Or: The California Cap-and-Trade Program as a Model for Domestic Carbon Markets and Linking?

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Renewable Energy Economics Course
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Kyoto University
Japan

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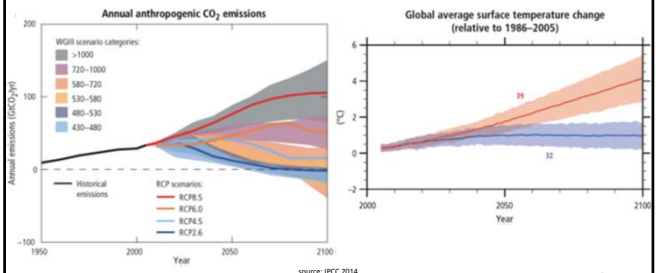
What climate emergency?



source: IPCC 2014

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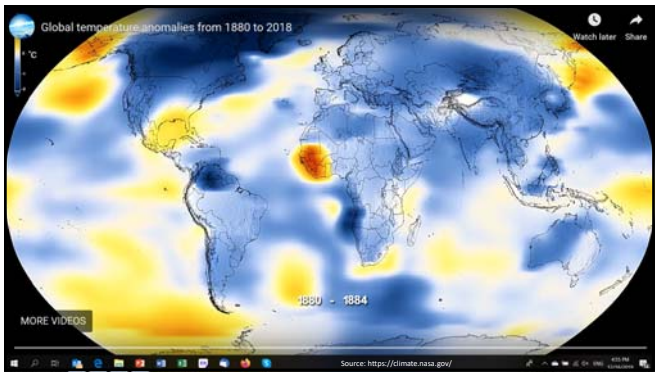

Climate skeptics

"I believe that there's a change in weather and I think it changes both ways."
(Trump 2019)

"Look, scientists also have a political agenda."
(Trump 2016)

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The scientific evidence

95%

"It is **extremely likely** 95% percent confidence]
more than half of the observed increase in global average surface temperature from 1951 to 2010
was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forcings together."
(IPCC 2014)

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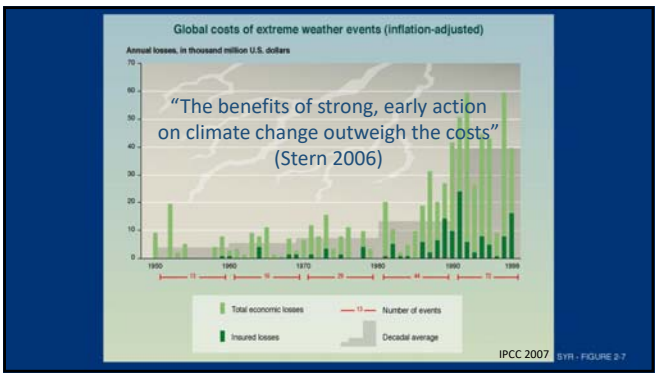

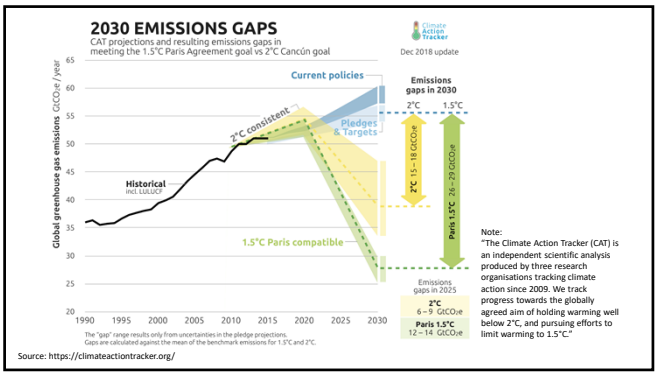

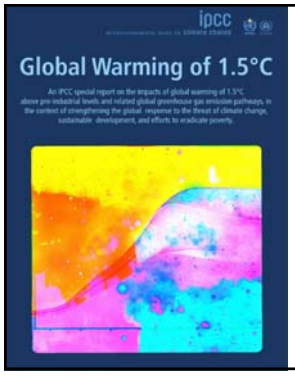

Headline Statements

A1. Global warming is **likely to reach 1.5°C between 2030 and 2052** if it continues to increase at the current rate (*high confidence*).

C2. Pathways limiting global warming to 1.5°C with no or limited overshoot would **require rapid and far-reaching transitions** in energy, land, urban and infrastructure (including transport and buildings), and industrial systems (*high confidence*). These systems transitions are unprecedented in terms of scale, but not necessarily in terms of speed, and imply deep emissions reductions in all sectors, a wide portfolio of mitigation options and a significant upscaling of investments in those options (*medium confidence*).

D1. Estimates of the global emissions outcome of current **nationally stated mitigation ambitions** as submitted under the Paris Agreement would lead to global greenhouse gas emissions in 2030 of 52–58 GtCO2eq yr-1 (*medium confidence*). Pathways reflecting these ambitions **would not limit global warming to 1.5°C**, even if supplemented by very challenging increases in the scale and ambition of emissions reductions after 2030 (*high confidence*).

D.6 **Sustainable development supports**, and often enables, the fundamental societal and systems **transitions** and transformations that help limit global warming to 1.5°C.

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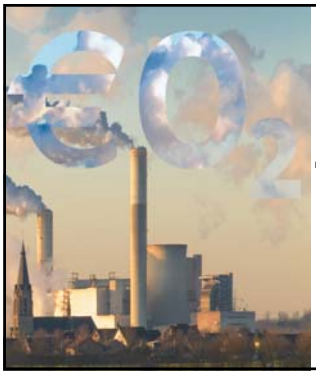

Why markets?

"If it is feasible to establish a market to implement a policy, **no policy-maker can afford to do without one**. … Unless I am very much mistaken, **markets can be used to implement any anti-pollution policy** that you or I can dream up".

John H. Dales 1968

Cap-and-Trade
Dales (1968): Land, Water, and Ownership. In: CJE I(4), 791-804

Environmental Tax
Baumol/Oates (1971): Use of Standards and Prices for Protection of the Environment. In: SJE 73, 42-54

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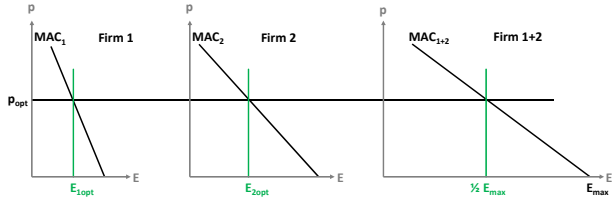
Minimize costs and reach targets, …

Minimize! $K(E_1)+K(E_2)$ under side condition: $E_1+E_2 = C$ (target) $\Rightarrow K'(E_1) = K'(E_2)$



As **all firms** are faced with the **same price** and independently choose their optimal emission level at **p = MAC**, the resulting distribution of emissions **equalizes marginal abatement costs across all firms** and thus minimizes the society's compliance costs with the environmental target!

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allow for prioritizing decisions, …

Scale, distribution, and allocation decisions can be separated and prioritized!

"The **cap** serves the goal of sustainable **scale**; the **auction** serves the goal of fair **distribution**; and **trading** allows efficient **allocation** – three goals, three policy instruments"
(Daly 2019)

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can be made sustainable, …

	Sustainable Design
Coverage	mandatory participation all GHG (based on CO_2e) all polluters
Cap	target 25-40% reduction by 2020, base 1990) absolute volume cap gradual cap reduction
Allocation	unit of 1 t of CO_2e/a 100% auctioning frequent, non-discriminatory auctions equally accessible market
Revenue Use	100% revenue recycling (earmarked) per capita dividend p[lus support for poorest
Flexibility Mechanisms	unlimited banking no borrowing offsets limited to sustainable projects
Price Management	price floor (≥ 50 US$/t), inflation adjustment price ceiling (≥ 200 US$/t), inflation adjustment
Compliance	control periods not longer than 3 years continuous emission monitoring or verified reporting emission and allowance tracking and registration fines (>p) for non-compliance over-compensation of excess emissions (at least 2x)
Supporting Measures	border adjustment linking

Source: Rudolph et al. 2012

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are allowed under the Paris Agreement, …

Article 6

1. Parties recognize that some Parties choose to pursue voluntary **cooperation in the implementation of their nationally determined contributions** to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity.

2. Parties shall, where engaging on a voluntary basis in **cooperative approaches that involve the use of internationally transferred mitigation outcomes** towards nationally determined contributions, **promote sustainable development** and ensure environmental integrity and transparency, including in governance, and shall apply robust accounting to ensure, inter alia, the avoidance of double counting, consistent with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

3. The use of internationally transferred mitigation outcomes to achieve nationally determined contributions under this Agreement shall be **voluntary and authorized by participating Parties**.

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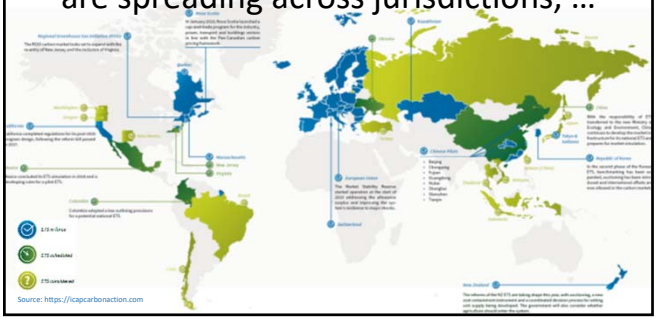
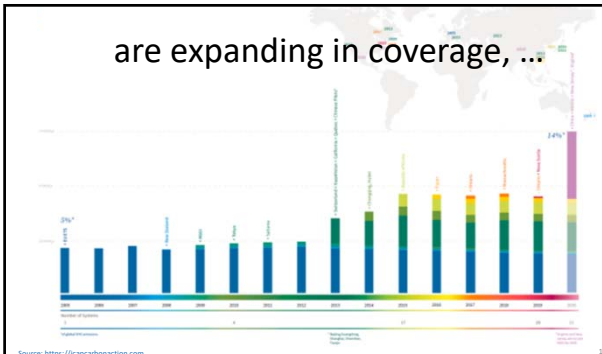
are spreading across jurisdictions, …



Source: https://icapcarbonaction.com

are expanding in coverage, …



Source: https://icapcarbonaction.com

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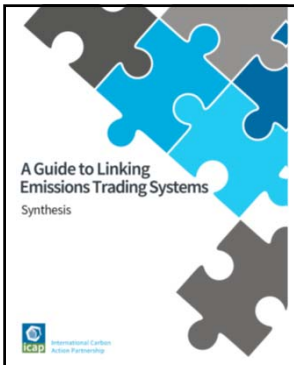
can be applied at sub-national level, and …

Source: https://icapcarbonaction.com

Environmental Federalism

- political **failure** at the **national** level (e.g. US 2010, JP 2010, AU 2014)
- efficient "**voting by feet**" (Tiebout 1956) vs. "**race to the bottom**" (Stewart 1977)
- now "**policy laboratories**" allowing "**tailor-made solutions**" (Adler 2004; Revesz 1992, 1996)!



can be linked!

- overall **abatement cost** reduction
- removal of **price differences**
- reduction of **competitive distortions**
- prevention of **carbon leakage**
- Increase of **margin for re-distribution**

But: The tragedy of cap-and-trade

"**Where Did All the Markets Go**?"
(Hahn/Hester 1989)

"[T]here is **a market tendency for the political process to resist market mechanisms** for rationing scarce environmental resources"
(Hahn 1987)

„[W]ith some minor revisions, **the results** of the Public Choice approach **still hold**".
(Kirchgässner/Schneider 2003)

But: The tragedy of cap-and-trade

Political Stakeholders	Interests CaT	Political influence
Voters	😐	–
Environmental groups	☺	–
Industry groups	☹	+
Environmental bureaucrats	😐	+
Politicians	😐	+

Source: Rudolph 2005

California

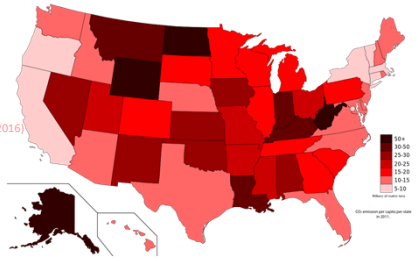
- most populous US State (39,557,045), and growing
- largest economy in the USA (US$3.0 trillion gross state product (2018)), world's fifth largest economy
- strong technology and movie sectors (Silicon Valley , Hollywood)
- national leader in environmental policy
- politically DEM dominated

CO_2 emission US States total (2012)

363.3 m t CO_2 (2016)

Source: https://www.caliper.com

CO_2 emissions US States per capita (2011)



Source: https://en.wikipedia.org

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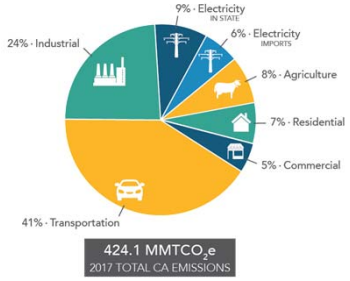
California GHG emissions by sector



Source: Pew Center 2011

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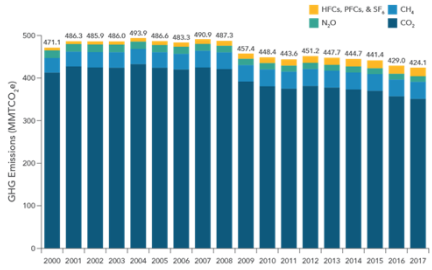
California GHG emission trends by gas



Source: Pew Center 2011

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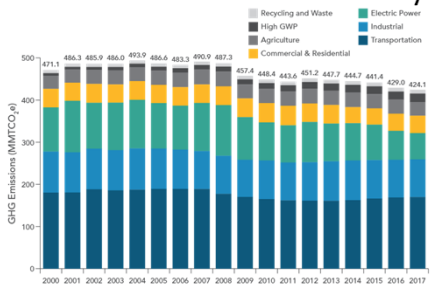
California GHG emission trends by sector



Source: Pew Center 2011

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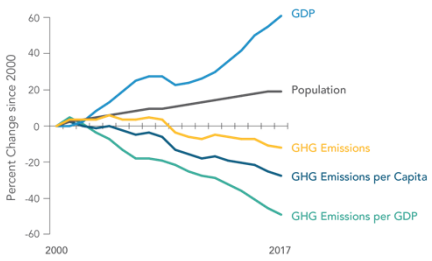
California decoupling



Source: Pew Center 2011

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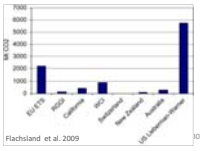
Western Climate Initiative (2010)

Source: www.lawandenvironment.com



Flachsland et al. 2009

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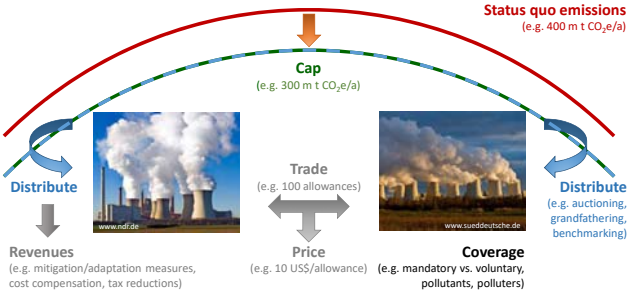
Western Climate Initiative (2019)

Cap-and-trade principles vs. …



Cap-and-trade (Dales 1968)

Carbon market design

Coverage
voluntary vs. mandatory participation
pollutants and polluters

Cap
target and total amount of emissions
absolute volume cap vs. specific intensity targets
dynamic cap reduction

Initial allocation and flexibility
free of charge distribution (grandfathering, benchmarking) vs. for purchase (auction, price)
secondary market (bilateral trading, stock exchanges etc.)

Revenue use
revenue neutrality vs. budget increase
e.g. dividend, climate action, tax reduction, budget reconciliation, re-distribution

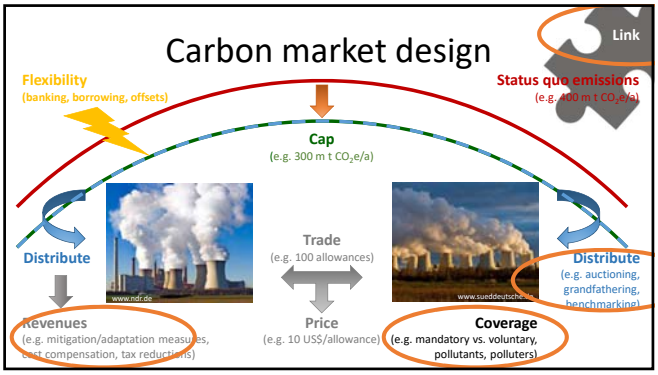
Flexibility mechanisms
banking and borrowing
offsets (domestic, international)

Price management
price collar (price floor, price ceiling)

Compliance
compliance periods
monitoring, reporting, verification (MRV); registries (allowances, emissions)
fines and compensation

Supporting measures
border adjustment
linking

Carbon market design



Sustainable CalCaT?

	Sustainable design	WCI	RGGI	EU
Coverage	mandatory participation	●	●	●
	all GHG (based on CO_2e)	●	●	●
	all polluters	●	●	●
Cap	2°C target, ≥ –25% by 2020, ≥ –45% by 2030 (1990)	●	●	●
	absolute volume cap ("Budget Approach")	●	●	●
	dynamic cap ("Contraction & Convergence")	●	●	●
Allocation	unit of 1 t of CO_2e/a	●	●	●
	equally accessible market	●	●	●
	frequent, non-discriminatory auctions	●	●	●
	100% auctioning	●	●	●
Revenue Use	100% revenue recycling, earmarked	●	●	●
	climate dividend ("Sky Trust"), support for poor	●	●	●
Flexibility Mechanisms	unlimited banking	●	●	●
	no borrowing	●	●	●
	offsets limited to sustainable projects	●	●	●
Price Management	price floor (≥ 50 US$/t)	●	●	●
	no price ceiling	●	●	●
Compliance	control periods not longer than 3 years	●	●	●
	continuous emission monitoring or verified reporting	●	●	●
	emission & allowance tracking & registration	●	●	●
	fines (>p) for non-compliance	●	●	●
	(over-)compensation of excess emissions	●	●	●
Supporting Measures	border adjustment	●	●	●
	linking	●	●	●

Source: Burtraw et al. 2014

Sustainable CalCaT?

	Sustainable design	WCI	TMG	NZ
Coverage	mandatory participation	●	●	●
	all GHG (based on CO_2e)	●	●	●
	all polluters	●	●	●
Cap	2°C target, ≥ –25% by 2020, ≥ –45% by 2030 (1990)	●	●	●
	absolute volume cap ("Budget Approach")	●	●	●
	dynamic cap ("Contraction & Convergence")	●	●	●
Allocation	unit of 1 t of CO_2e/a	●	●	●
	equally accessible market	●	●	●
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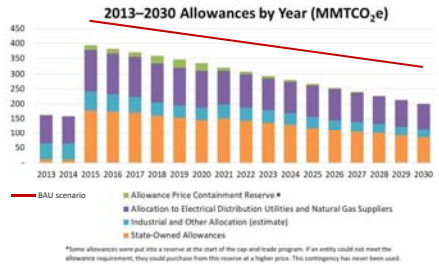
	(over-)compensation of excess emissions	●	●	●
Supporting Measures	border adjustment	●	●	●
	linking	●	●	●

Source: Burtraw et al. 2014

CalCaT cap



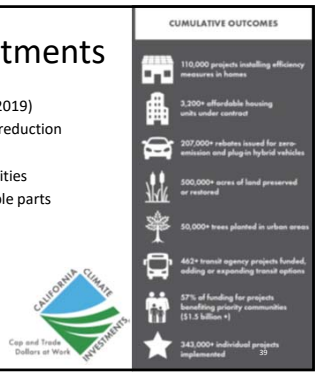
Source: http://priceoncarbon.org

CalCaT allowance prices

Source: https://onclimatechangepolicydotorg.files.wordpress.com/

Cal CaT climate investments

- US$ 12.5 trillion in total proceeds (2019)
- 37 m t of additional CO_2e emission reduction
- projects underway in 98% of California's disadvantaged communities
- 57% of funds benefit most vulnerable parts of California's population



Source: http://www.caclimateinvestments.ca.gov/

The political triumph of CalCaT

Political Stakeholders	Interests CaT	Political Influence
Voters	😐	+
Environ. groups / EJ groups	☺ / ☹	+ / +
Tech. companies/ utilities / manufacturing	☺ / 😐 / ☹	+ / + / –
CARB/ Economics Bureaus	☺ / 😐	+ / –
DEM / REP	☺ / 😐	+ / +

Source: Rudolph et al. 2014

We need Cal CaT's coverage, initial distribution, revenue use, and linking!

While global warming is one of the most pressing challenges to humankind, cap-and-trade can be the no. 1 remedy!

CalCaT can be considered a model program for domestic GHG cap-and-trade schemes and inter-jurisdiction-linking!

While, CalCaT excels in coverage, initial distribution, revenue use, and linking, design improvements are possible particularly with respect to the cap!

and …

We need political leadership to be back!

Industry pressure has to be countered by strong civil society support and pro-climate action networks!

Social and climate justice have to be an integral part of market-based climate policy design!

Windows of opportunity have to be strategically utilized!