Welcome to our 4th DE-US.net webinar!

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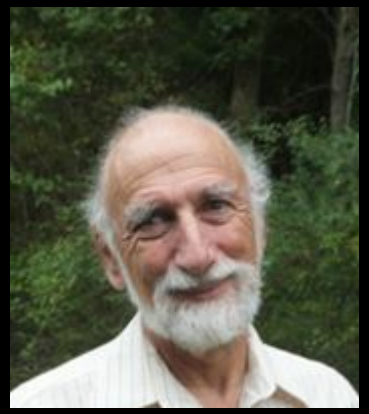
Your hosts

Prof. Dr. Reimund Schwarze



Prof. Peter B Meyer, PhD

Dr. Stephan Bartke

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Summer School

May 22.2018 – May 25.2018 Bochum / Germany - STRUCTURAL CHANGE AND BROWNFIELD RECYCLING IN GERMANY

Tuesday, May 22: Urban Development in global and regional perspectives
The Ruhr Metropolitan Area, a Survey. Michael Schwarze-Rhodrian, Regional Association Ruhr (asked)
Urban development in a global environmental-economic perspective. Prof. Dr. Reimund Schwarze, UFZ

Structural Change in the Ruhr-Region, 1960 – 2017. Prof. Dr. Rolf Heyer, WEG/Ruhr University Bochum
Brownfield Recycling in Germany and Northrhine-Westfalia, Instruments and Results. Prof. Dr. Rolf Heyer

Wednesday, May 23: Structural Change and Brownfield Recycling in Bochum
Excursion by bus
City West with Jahrhunderthalle; from Graetz (TV-production) via Nokia (mobile phone production) to logistics; former coal mine Lothringen, new industrial parks; from coal mine Dannebaum via Opel (car production) to Mark 51°7; University campus Querenburg with technology and health science campus.

Thursday, May 24: Urban land management
Tourism, Culture and Recreation, New Industries in Old Buildings. Andreas Kuchajda, Bochumer Veranstaltungsgesellschaft.
No more than 30 ha per day ! Strategies, instruments and results. Detlef Grimski, UBA.

Residential Reuse of Former Industrial Sites? Prof. Dr. Rolf Heyer, WEG/RUB
Investors and Brownfields. Stephan Bartke, UFZ

Friday, May 25: Regional Projects / From Steel to Housing and New industries
Excursion by bus: Regional Projects
From Steel to Housing and New industries: Phoenix in Dortmund; a new district for Gelsenkirchen : Graf Bismarck; World Heritage : Zeche Zollverein in Essen; The park of the 21st Century : Landschaftspark Park Duisburg; Inner Harbor, Duisburg.

http://www.de-us.net/index.php/summerschool.html

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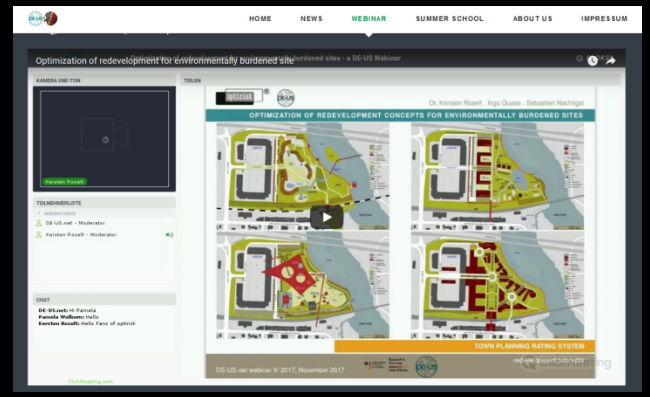
Previous webinars

- JAN 23, 2018: Brownfields Redevelopment, The Opel/GM Case in Bochum/Germany
  - Rolf Heyer, WEG Bochum & Sabine Martin, KSU
- NOV 27, 2017: Optimization of redevelopment for environmentally burdened sites
  - Kersten Roselt, JenaGeos & Ingo Quaas, Quaas Stadtplaner
- Sep 13, 2017: Climate-Resilient Infrastructure Financing
  - Reimund Schwarze, UFZ & Peter B. Meyer EP Systems
- Find recordings at www.de-us.net/index.php/webinar.html



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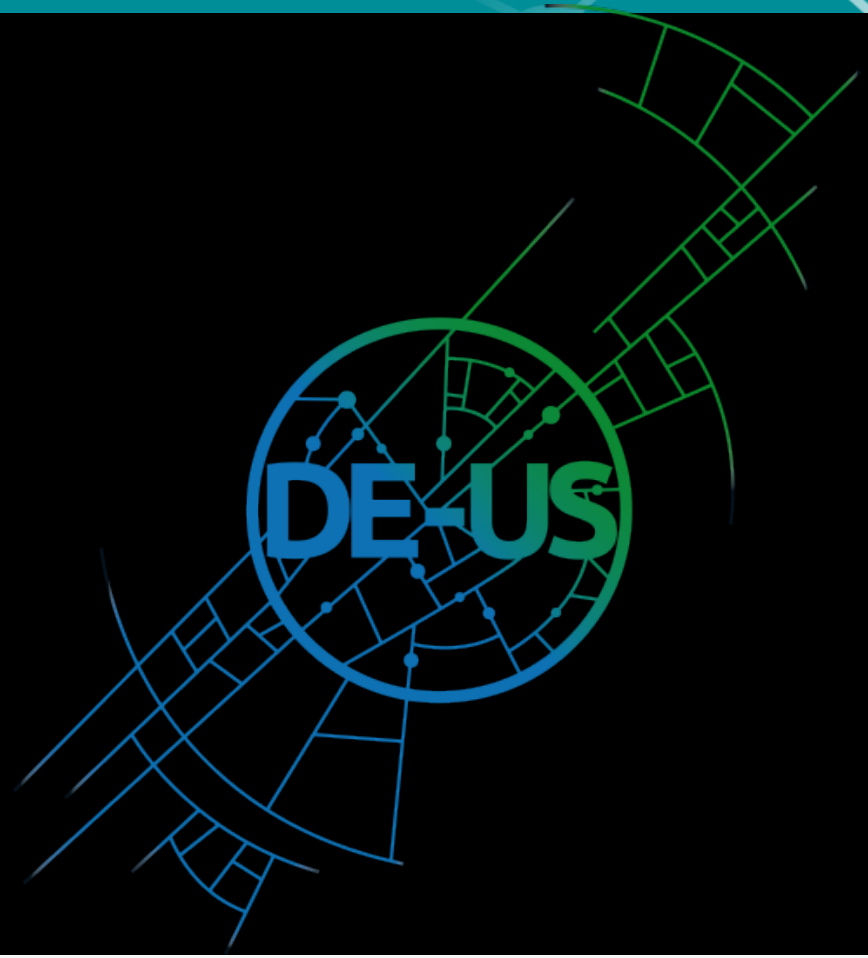
How it works

- Peter and Reimund will present
- YOU can send your questions / comments
  - In the chat box below
  - Or by email to webinar@de-us.net
  - Tweet them to @de_us_net
- During and after the presentation, we will answer to the questions



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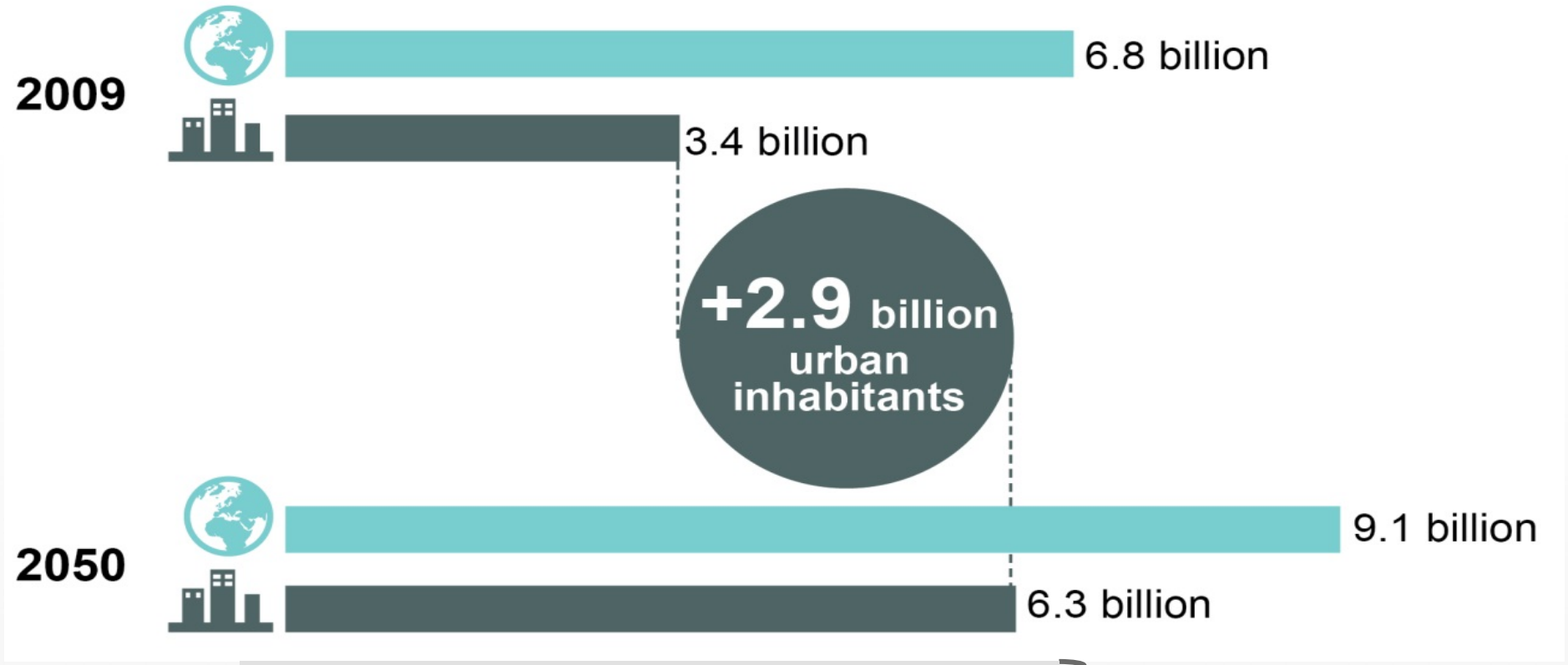
DE-US.net webinar I/2018 2018 February 22nd

Urban Climate-Resilient Infrastructure Finance

after the Bonn-Fiji commitment to urban action

Peter B. Meyer (EPSG, USA) and Reimund Schwarze (UFZ, Germany)

„Our struggle towards sustainability will be won or lost in cities.“
(Ban Ki Moon, 2012)



Asia 48% >>>>>>>>> 64%
Africa 40% >>>>>>>>> 56%
India, China, Nigeria 37%

90% of the entire urban population growth

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Outline

1	Climate infrastructure finance issues
2	Paris-Accord: Builds on bottom-up financing solutions
3	Bonn-Fiji commitment to urban action: How the Paris Accord makes a difference
4	Carbon pricing and carbon risk disclosure as panaceas - mechanisms, experiences and challenges
5	Pulling pieces together: The need for co-benefits frameworks
6	Conclusion & take home message

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1. Climate infrastructure finance issues

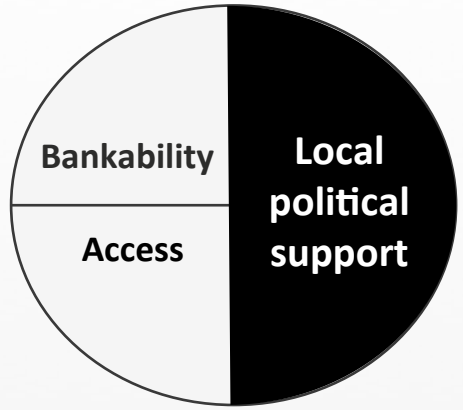
The need: average annual infrastructure investment need of some US$ 5.7 (WEF 2013) to US$ 6.5 (CCFLA 2016) trillion

The Issue: not enough climate financing – only US$437 billion invested internationally in 2015, falling to US$383 billion in 2016 (CPI).

The Perceived Problem: only 4% of the 500 largest cities in developing countries were creditworthy in international financial markets and 20% are creditworthy in local markets

The Reality: infrastructure financing may be accessible but too expensive – or the needs may exceed even creditworthy cities' capacity to service the debt – and may appear to be a less immediate need than other current expenditures

The Way Forward: such infrastructure could compete on current cost grounds if carbon risks and lifetime returns on investment are considered



What is necessary, what is sufficient?

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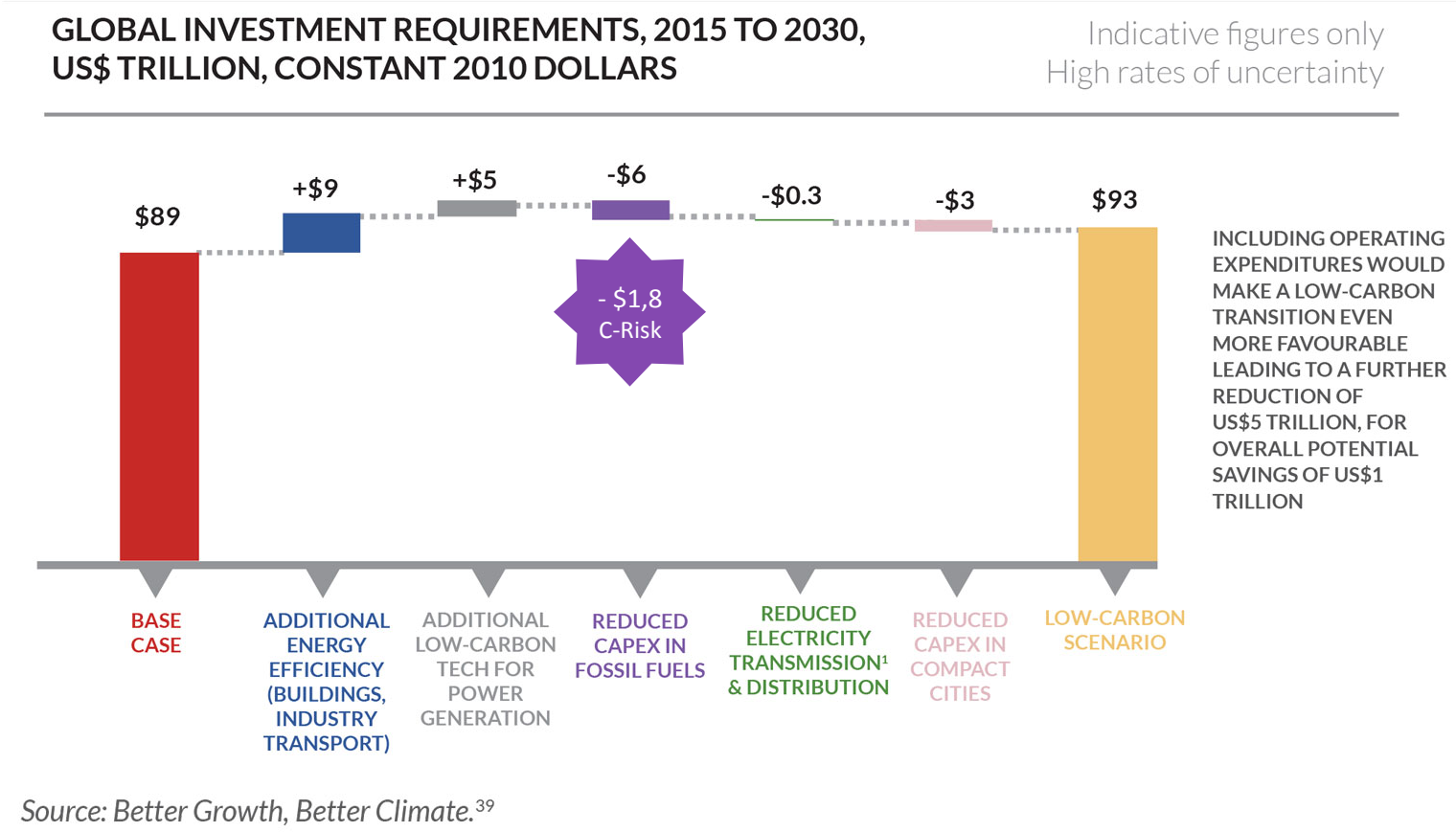
Global Commission on the Economy and Climate

Global investment requirements 2015–2030, US$ trillion, constant 2010 dollars



Source: Better Growth, Better Climate.[39]

- The term '**stranded asset**' refers to changes in technology, markets or regulation which render economic assets worthless
- If, on the other hand, carbon risk (**C-Risk**) accounting would become a systematic element of investment planning in cities, stranded asset risks turn into actual cost savings for low carbon investment plans of cities

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There is no one-size-fits-all financing solution

E.g., city self-financing capacities differ substantially the US – DE contrast illustrates well:

- **German cities** are mostly dependent on their states (laender) and the federal government for their operating funds – between 10-16 % of their financing needs generate from their own tax bases. Land tax is based on unit values (1935_{East}, 1964_{West}).
- **U.S. cities** generate 80% of their financing needs from their own tax bases – but their ability to raise funds from taxation and borrowing are controlled by the individual states and can include income taxes in some instances. Land tax is based on current market values and rises with local development.

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What is ‘climate resilient infrastructure'?

- **Climate resilience** is “*the capability of urban systems to prepare for and respond to the risks and impacts of natural hazards, climate variability, and climate change*” (World Bank). It effectively combines climate change mitigation and adaptation *(ARC3.2: ‘Climate actions’)* with elements of disaster risk reduction.
- Most definitions focus on physical structures, i.e. **“hard infrastructure ”** such as buildings, utilities, transportation systems, communications networks. But there is also a **“soft infrastructure ”** of health care, education, emergency and support networks, the so-called “safety net”. It may be associated with physical structures, e.g. parks, public pools, schools, libraries.
- **Climate-resilient infrastructure is a mix of hard and soft infrastructure that is resilient to climate variability and climate change.** It underpins sustained quality of life, business continuity and growth.

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Resilient infrastructure depends on smart cities

Forecasting capacity is the foundation of **resilience planning**

- Threats and Opportunities need to be identified
- The lifetime costs and benefits of alternative means of pursuit of resilience need to be compared .

Informing citizens and civil society is essential for **soft infrastructure** to become more resilient

Smart sustainable cities "*use information and communication technologies (ICT) to be more intelligent and efficient in the use of resources, resulting in cost and energy savings, improved service delivery and quality of life, and reduced environmental footprint– all supporting innovation, growth and the low-carbon economy*" (International Telecommunications Union).

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Availability of public funds and market access is only half the issue, …

We find both **“hard”** and **“soft”** barriers to **C**limate **I**nfrastructure **F**inance (CIF) of cities:

- Many reports highlight the limited availablility of public funding on urban CIF. Only $55 B out of a total of $391 B in climate finance is delivered through grants and low cost project debt
- Many reports refer to the global need to improve creditworthiness of cities. Only 4% of the 500 largest cities were creditworthy in international financial markets and 20% were domestically creditworthy.
- **Soft factors** such as **ideology** may block commitment of available funds. Without prior **political commitment**, available sustainable infrastructure investment options may never get examined
- **Sources of funding – *and their priorities* –** may shape local commitment to climate resilience in infrastructure investments. When priorities are identified by an external funding source as factors in eligibility, project plans often get modified to assure access to funds
- That means that local political will is not fixed and may be **malleable by supra-local policies and actors**

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2. Paris-Accord: Builds on bottom-up financing solutions

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The Paris Accord, a regime shift in UN climate policy

Degree of international rulling

Kyoto-Protocol

2008 - 2012

The interim

2013 - 2020

Paris Accord

2020 - -

Without Canada and the US

Kyoto-Protocol
Only EU, Japan and Australia

Mutually reinforce?

Pledge and review process (Copenhagen/ Cancun)

Bonn-Fiji commitment to urban action

Paris Accord "Hybrid" decentralized approach

Commitment periods

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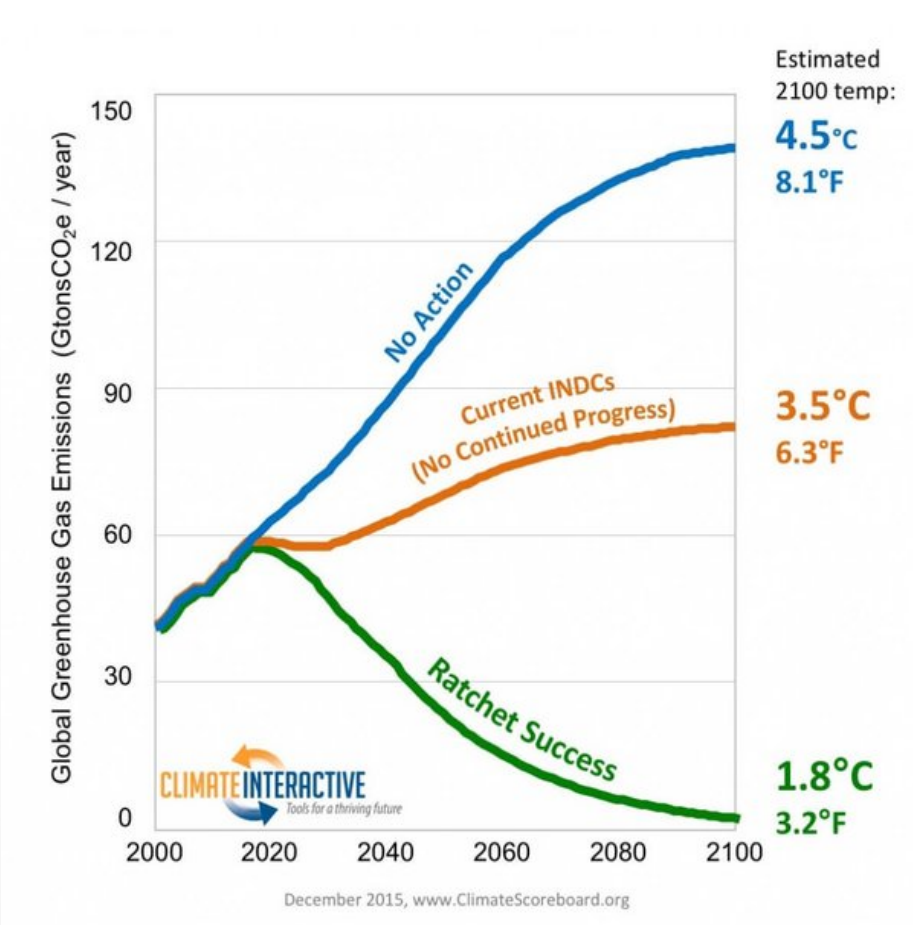
Long-term goals, national pledges and ‘ratcheting’

- **Long term goals**: Stay significantly below 2°C global temperature change, strive for 1.5°C
- **Key instrument:** Nationally Determined Contributions (NDCs)
- Current NDCs for 2020 are likely to lead to a warming of at least 3°C; unless a more stringent approach can be agreed for 2030 by ‘ratcheting’ NDCs upward, the international regime will not be able to deliver the long term goals
- Long-term goals can be thought of as being **“transformational”**, sending a signal to city planers, businesses and financial markets



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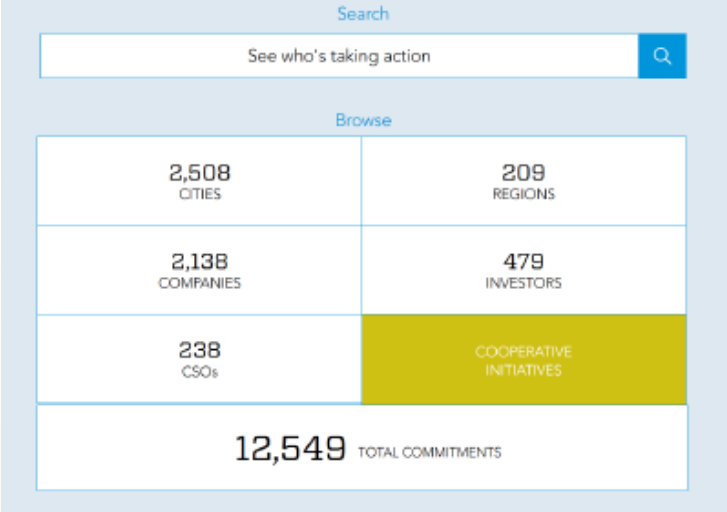
Solutions Agenda, a new interplay between subnational, private initiatives and UN climate policy



✓**Breakthrough Energy Coalition –** to 'Form a network of private capital committed to building a structure that will allow informed decisions to help accelerate the change to the advanced energy future.'

✓ **Caring for Climate –** 'an initiative mobilizing business leaders to implement and recommend climate change solutions and policies by advancing practical solutions, sharing experiences, informing public policy and shaping public attitudes.'

✓ **Global Alliance for Buildings and Construction –** 'aims to gather countries, cities and public and private organizations of the building sector value chain, in order to scale up the implementation of ambitious actions toward the "below 2°C" pathway in buildings and construction sector.

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3. The Bonn-Fiji commitment to urban action

The **Global Covenant of Mayors for Climate & Energy** joining forces with the **Urban Leadership Council** in the **Implementation of the Paris Accord** goals in their jurisdictions:

- Affirm our resolve to enhance the resilience of communities
- I underscore the need to assess the direct and indirect impacts of climate change, reduce disaster risks and implement adaptation planning and measures
- Commit to cooperate with many more local an regional governments globally
- Commit to work with Parties and identify concrete opportunities for greater climate ambition

Aggregate impact of the 7494 cities and local governments, representing over 680 million people, could collectively reduce 1.3 Gt CO_2e per year from business as usual in 2030

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The U.S. Pull-out and America‘s pledge – The „We Are Still In“ coalition and the U.S. Climate Alliance

Four days after President Trump announced withdrawal from the Paris Agreement, the **“We Are Still In” coalition** was formed

- It now has over 2500 members from all 50 states, corporations, universities and local governments
- Membership represents over 130 Million people and $6.2 trillion of the U.S. economy implementing the U.S. commitment to the agreement

The **U.S. Climate Alliance**, a bi-partisan collaboration of state Governors, now includes states with over 36% of the US, population, and economies totaling over $7 trillion

- Alliance states are on track to achieve emissions reductions of 24-29% below 2005 levels by 2025
- Member states’ economies continue to grow more rapidly than those of non-alliance states
- The Alliance has formed a new partnership today with Resources for the Future and the Climate Impact Lab to generate updated estimates for the **Social Cost of Carbon,** for use in assessing the damage done by carbon pollution – and central to measuring the economic returns to mitigation

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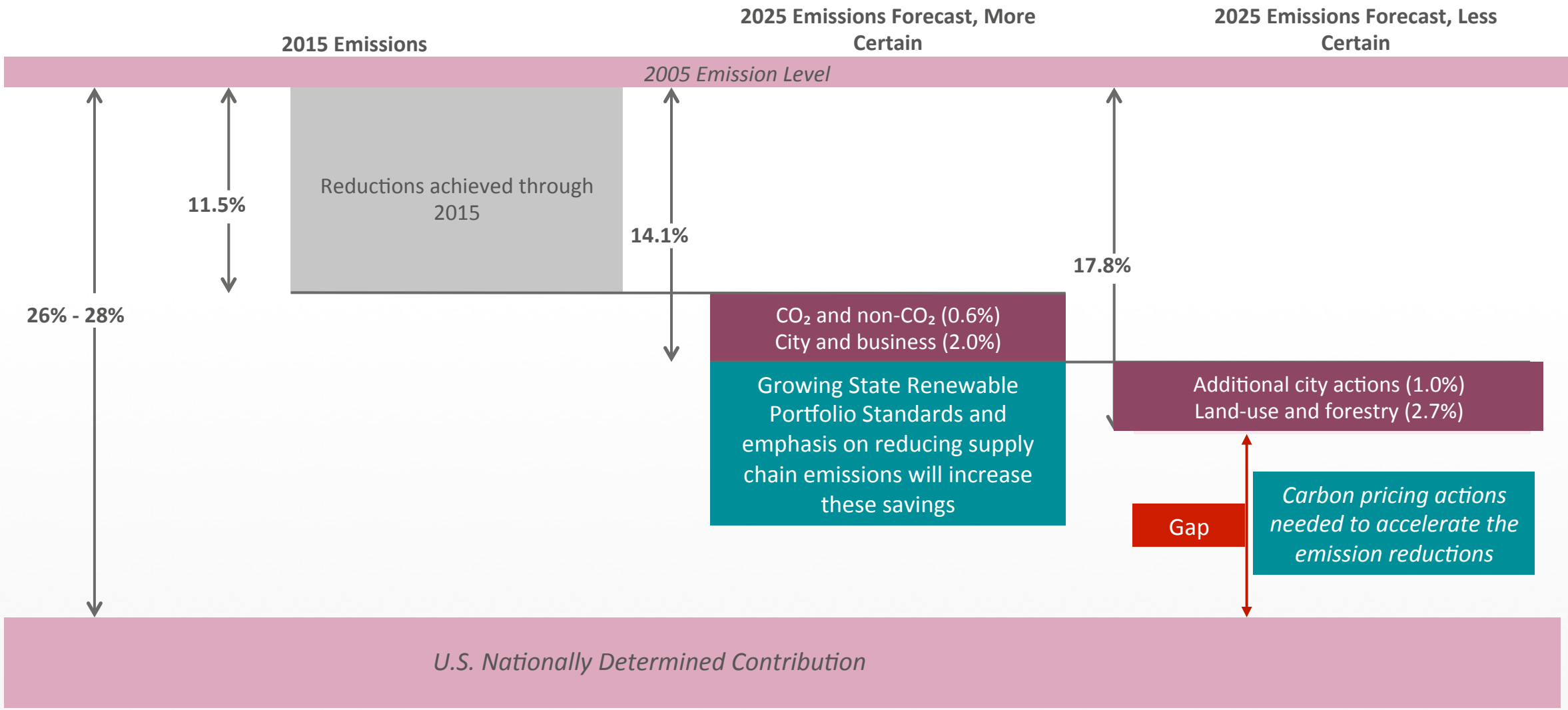

Source: C2ES, Projecting and accelerating U.S. greenhouse gas reduction, 9/2017 *(adapted)*

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How Paris Accord helps to solve the ‘other half’ of the issues

- Ideology may block commitment of available funds to sustainable or climate-responsive physical infrastructure
  - **National commitments on GHG reduction may change ideologies**
- Without prior political commitment, available sustainable infrastructure investment options may never get examined
  - **With no ideological barriers and an incentive to find the most efficient means of reducing emissions, new options will be welcomed**
- Available sources of funding – and their political priorities – may shape local commitment to climate resilience in infrastructure investments
  - **Where local financing capacity exists, as in the US and Germany, we already see sub-national commitments growing**
- That local commitment is not fixed and may be malleable by the actions and programs of supra-local political and social entities
  - **Precisely: That is why the Paris Accord makes a difference!**

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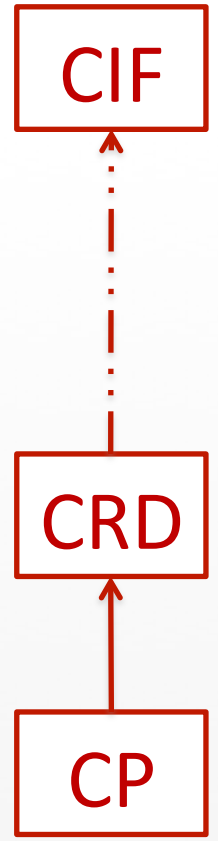
4. Carbon pricing and carbon risk disclosure as panaceas - mechanisms, experiences and challenges

- Climate Infrastructure Finance (CIF) depends on predictions of the risks of higher future costs of carbon, that is Carbon Risk Disclosure (CRD)
- Carbon Pricing (CP) helps offers a means for measuring climate-related risks and opportunities in financial terms
- Such measurements are essential to scenario projections that are routinely used in assessing prospective risk in the presence of uncertainty
- **CP is thus necessary for CIF bankability**



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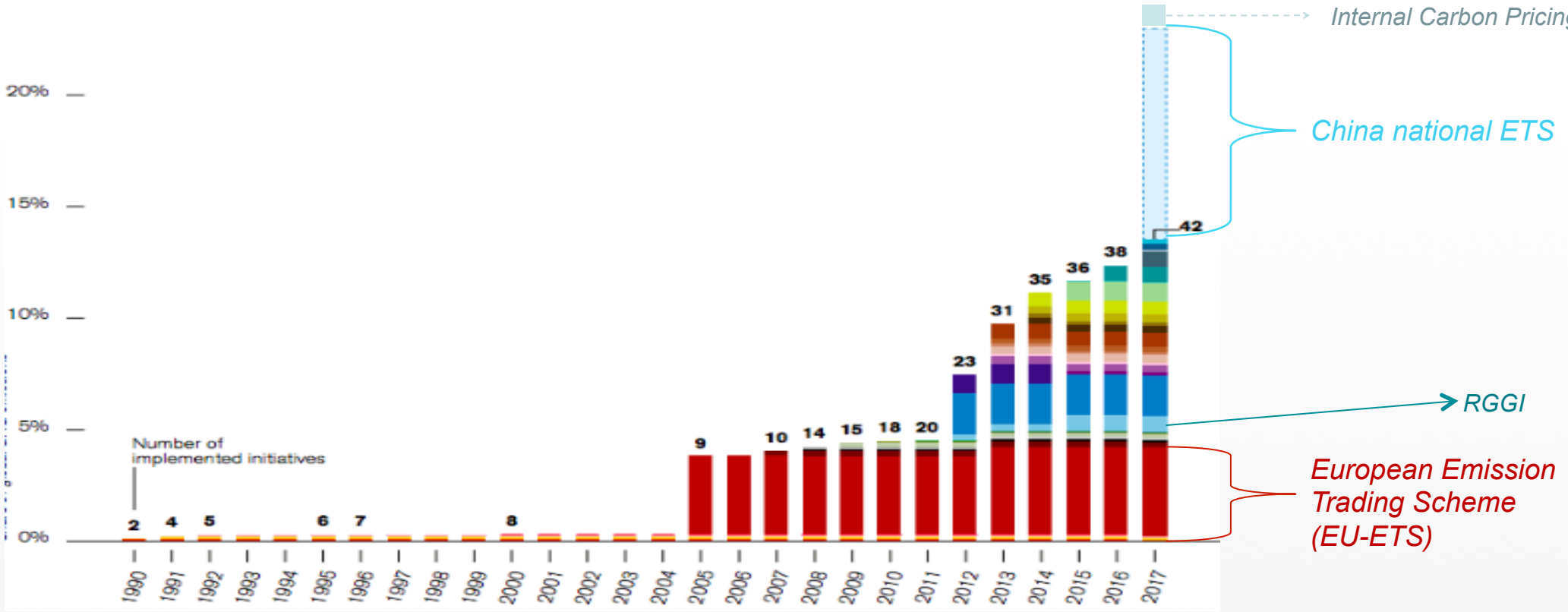
The growing world of ‚effective carbon pricing‘



World Bank Group (2016). Regional, national and subnational carbon pricing initiatives: Share of global GHG emissions covered

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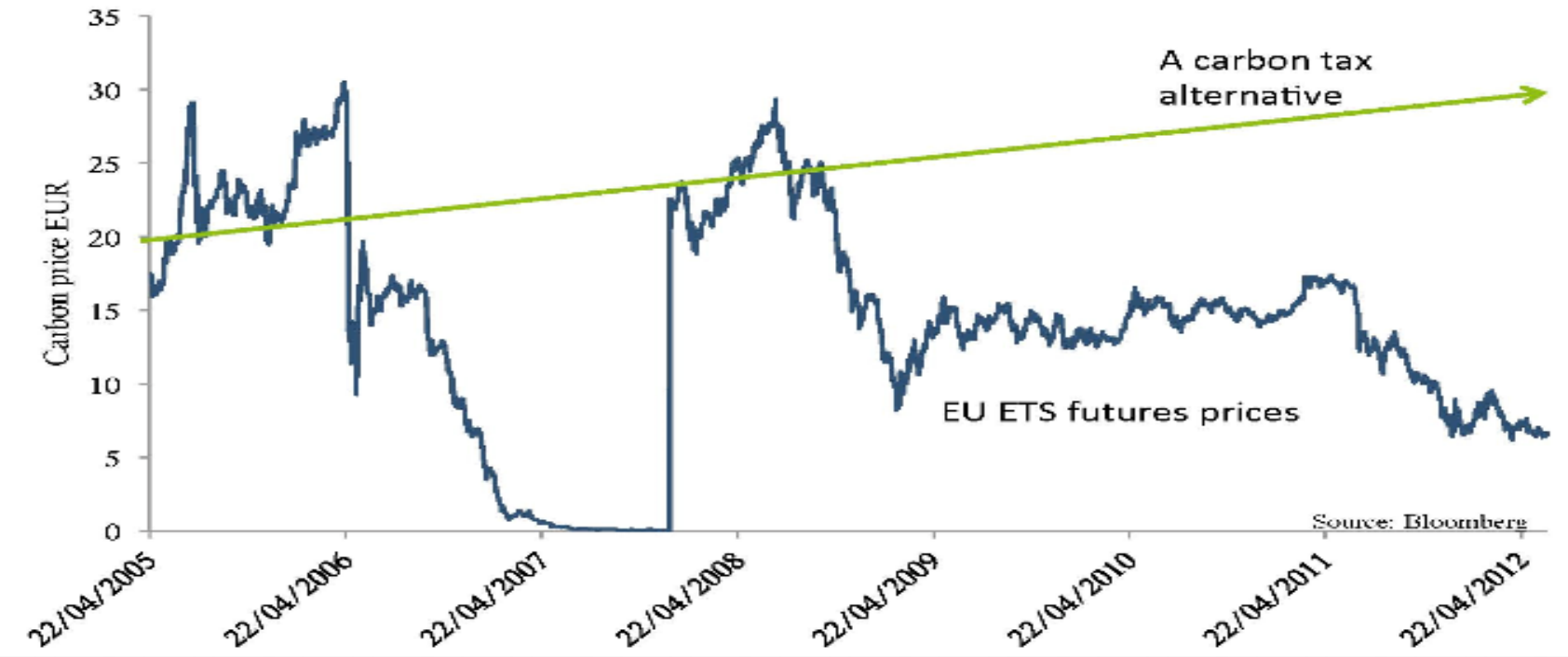
EU-ETS – failures & how to overcome them



- ***Decreasing EU cap*** *(2.2% linear reduction from 2021, was 1.74%)*
- ***Market stability reserve*** *(24% of surplus allowances, was 12%; excesses cancelled after 2023)*
- *MS allowed to* ***voluntarily cancel allowances for plant closures***
- ***No fossil fuels from allowance fund*** *(2%, 310 Mt) for poorer MS*
- ***BUT: No minimum price***

surplus of allowances → high price fluctuation → not representing social costs

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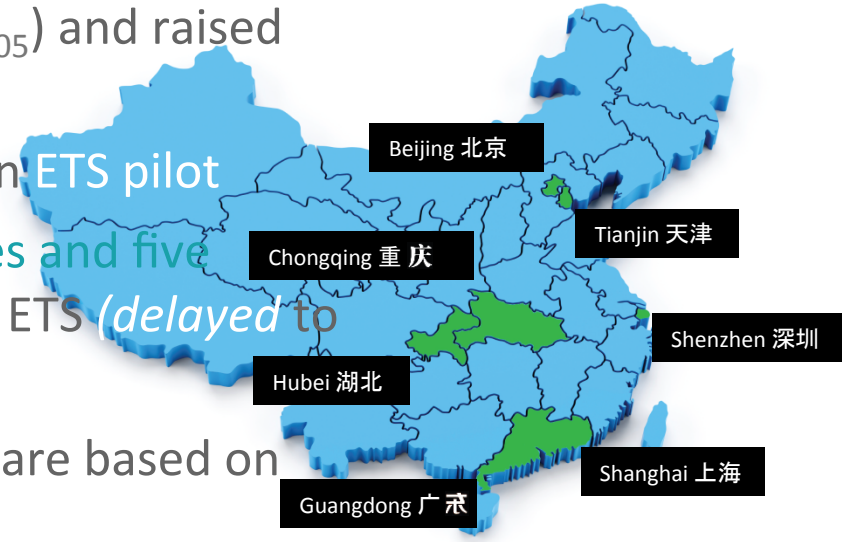
China's Emission Trading Scheme (ETS)

- China signed up to decrease its carbon intensity by 40–45% (in 2020 $_{2005}$) and raised ambition to -60-65% (in 2030 $_{2005}$)
- To achieve this target, China adopted numerous programs, including an ETS pilot
- During 2014–2016 (*extended*), China's pilot ETS, included two provinces and five municipalities (~ 25% China's GHG) and expected to lead to a national ETS *(delayed* to 2018)
- The caps are decided bottom-up by provinces and municipalities, they are based on historical emissions ('*grandfathering*') with some benchmarking
- **Shenyang** (capital of the Liaoning province) **to launch its own City-Level Carbon Market** *(gradual growth)*
- **Tianjin holds 1st Fixed Price Carbon Auction**. The first auction offers 1,000 allowances for a set price of 15 RMB (~ 1.9 €) each, while the remaining 11,944 allowances will be auctioned for a set price of 12.5 RMB (~ 2 USD). *Clearing nationwide at 1–8 USD/tCO$_2$*



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The Regional Greenhouse Gas Initiative

RGGI formed in 2008 by nine US states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont, New Jersey

- 90% of all allowances are distributed by auction; total allowances declining 2.5% each year
- Member states cut carbon emissions by 30%, 2008-2015; rest of US (excl. California) dropped only 14%
- RGGI states' economies outgrew the rest of the US 25% to 21%
- $1.37 B in proceeds have been invested in GHG mitigation efforts
- Expected to provide $4.67 B in lifetime energy bill savings
- Over their lifetime, RGGI investments should save 76.1 M MMBtu of fossil fuels and 20.6 M MWh of electricity, reducing carbon pollution by 15.4 M short tons

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The Carbon Disclosure Project, facts and trends

Voluntary Self-Generated Reports

	2013	2017
Companies	4500	5600
Cities	200	533
States and Regions	72	72

Source: CDP Official webpage; CDP (2013). The Facts, CDP, 2013. Own compilation

Company internal carbon pricing

Number of companies using / planning to use an internal price on carbon

Country	2015 Total	2016 Total	Increase from 2015 - 2016
Brazil	27	47	74%
Greater China	84	125	49%
India	27	44	63%
Japan	69	104	51%
Mexico	13	26	100%
Republic of Korea	48	64	33%
USA	147	210	43%

Steady increase of internal CP globally

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Internal pricing, convergence and divergence

Energy industries	2014	2015	2016
BP	40	40	40
ConocoPhillips	46	51	38
Devon Energy Corporation	15	15	15
Encana Corporation	80	94,16	125
Enerplus Corporation			22,98
Eni SpA		40	40
Exxaro Resources Ltd		8,93	8,17
Exxon Mobil Corporation	80	80	80
Galp Energia SGPS SA			33,51
Hess Corporation			40
Imperial Oil		80	80
Keyera Corp.			22,98
Origin Energy			36,75
PTT			18,7
Royal Dutch Shell	40	40	40
S-Oil Corp		4,22	14,58
Statoil ASA		50	64
Suncor Energy Inc.		41,43	42,12
Total	32	28,06	27,92
TransCanada Corporation			61,27
Vermilion Energy Inc.		24,69	16,91
Vopak			27,92
	7	*14*	*22*

CDP
DRIVING SUSTAINABLE ECONOMIES

Utilities	2014	2015	2016
ACCIONA S.A.			80,42
AGL Energy		9,81	10,25
Ameren Corporation	30	53	53
Centrica		19,89	32,08
Colbun SA		5	5
Companhia Energetica Minas Gerais—CEMIG		0,95	1
CPFL Energia SA			0,28
E.ON SE		44,9	44,68
EDP—Energias de Portugal S.A.		67,35	67,01
Enagas		7,86	7,82
Endesa			12,29
ENEL SpA		12,35	12,29
Exelon Corporation			20
Gas Natural SDG SA		33,68	37,11
Iberdrola SA		33,68	33,51
Korea Gas Corp			85,75
Los Angeles Department of Water and USA Power		12,45	12,45
National Grid PLC	89,1	85,69	86,04
NiSource Inc.		20	30
Pennon Group	324	306,03	291,65
Severn Trent			21,29
Snam S.P.A		8,98	8,23
Suez Environnement		24,48	
TransAlta Corporation	23	22,6	22,98
United Utilities			23,48
Verbund AG			7,48
	4	*18*	*25*

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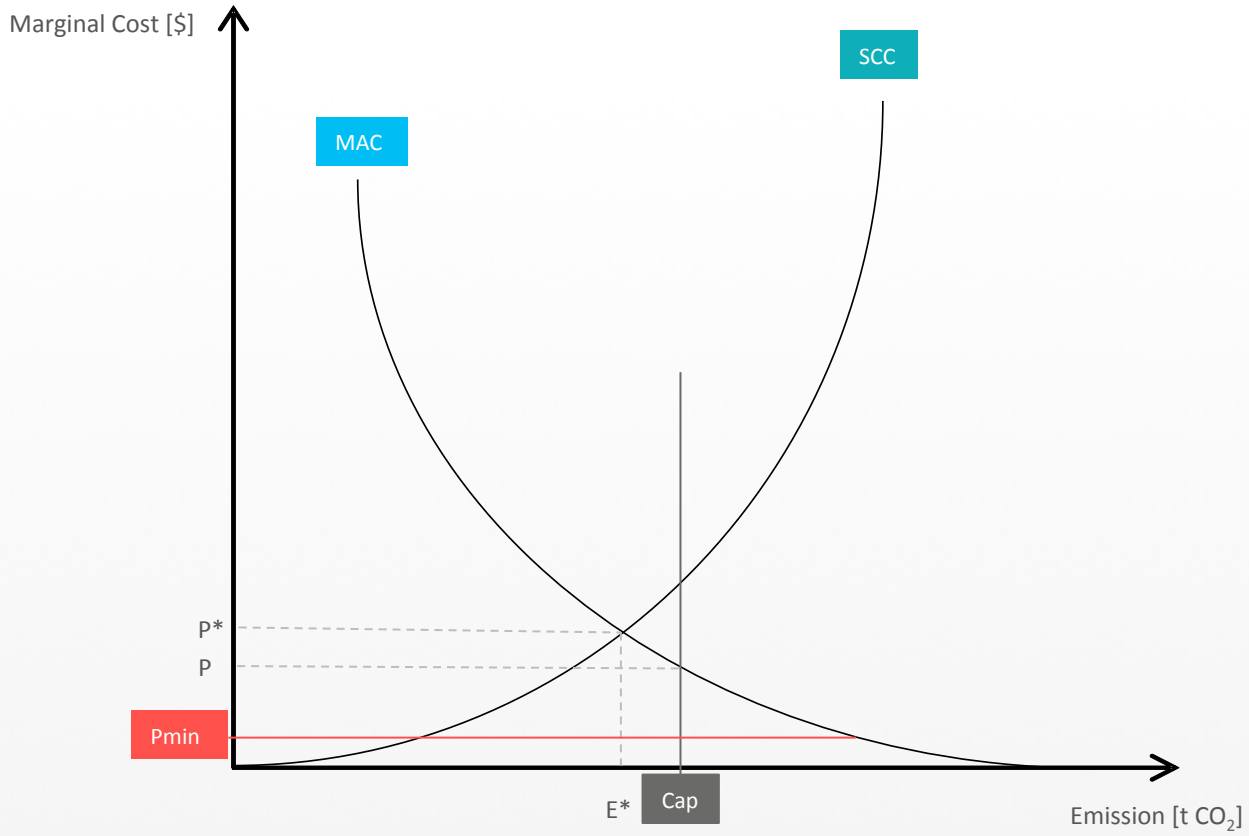
Limits of Carbon Pricing



- Prices exist – but CP methods are not standardized: Investors cannot reflect if technology or enterprise-specific methods such as fees or **marginal abatement cost (MAC)** are used
- Even if we had the needed standards, however, that would only get us to **effective carbon pricing (CP)**, not to the **social cost of carbon (SCC)**
- We need politically determined SCC-oriented **carbon price targets**, e.g. 40-80 $/t CO2 in 2020 (Macron's #OnePlanetSummit), not a P-floor

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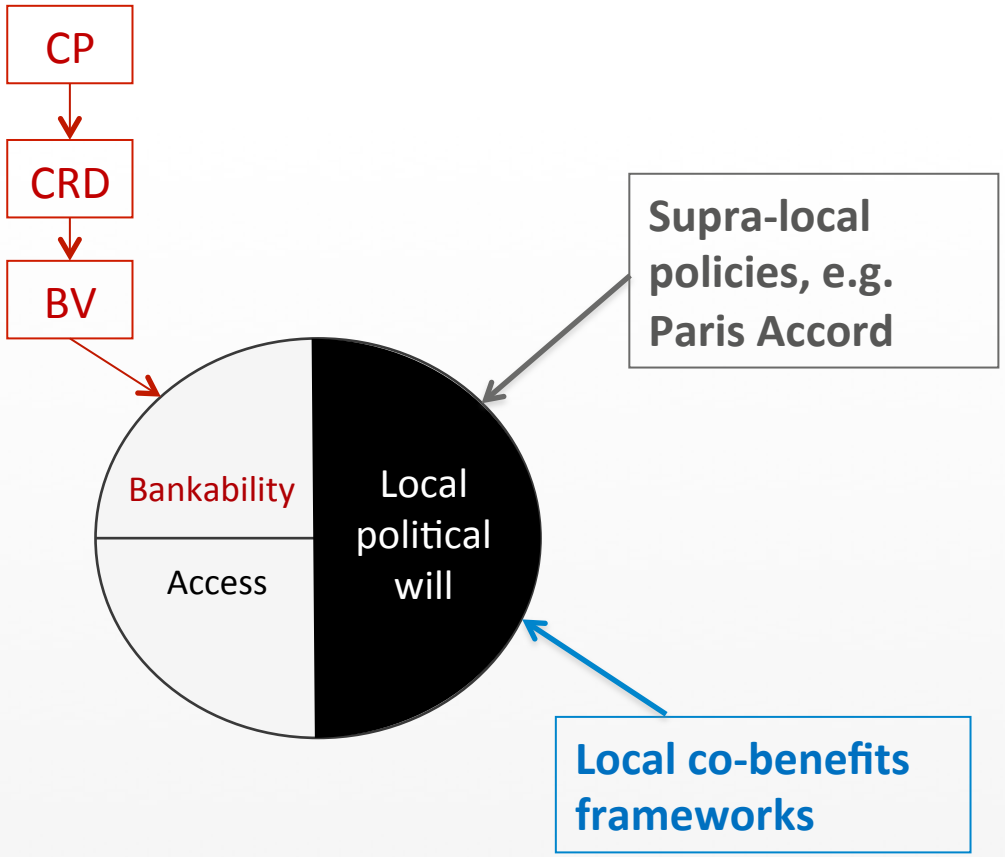
5. Pulling pieces together: The need for co-benefits frameworks



- **Accessability**, i.e. the capacity to service debt incurred for infrastructure, is a necessary, albeit insufficient condition for carbon infrastructure financing (CIF)
- **Carbon pricing (CP)**, carbon risk disclosure (CRD) and a form of 'blended value' (BV) movement would have a major impact on bankability of CIF programs
- **Local political will** is influenced by **supra-local policies** and actors such as the **Paris Accord**
- It also depends on the framing of climate action as producing **local co-benefits** to the constituency

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e.g.: Economic Development Benefits from Energy Efficiency and Renewable Energy Investments

A US Dept. of Energy study in 2014 found that investing in local energy infrastructure produced an array of different measurable local economic impacts:

- *Job Creation*
- *Energy Cost Savings*
- *Higher Energy Supply Certainty*
- *Improved Local Business Competitiveness*
- *Higher Property Values and Tax Revenues*
- *City Marketing and Reputation*

In addition to direct benefits to existing local businesses, the energy investments attracted new capital to localities across the country by reducing energy instability risks (e.g.: Newton/ Iowa)

SuRe® - The Standard for Sustainable and Resilient Infrastructure

#mysmartcity

#worldsmartcity2017

ISO 37120

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Resilience Investment Co-Benefits: Some Other Examples

- RGGI improved health status, reduced demand for medical care, and increased worker productivity across New England with measurable cost savings to the region‘s economy.
- As a C-40 Cities report points out, measuring infrastructure co-benefits requires good data collection and analytical capacity, highlighting the importance of the **Smart City**.

Table 1. Summary of Cumulative RGGI Health Benefits, 2009 to 2014

Avoided Health Effects	**Avoided Mortality**		
	• 300–830 premature adult deaths		
	Avoided Morbidity		
	• 35–390 non-fatal heart attacks		
	• 420–510 cases of acute bronchitis		
	• 8,200–9,900 asthma exacerbations		
	• 13,000–16,000 respiratory symptoms		
	Other		
	• 180–220 hospital admissions		
	• 200–230 asthma ER visits		
	• 39,000–47,000 lost work days		
	• 240,000–280,000 days of minor restricted activity		
Value of Avoided Health Effects	**Low**	**Central**	**High**
	$3.0 billion	$5.7 billion	$8.3 billion

Source: Abt Associates analysis (2017).

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6. Conclusions & take-home message

Access to capital is necessary, but not sufficient

Bankability of CRI programs can be facilitated by effective carbon pricing, but CP alone will not suffice and does not create the needed political will

Only with the recognition of co-benefits will cities overcome their orientation towards minimizing the short-term budget cost of their infrastructure investments

Connecting city need for infrastructure to local concerns for climate change is an essential element of success for the Paris Accord

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Peter B. Meyer, PhD <pbmeyer@Louisville.edu>
Professor Emeritus of Urban Policy and Economics
University of Louisville

President and Chief Economist
The E.P. Systems Group, Inc., New Hope, PA, USA
<pbm@theepsystemsgroup.com>

Prof. Dr. Reimund Schwarze <schwarze@europa-uni.de>
Professor International Environmental Economics
European University Viadrina

Department of Economics – Head of Climate Economics
Helmholtz Centre for Environmental Research GmbH – UFZ
<reimund.schwarze@ufz.de>

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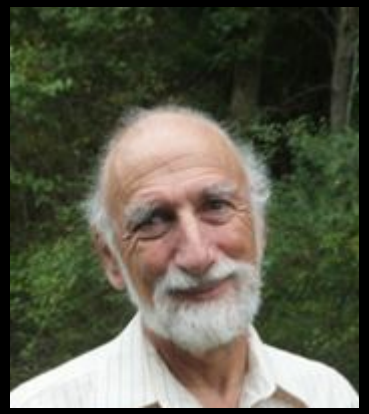
Now we answer to your questions

Prof. Dr. Reimund Schwarze



Prof. Peter B Meyer

Dr. Stephan Bartke

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