km – nearly triple the urban area in 2000.
- *Adoption of smart surfaces would ensure that trillions of dollars of urban expansion would reduce, rather than accelerate, global warming – and ensure these areas are cooler, healthier, more resilient and more livable.*



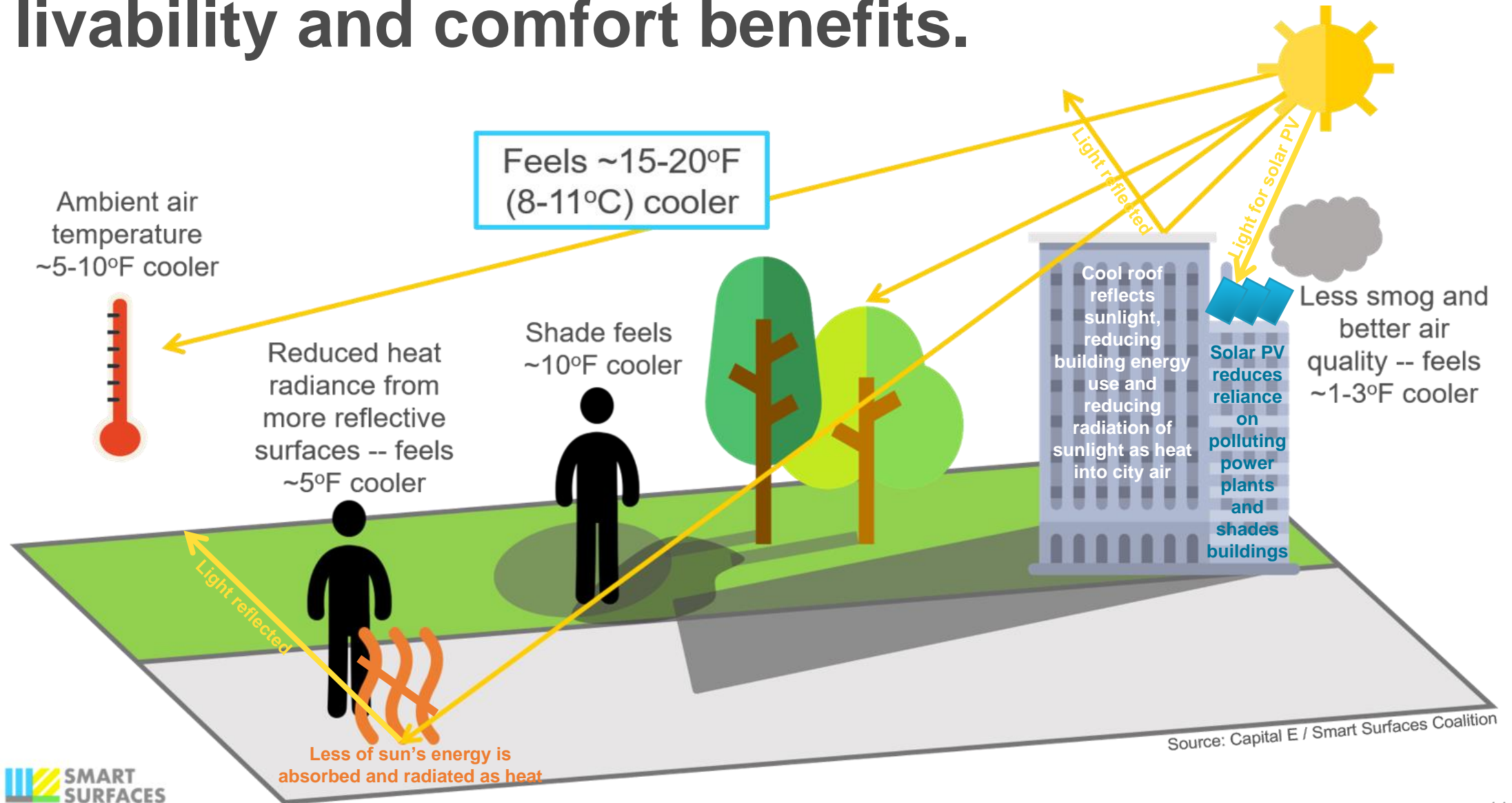
# Smart surfaces are a major new integrated urban strategy to cut costs, enhance health, increase competitiveness and cut climate change by 10%.

Increasing the reflectivity of roofs and parking lots bounces incoming light and heat back into space – cooling cities and cutting CO2-equivalent emissions by 10%.



Source: Lawrence Berkley National Lab Heat Island Group. Numbers do not sum to 100 percent due to rounding.

# Combining smart surfaces delivers large livability and comfort benefits.



# Benefits of Smart Surface Adoption in the US alone:

Save Billions



Reduce Urban Heat



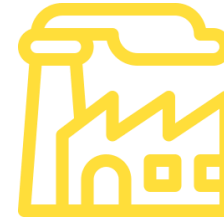
Create Jobs



Improve Health



Reduce Pollution



Slow Global Warming



City-wide adoption of smart surfaces across the United States would:

- **Save cities \$700 billion** over 30 years in energy, health, and other costs
- **Cut air pollution** and smog-related illnesses, asthma and other respiratory illness
- Greatest benefits for: low-income populations, elderly, infants, and people with respiratory conditions (asthma, allergies) ...and reduces pandemic risks
- Redress structural inequalities that burden minority and low-income communities
- Create more than **500,000 new jobs**
- Global urban adoption would **reduce global CO2-equivalent emissions by ~10%**
- Addresses climate change **mitigation and adaptation** very cost-effectively

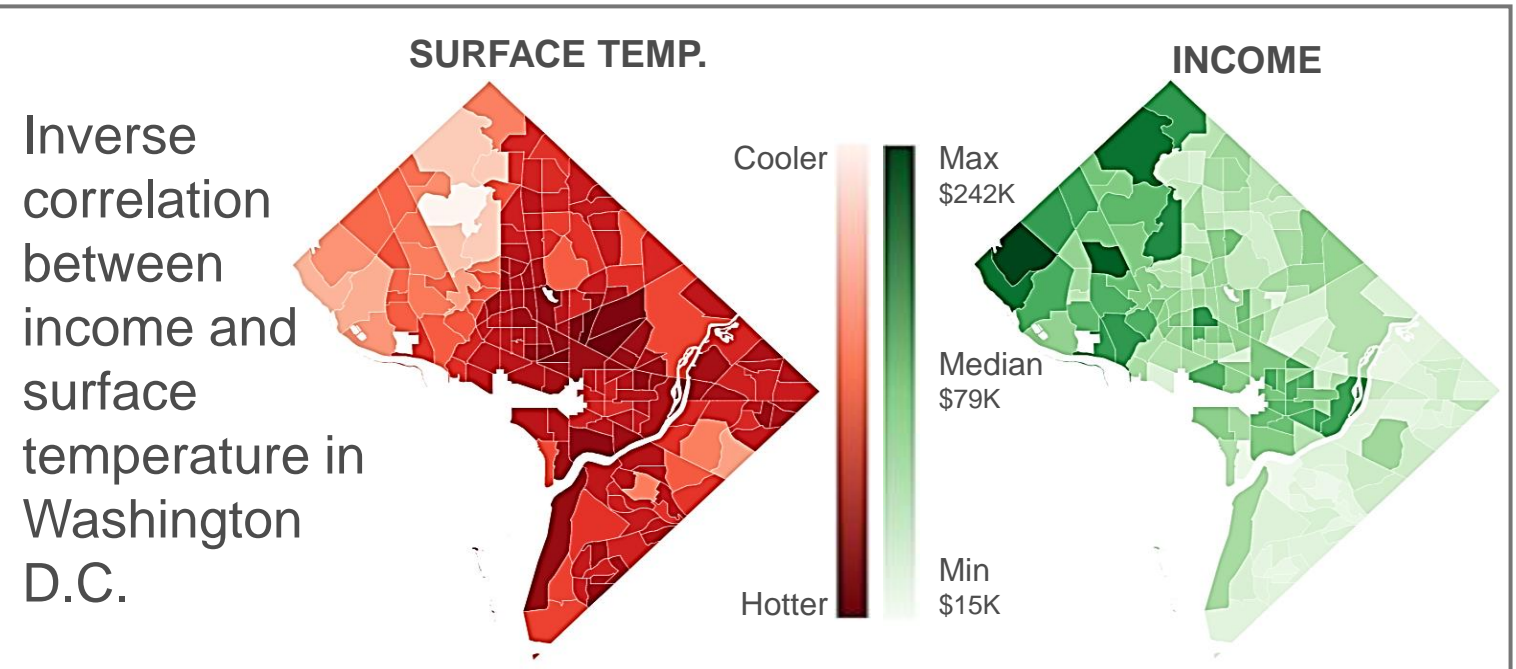
# An Example: Washington DC Benefits are 3x Costs

VALUING SMART SURFACES IN D.C.	
<b>COSTS</b>	<b>\$838 M</b>
First Cost	\$543 M
O&M	\$191 M
Additional Replacements	\$104 M
Employment Training	\$803 K
<b>BENEFITS</b>	<b>\$ 2.65B</b>
Energy	\$348 M
Financial Incentives	\$65.6 M
Stormwater	\$1.17 B
Health	\$523 M
Climate Change	\$434 M
Employment	\$104 M
<b>NET PRESENT VALUE</b>	<b>\$1.81 B</b>

*“The smart surfaces cost benefit analysis completed for Washington, DC provided a powerful and persuasive new way for the city to understand and manage its surfaces in order to address the urban heat island effect and mitigate the effects of climate change. The report and its findings have been influential within DC in enabling the city to expand smart surface requirements for roofs, roads, and surfaces generally.”*

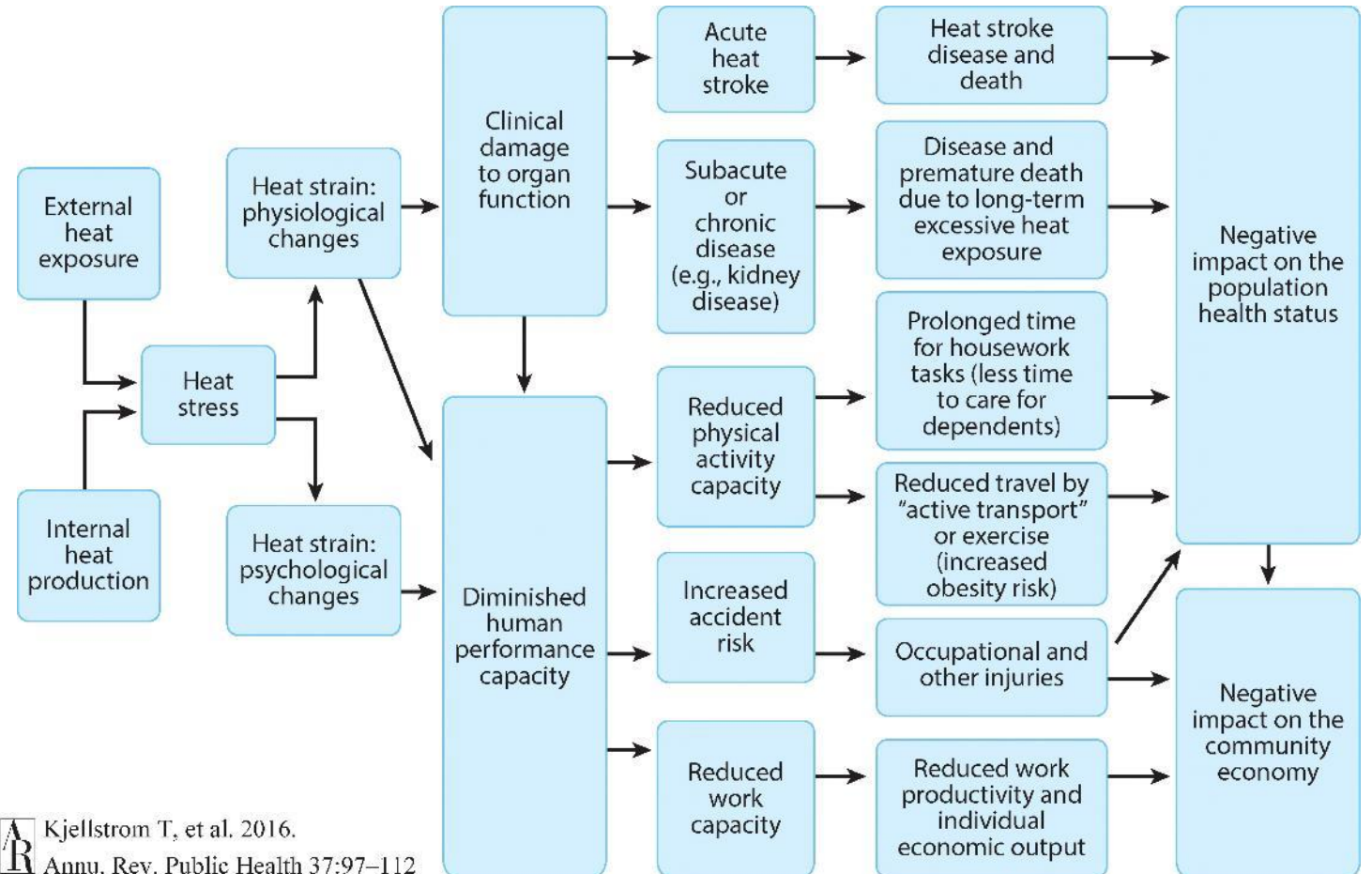
**- Bill Updike**


Former Chief of Green Building & Climate branch at DC Department of Energy & Environment



# Smart surfaces decrease temperature and a large range of health risks/costs.

“When people are exposed to extreme heat, they can suffer from potentially deadly illnesses, such as heat exhaustion and heat stroke. Older adults, young children, low-income populations, people who work outdoors, and people in poor health are the most vulnerable to these impacts.” - US EPA



 Kjellstrom T, et al. 2016.  
Annu. Rev. Public Health 37:97–112

# Smart surfaces reduce heat and health risks, especially in low-income neighborhoods.

- Low-income areas are often ~10°-15° F (6°-8° C) hotter in summer than high income areas — imposing huge health and livability costs. Almost all excess heat deaths are in lower income neighborhoods. Smart surfaces can largely solve this -
  - More reflective surfaces → cooler, better air quality
  - More porous surfaces → less flooding, less mold
  - More trees → more shade, lower temperature, cleaner air
- Energy costs account for ~ 15% of income in lowest-income households, compared to 1% of income in wealthy households.
- Reduced health risks and vulnerability of urban populations to pandemics
- Health costs (asthma, heat stroke, etc.) from excess heat and air pollution from lack of smart surfaces are the norm in low income communities. The costs are “grossly undercounted”, according to the Executive Director of the American Public Health Association, Georges Benjamin (Member of the Coalition Steering Committee).

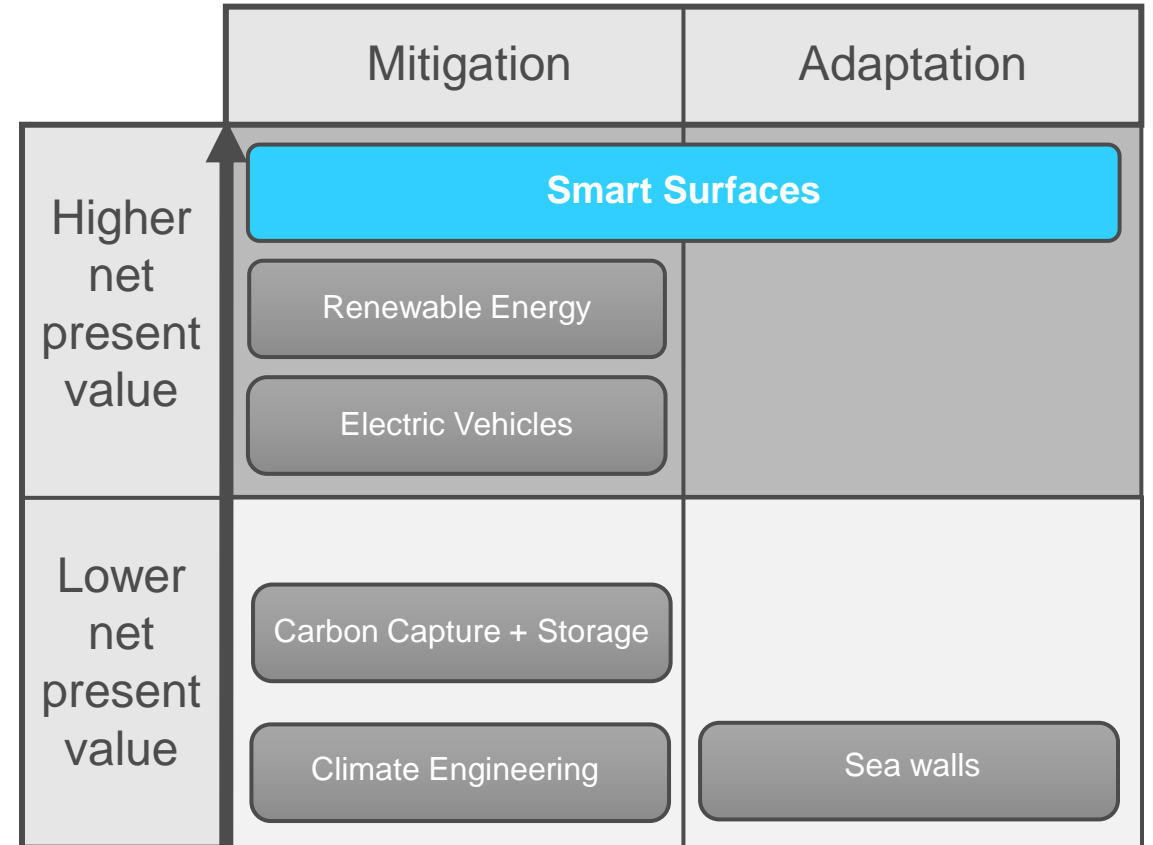
# Reasons for Immediate City Adoption of Smart Surfaces:

Objective	Motivation
<b>Cleaner, healthier, more livable city</b>	Cities seek to attract and retain businesses and residents. Healthier city > more competitive, attractive and livable. <u>Result</u> : stronger economic performance.
<b>Improved water management and air quality</b>	770 US cities are under EPA consent decree to reduce water pollution, and EPA requires many cities to improve air quality - or face penalties. Smart surfaces improve air and water quality cost-effectively. <u>Result</u> : Reduced costs, healthier more livable environment > stronger economic performance.
<b>Greater social equity</b>	Historically redlined areas tend to be much hotter and less livable. Cities can now redress these gross structural inequalities cost effectively. <u>Result</u> : More equitable, livable, stronger communities
<b>Improve city rankings</b>	Four influential city rankings will incorporate smart surfaces into their annual city rankings. <u>Result</u> : Improved city ranking and competitiveness
<b>Reduce costs and risks</b>	Cities face rising heat, flooding, and severe weather. Smart surfaces reduce these risks, making cities more resilient – and - protecting and enhancing their credit rating – see <a href="#">analysis</a> . <u>Result</u> : Stronger economic performance
<b>Tourism</b>	Cities, already hot in the summer, increasingly risk losing summer tourism revenue. Smart surfaces make cities cooler, more shaded and more appealing. <u>Result</u> : Protect and enhance tourism and livability



# Comparison of Major Climate Mitigation Strategies:

	Full transition to Renewables + Electric Vehicles	Carbon Capture and Storage	Trees	No-till + other low Carbon Agriculture	Smart Surfaces
<b>New strategy</b>	No	No	No	Yes	Yes
<b>Impact/size potential % GHG reduction</b>	~ 50%	~ 20%	~20%	~ 10%	~10%
<b>Cost per ton of GHG reduction</b>	Low-medium	High	Medium	Low-medium	Very low
<b>Positive NPV</b>	Maybe	No	No	Yes	Yes
<b>Also delivers adaptation</b>	No	No	Yes	Yes	Yes



# The Smart Surfaces Coalition was developed to respond to global city demand for help addressing climate and resilience.



More than **2000 cities** are members of National League of Cities



City smart surface cost benefit analyses conducted with El Paso, Philadelphia and Washington DC demonstrate **over \$10 billion NPV**

**28 cities** have already reviewed and contributed to development of the Smart Surfaces Coalition online cost benefit analytic engine



**40 Smart Surfaces Coalition partners** already work closely with and **influence cities** and towns – with most of the US population – on a broad range of policy and planning issues



**4** widely influential annual US and international **city rankings will adopt smart surface** performance as a key metric for future city rankings

**The Smart Surfaces Coalition has built the essential building blocks for a critical new urban livability and climate change strategy:**

A powerful coalition of 40 influential organizations committed to a common objective

Compelling cost-benefit research conducted with cities and partners

Free, online analytic engine providing city-specific cost-benefit analysis

An integrated 3-year work plan, developed with and for 24 leading partner organizations to extensively support 1,000 cities in adopting smart surfaces

# Recognition of the Importance of Funding the Smart Surfaces Coalition:

## Brendan Shane

Climate Director, The Trust for Public Lands,  
former C-40 Regional Director for North  
America, former Head of Environmental Policy  
Washington DC

“The new Smart Surfaces Coalition is so essential because it provides *a powerful new way for cities to address both mitigation and adaptation*. It will **provide to cities, and groups like C-40, a powerful new way to slow climate change and improve urban resilience and livability**. As one of the *largest, and perhaps the most effective urban climate strategies*, smart surfaces *must be funded and scaled rapidly if we are to limit warming and protect our cities.*”

## Georges C. Benjamin, MD

Executive Director, American Public Health  
Association

“Climate change is **the greatest public health crisis of our lifetime and is an especially grave and immediate threat to urban communities, especially lower income communities** which are at a higher risk of heat related injury. The Smart Surfaces Coalition offers a *transformative and cost-effective way to slow global warming and make cities cooler and healthier*. Smart Surfaces are also an **important strategy to mitigate the health risk from extreme heat in a cost-effective way** — *it must be adequately funded, rapidly implemented and brought to scale.*”

# Scaling Smart Surfaces: 2020-2035

Phase 1 (2012-2017)	Phase 2 (2018-2020)	Phase 3 (2020-2024)	Phase 4 (2024-2027)	Phase 5 (2027-2035)
<p>Research included working with 3 major cities to rigorously quantify and document the full range of costs and benefits of urban adoption of smart surfaces</p> <ul style="list-style-type: none"> <li>Developed online smart surfaces cost-benefit analytic engine to enable any city to model scenarios and understand full costs and benefits of smart surfaces adoption</li> <li>Co-developed integrated work strategy and proposals for funding 24 Coalition partners, laying the foundation for rapid scaling of urban smart surfaces</li> </ul>	<ul style="list-style-type: none"> <li>Created Smart Surfaces Coalition (501C3) with 40+ leading partners in response to city demand for help in addressing climate change and resilience</li> </ul>	<ul style="list-style-type: none"> <li>With <b>40+</b> Smart Surfaces Coalition partners (24 funded), provide the training, tools, data and support and incentives to enable and motivate rapid adoption of smart surfaces</li> <li>With cities, expand research on smart surfaces, expand partnerships and tools, and drive innovation in smart surface technologies</li> </ul> <p><b>Outcomes:</b></p> <ul style="list-style-type: none"> <li>250 cities adopt smart surfaces (20,000 square miles)</li> <li>1,000 cities have been trained and are modeling smart surfaces adoption</li> <li>0.1 gigaton CO2-equivalent emissions reduction per year</li> <li>3 gigaton of CO2-equivalent reduction achieved by 2050</li> </ul>	<ul style="list-style-type: none"> <li>Expand Coalition with new partners (e.g. multilateral development banks) and to cities globally</li> </ul> <p><b>Outcomes:</b></p> <ul style="list-style-type: none"> <li>Smart surfaces are the norm for US and European cities</li> <li>4000 cities have adopted smart surfaces (200,000 square miles)</li> <li>1 gigaton CO2-equivalent emissions reduction per year</li> <li>25 gigaton of CO2-equivalent reduction achieved by 2050</li> </ul>	<p><b>Outcomes:</b></p> <ul style="list-style-type: none"> <li>1 million square miles of urban and suburban area adopt smart surfaces</li> <li>Roughly offsets projected loss of reflectivity in the Arctic</li> <li>5 gigaton CO2-equivalent reduction per year</li> <li>100 gigaton of CO2-equivalent reduction achieved by 2050 (equivalent to 2.5 years of global emissions)</li> </ul>

# Guiding the Coalition

## Steering Committee (strategy decisions)

- **Greg Kats (co-chair)** – author of Greening Our Built World; Costs Benefits and Strategies
- **Vivian Loftness (co-chair)** – former Head of the School of Architecture at Carnegie Mellon
- **Lynn Goldman** – Dean, School of Public Health at The George Washington University
- **Rashad Kaldany** – former COO of the International Finance Corporation
- **Julie T. Katzman** – former COO of the Inter-American Development Bank
- **Georges Benjamin, MD** – Executive Director of the American Public Health Association
- **Will Wynn** – former two-term Mayor of Austin, TX
- **Emma Stewart** – former Director, Urban Efficiency & Climate, WRI
- **Durwood Zaelke** – President of the Institute for Governance and Sustainable Development
- **Mark Chambers** – Director of Sustainability for New York City
- **Chris Leinberger** – President of Locus, also at GWU and at Brookings
- **Cooper Martin** – Director, Sustainable Cities Institute, National League of Cities
- **Cynthia Koehler** – Executive Director, WaterNow Alliance
- **Kurt Shickman** – CEO, Global Cool City Alliance
- **Brendan Shane** -- Climate Director, Trust for Public Lands, former C-40 Regional Director for North America

## Board of Directors (fiduciary oversight)

- **Frank Loy (chair)** – former Under Secretary of State for Global Affairs, former board chair of: Environmental Defense Fund, Resources for the Future, League of Conservation Voters
- **Jacob Scherr** – Global Leadership Council, and former Director Global Advocacy and Strategy for NRDC
- **Tracy Wolstencroft** – former President of National Geographic Society, former Partner at Goldman Sachs
- **Greg Kats** – former Managing Director, Good Energies, Inc.

