ISPRA

Gas serra: inventario delle emissioni, proiezioni al 2030 e politiche sul clima
15 MAGGIO 2018 - Auditorium MATTM
Via Capitan Bavastro 180, Roma

Scenari internazionali di emissione e assorbimenti di gas serra congruenti con l'Accordo di Parigi

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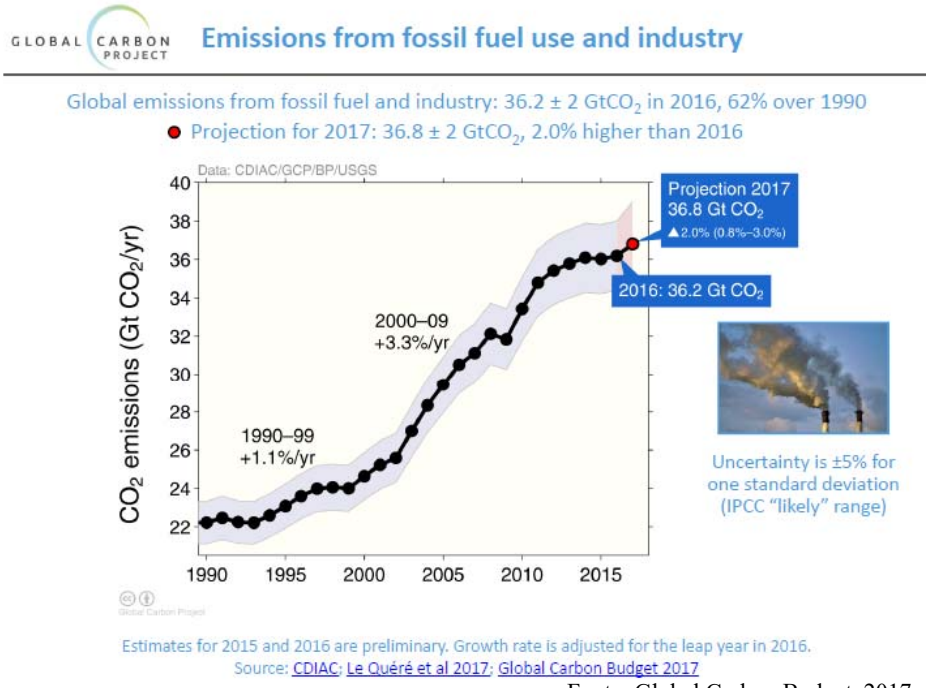
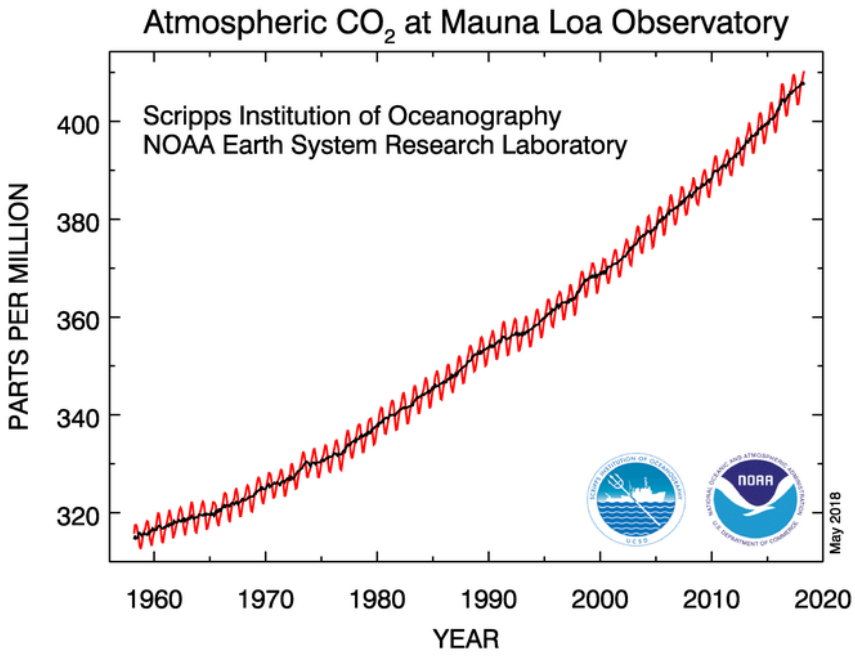
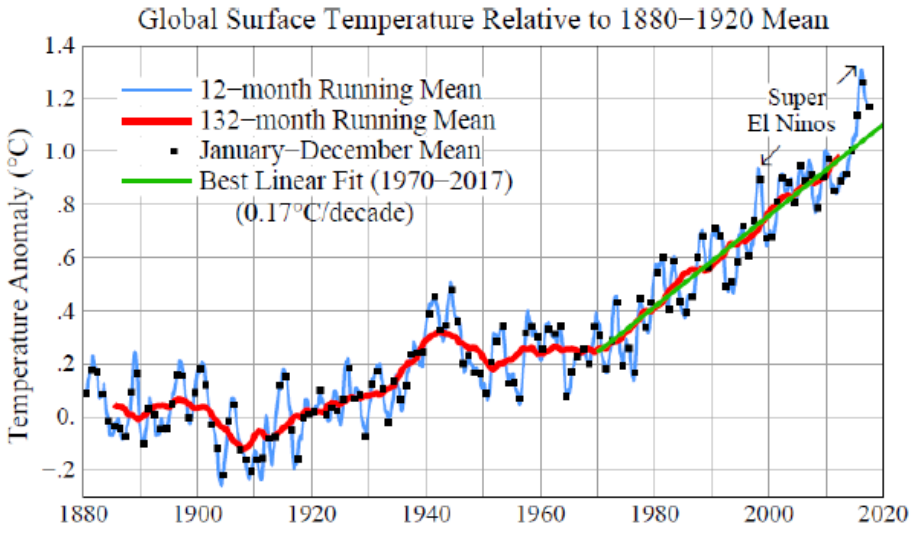


Fonte: Global Carbon Budget, 2017



Fonte: NOAA - www.esrl.noaa.gov/gmd/ccgg/trends/

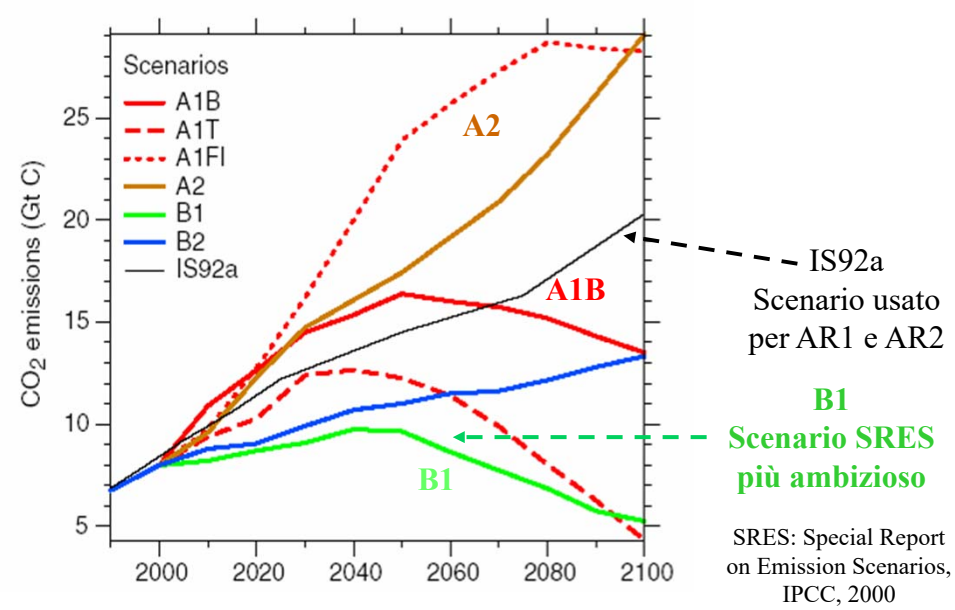
Andamento delle temperature globali dal 1880 al 2017



Source: Hansen et al., 2018, Global Temperature in 2017

Scenari di emissioni – periodo 1990-2007

Scenari "SRES" – usati fino al 4° rapporto IPCC



SRES: Special Report on Emission Scenarios, IPCC, 2000


13 AUGUST 2004 VOL 305 SCIENCE www.sciencemag.org

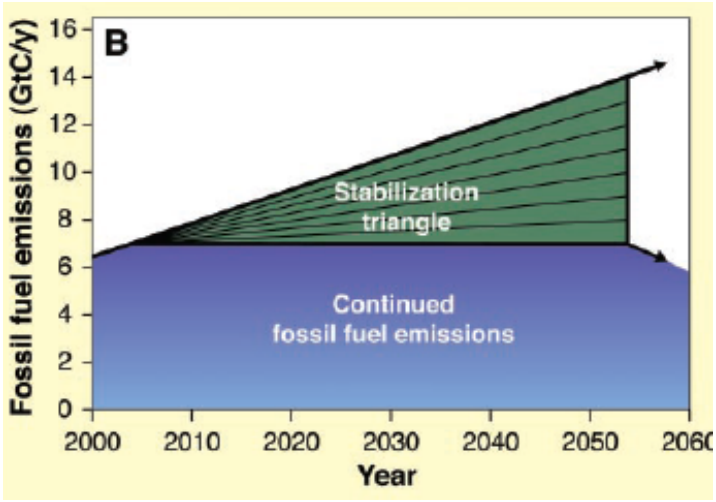
SPECIAL SECTION

TOWARD A HYDROGEN ECONOMY

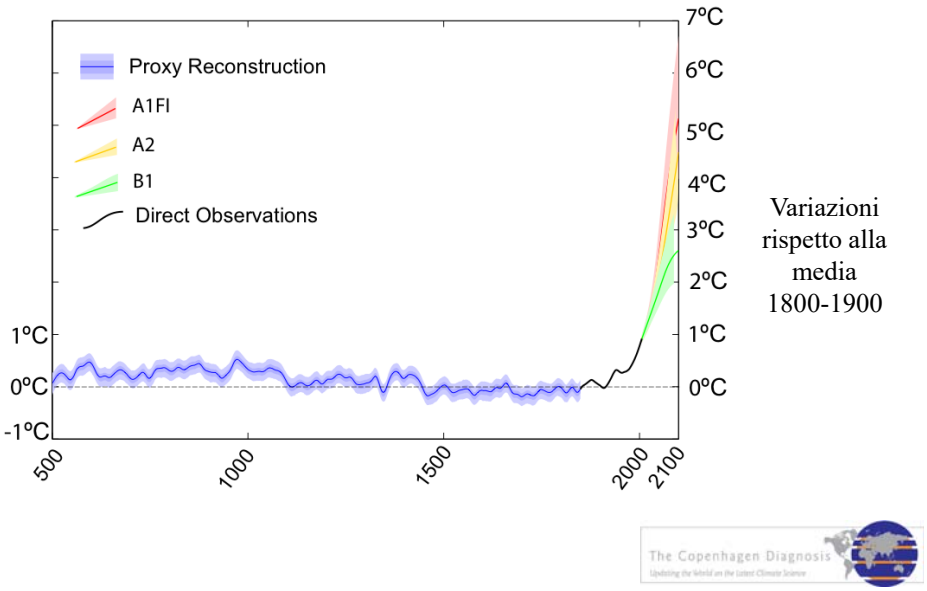
REVIEW

Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies

S. Pacala[1]* and R. Socolow[2]*



Temperature ricostruite, osservate e proiezioni per il futuro
(Fonte: Copenhagen Diagnosis, 2009)



Scenari di emissioni – periodo 2008-2014

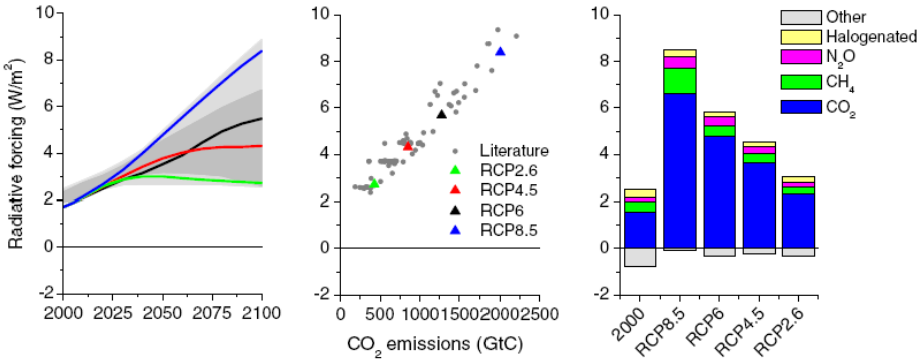
Scenari "RCP" – usati dal 5° rapporto IPCC

Nell'AR5 sono stati utilizzati quattro nuovi scenari, gli scenari **RCP, Representative Concentration Pathways:**
RCP 2.6 scenario di mitigazione (riduzione emissioni molto elevate)
RCP 4.5 scenario di stabilizzazione (riduzioni consistenti)
RCP 6.0 scenario di stabilizzazione (riduzioni blande)
RCP 8.0 scenario ad alte emissioni ("business as usual")

I numeri degli scenari RCP indicano il forzante radiativo totale raggiunto circa nel 2100, rispetto al 1750

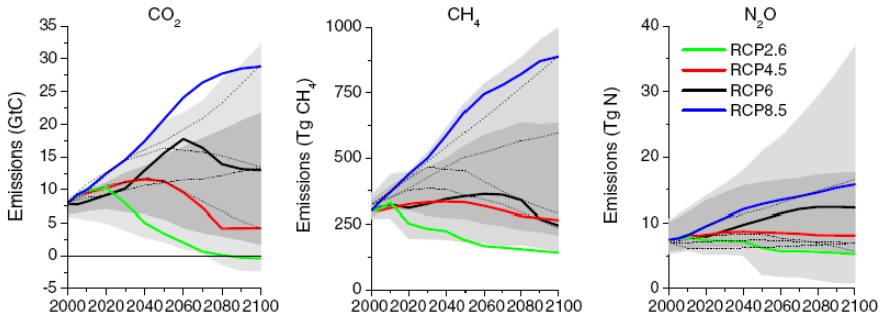
«Il forzante radiativo è la misura dell'influenza che un fattore ha nell'alterare il bilancio di energia in entrate e in uscita nel sistema terra e atmosfera ed è un indice dell'importanza del fattore stesso come un potenziale meccanismo di cambiamento climatico. I valori dei forzanti radiativo sono riferiti alle condizioni pre-industriali stimate al 1750 e sono espressi in W/m^2» *(IPCC, AR4)*

Scenari “RCP”
Representative Concentration Pathways

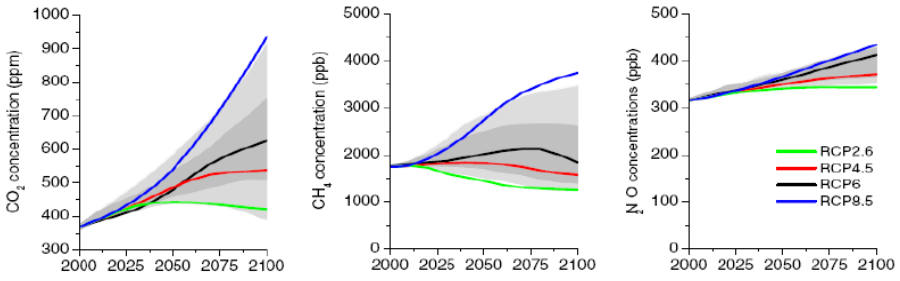


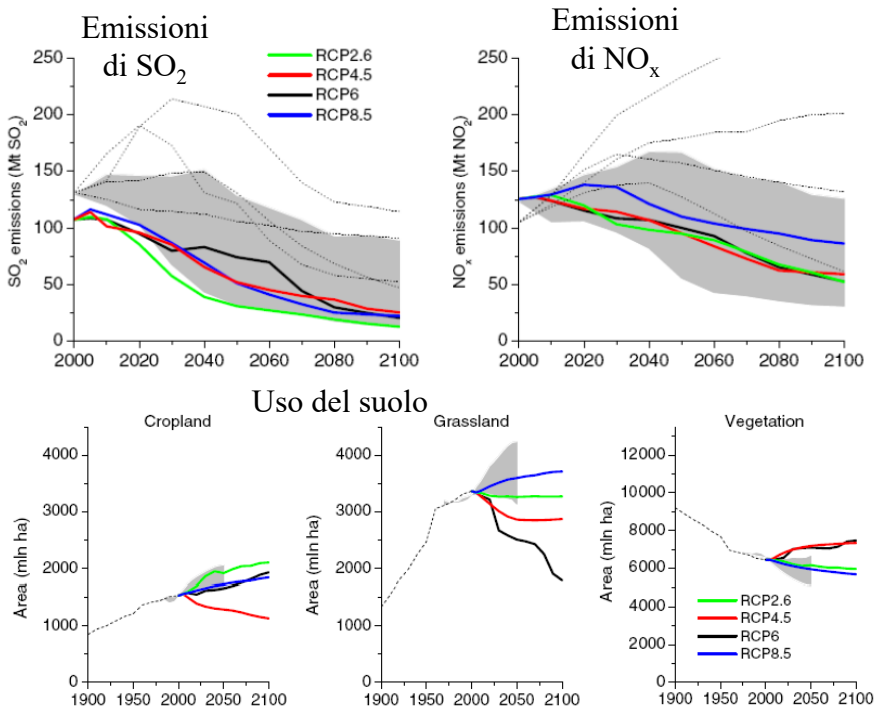
Gli scenari RCP si basano su una combinazione di modelli di valutazione integrata effettuati da diversi gruppi di ricerca.

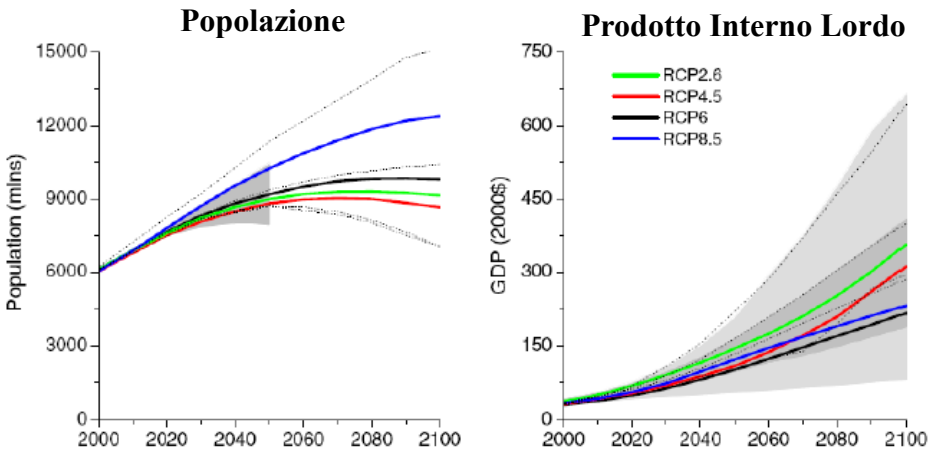
Emissioni degli scenari RCP



Concentrazioni in atmosfera negli scenari RCP

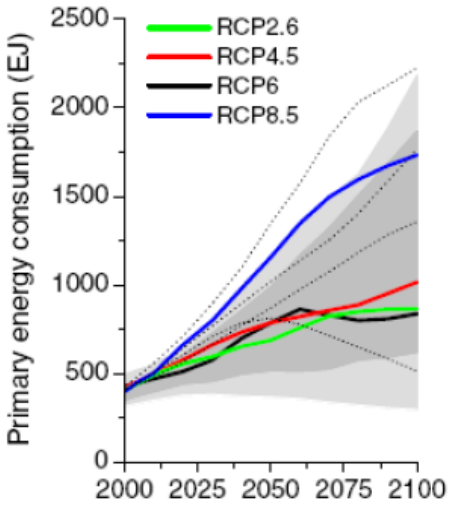




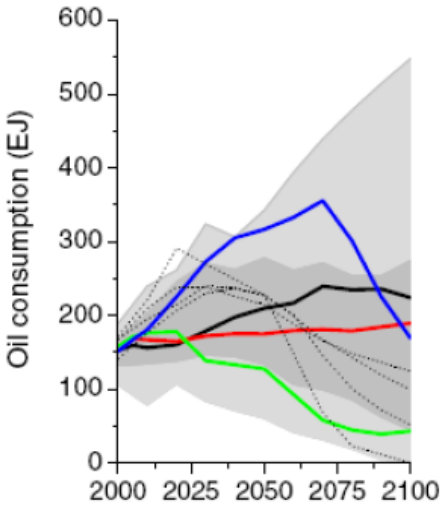


Tutti i dati sono disponibile in un database sul web, scaricabili gratuitamente. Per ogni scenario RCP sono disponibili griglie di dati spazialmente definiti sull'uso del suolo e dati settoriali delle emissioni, nonché delle corrispondenti concentrazioni in atmosfera, anno per anno fino al 2100.

Consumo di energia primaria

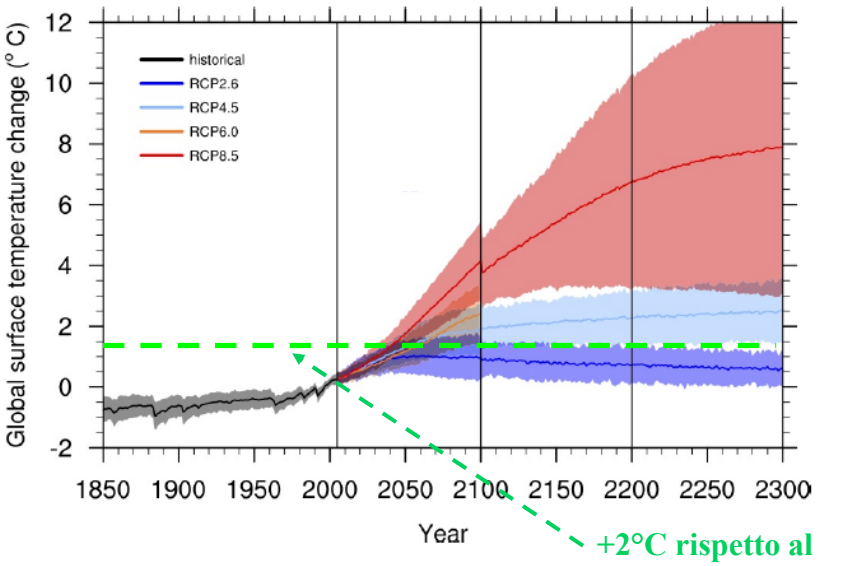


Consumo di petrolio



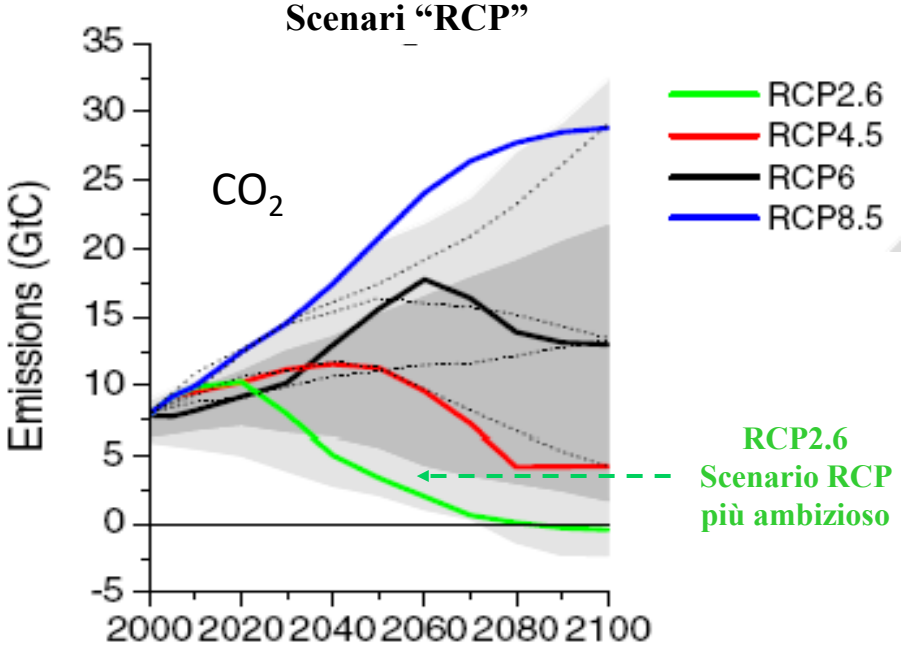
Proiezioni dell'aumento delle temperature globali

(Variazioni rispetto alla media 1986-2005)



Fonte: IPCC, 2013 AR5-WG1, fig. 12.15

Scenari "RCP"

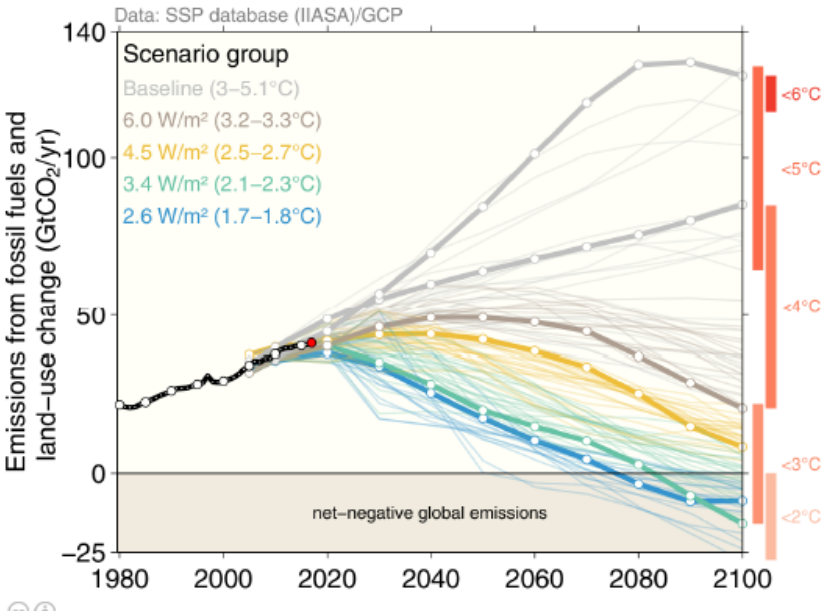


Scenari di emissioni – periodo 2014 – AR6

Shared Socio–Economic Pathways (SSPs)

Gli SSP sono stati sviluppati per integrare gli RCP, sono basati su cinque «narrazioni» che descrivono futuri alternativi socio-economici:
SSP1: sviluppo sostenibile
SSP2: scenario a sviluppo intermedio
SSP3: rivalità regionale
SSP4: sviluppo con forti diseguaglianze
SSP5: sviluppo con tanti combustibili fossili

Questi SSP considerano in modo coerente diversi driver socio-economici, tra cui popolazione, istruzione, crescita economica, urbanizzazione. Gli scenari SSP sono stati sviluppati per una serie di livelli di forzanti climatici, tra cui i livelli di forzanti degli scenari RCP, ma considerano anche livelli di forzanti inferiori.
Ad esempio, lo scenario SSP-1.5°C è utilizzato per lo «Special Report IPCC 1.5°C» in uscita a settembre 2018.



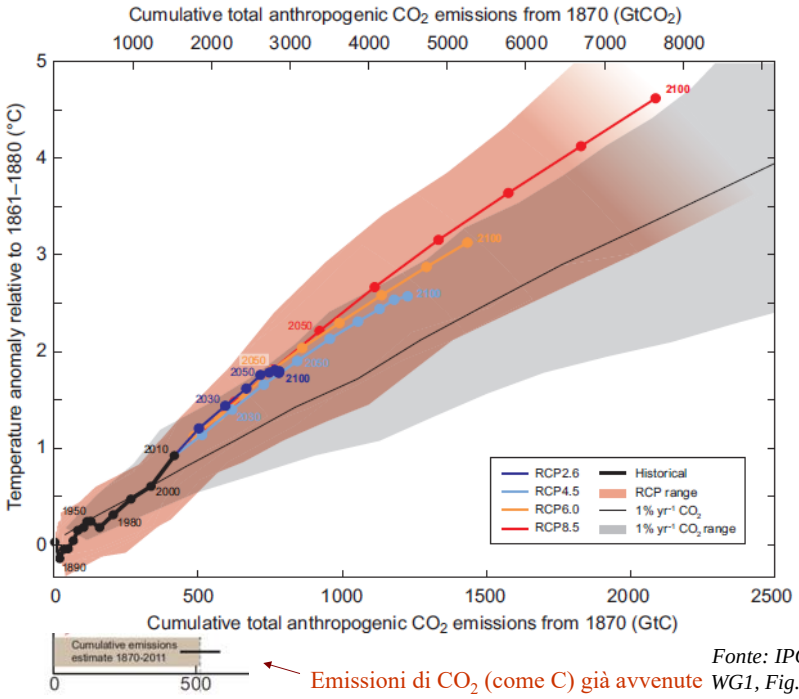
Fonte: Global Carbon Budget 2017

Nel 5° rapporto IPCC è stato introdotto un concetto che limita in parte l'importanza dello «scenario di emissione», ed è quello di "**budget" di emissioni di CO_2**.

Il «budget» rappresenta la quantità massima di emissioni cumulate compatibili con un determinato incremento delle temperature globali.

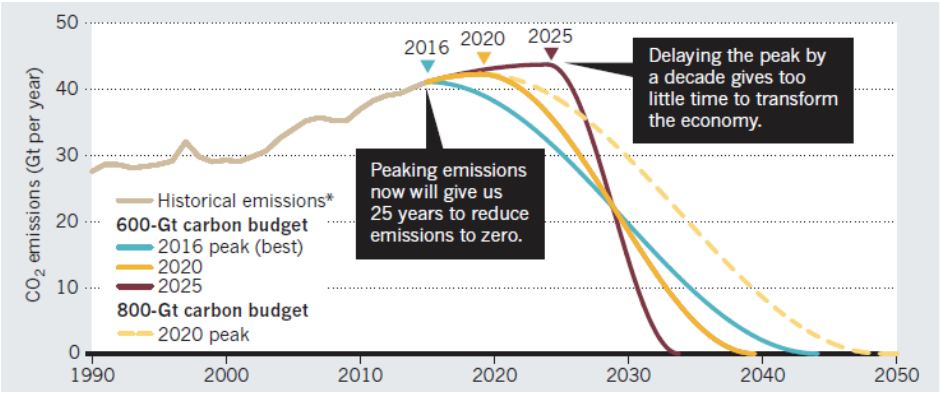
L'obiettivo di una politica climatica può essere espresso in termini di «budget» emissioni globali di CO_2, perché esiste una relazione lineare fra l'aumento delle temperature medie globali le emissioni cumulate globali di CO_2

Le temperature a fine secolo non dipendono dall'andamento delle emissioni ma dalle emissioni cumulate (l'integrale …)



Fonte: IPCC-AR5 WG1, Fig. SMP10

Per contenere il riscaldamento globale entro 1.5-2°C il budget oggi disponibile di CO_2 è di 600 Gt (150 -1050).



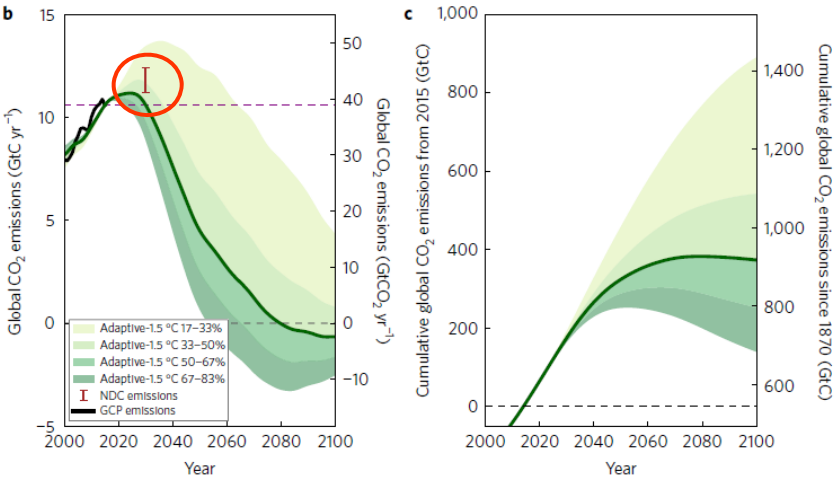
Figures et al. (2017) Nature, 546, 593-595

Per raggiungere gli obiettivi delle politiche climatiche oggi oggetto di discussione (ΔT max <2°C o 1,5 °C) è necessario quindi lasciare nel sottosuolo un bel po' di C fossile, o rimettercelo.

nature geoscience
ARTICLES
PUBLISHED ONLINE: 18 SEPTEMBER 2017 | DOI: 10.1038/NGEO3031

Emission budgets and pathways consistent with limiting warming to 1.5 °C

Richard J. Millar[1,2*], Jan S. Fuglestvedt[3], Pierre Friedlingstein[1], Joeri Rogelj[4,5], Michael J. Grubb[6], H. Damon Matthews[7], Ragnhild B. Skeie[3], Piers M. Forster[8], David J. Frame[9] and Myles R. Allen[2,10]



La dimensione della sfida

Ridurre quasi a zero le emissioni globali di gas serra in 3 - 4 decenni

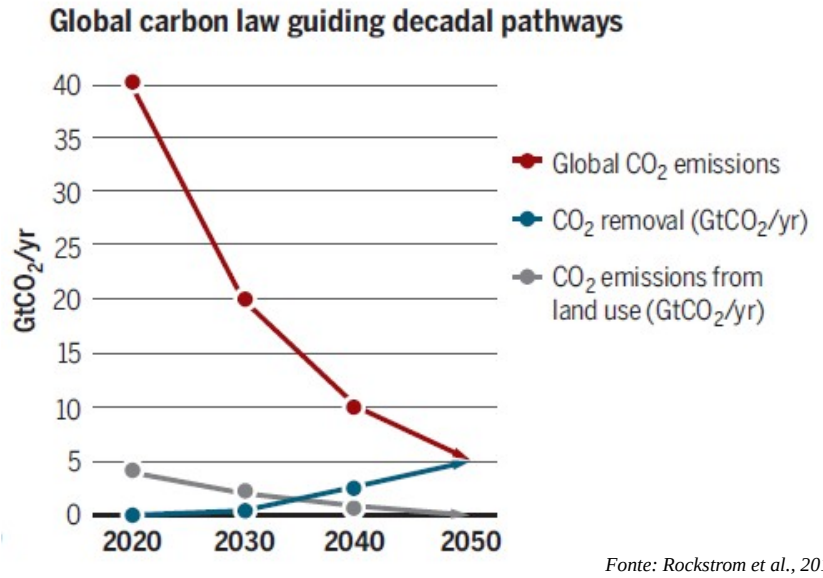
CLIMATE POLICY

A roadmap for rapid decarbonization

Emissions inevitably approach zero with a "carbon law"

Fonte: Rockstrom et al., 2017, A roadmap for rapid decarbonization. Science, vol. 355, issue 6331, 1269-1271

Ridurre quasi a zero le emissioni globali di gas serra in 3 - 4 decenni



Fonte: Rockstrom et al., 2017

Obiettivi dell'Accordo di Parigi

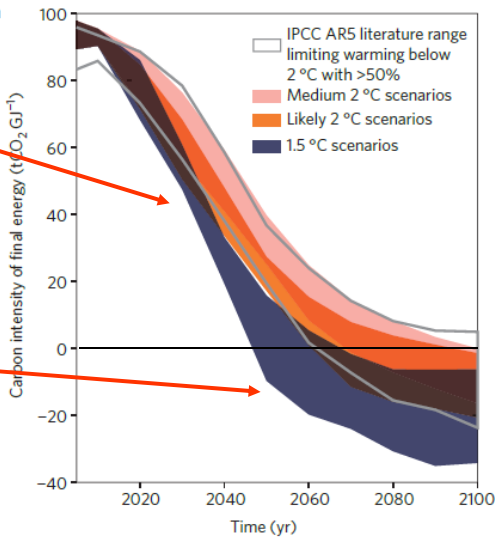
"…mantenere l'aumento della temperatura media globale ben al di sotto di 2 °C rispetto ai livelli preindustriali, e proseguire l'azione volta a limitare l'aumento di temperatura a 1,5° C…" (art. 2)

«…raggiungere il picco globale di emissioni di gas ad effetto serra al più presto possibile… raggiungere un equilibrio tra le fonti di emissioni antropogeniche e gli assorbimenti di gas ad effetto serra nella seconda metà del corrente secolo…» (art. 4)

Andamento dell'intensità carbonica dell'energia fino al 2100 compatibile con gli obiettivi di temperatura < 2°C o < 1,5°C

Rapida decarbonizzazione

Rimozione di carbonio dall'atmosfera



Source: Rogelj J. et al. (2015) *Energy system transformations for limiting end-of-century warming to below 1.5 °C.* Nature Climate Change, 5, 519-528.

The political economy of negative emissions technologies: consequences for international policy design

Matthias Honegger and David Reiner

Earth's Future

COMMENTARY

The world's biggest gamble

High-level techno-economic assessment of negative emissions technologies

Niall McGlashan, Nilay Shah, Ben Caldecott

Negative emission technologies: What role in meeting Paris Agreement targets?

Betting on negative emissions

Sabine Fuss, Josep G. Canadell, Glen P. Peters, Massimo Tavoni, Robbie M. Andrew, Robert B. Jackson, Chris D. Jones, Florian Kraxner, Nebosja Nakicenovic, Corinne Le Michael R. Raupach, Ayyoob Sharifi, Pete Smith and Yoshiki Yamagata

nature climate change

REVIEW ARTICLE

Catalysing a political shift from low to negative carbon

Glen P. Peters and Oliver Geden

NATURE ENERGY | VOL 1 | JANUARY 2016 | www.nature.com/natureenergy

comment

Biophysical and economic limits to negative CO_2 emissions

A commercialization strategy for carbon-negative energy

Daniel L. Sanchez and Daniel M. Kammen

Scrutinize CO_2 removal methods

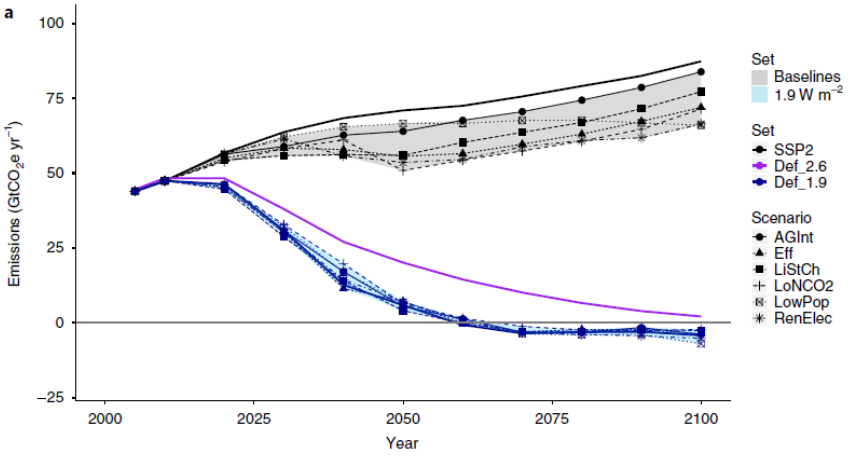
The trouble with negative emissions

Reliance on negative-emission concepts locks in humankind's carbon addiction

Alternative pathways to the 1.5 °C target reduce the need for negative emission technologies

Detlef P. van Vuuren[1,2]*, Elke Stehfest[1], David E. H. J. Gernaat[1,2], Maarten van den Berg[1], David L. Bijl[1], Harmen Sytze de Boer[1,2], Vassilis Daioglou[1,2], Jonathan C. Doelman[1], Oreane Y. Edelenbosch[1,2], Mathijs Harmsen[1,2], Andries F. Hof[1,2] and Mariësse A. E. van Sluisveld[1,2]

- Efficienza energetica
- Rinnovabili
- In vitro «cultured» meat
- Cambio stili di vita (trasporti, consumi elettrici, dieta, ecc.)
- Demografia
- Interventi sui gas non-CO_2



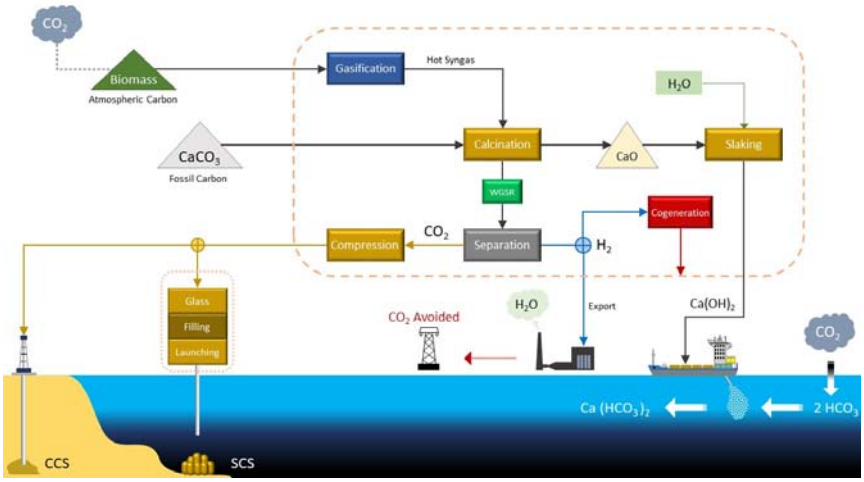
Esistono molte tecnologie per le emissioni negative

- Afforestazione
- Riforestazione
- Pratiche agricole (aumentare il C nei suoli)
- Bioenergia + cattura e stoccaggio del carbonio (BECCS)
- Biochar
- Cattura diretta di CO_2 dall'aria e stoccaggio (DACS)
- Dilavamento accelerato (enhanced weathering) dei minerali
- Aumento della produttività oceanica
- Aumento dell'alcalinità degli oceani
- Utilizzo di biomasse nell'edilizia
- Aumentare la carbonatazione del cemento

AFFORDABLE CO_2 NEGATIVE EMISSION THROUGH HYDROGEN FROM BIOMASS, OCEAN LIMING AND CO_2 STORAGE

Stefano CASERINI[1*#], Beatriz BARRETO[1], Caterina LANFREDI[1], Giovanni CAPPELLO[2], Dennis ROSS MORREY[2], Mario GROSSO[1]

INTERNATIONAL CONFERENCE ON
NEGATIVE CO_2 EMISSIONS
MAY 22-24, 2018



International Journal of Greenhouse Gas Control 60 (2017) 140–155

Contents lists available at ScienceDirect

International Journal of Greenhouse Gas Control

journal homepage: www.elsevier.com/locate/ijggc

Evaluation of a new technology for carbon dioxide submarine storage in glass capsules

Stefano Caserini*, Giovanni Dolci, Arianna Azzellino, Caterina Lanfredi, Lucia Rigamonti, Beatriz Barreto, Mario Grosso

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ARTICLE INFO

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Keywords:
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Life cycle assessment
Emission reduction
Carbon sequestration

ABSTRACT

The paper describes the energy and environmental evaluation of a new patented process for the storage of liquid carbon dioxide (CO_2) in glass capsules on the deep seabed. This technology is proposed as a safe option to store CO_2 captured from flue gas of industrial processes and power plants, as well as directly from the atmosphere, in order to overcome the obstacles that still today limit the commercial deployment of other CO_2 storage techniques, such as the injection in saline aquifers. By keeping the liquid CO_2 separated from the seawater, the technology might be an alternative that presents reduced risk associated with the storage in the marine environment when compared to other alternatives proposed in the past.

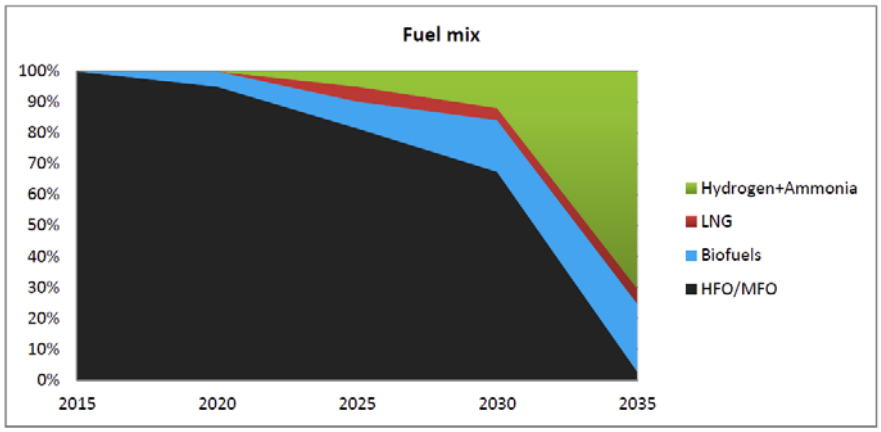
A Life Cycle Assessment carried out with different combinations of the geographical and technological parameters showed an average impact of 0.10 tCO_2eq per ton of stored CO_2. The process with the highest impact was the capsule production, due mainly to the consumption of natural gas and electricity, as well

Decarbonising Maritime Transport

Pathways to zero-carbon shipping by 2035

Case-Specific Policy Analysis

Figure 9. **Fuel mix evolution between 2015-2035 for 80% carbon factor reduction**



È sufficiente limitare la temperatura a fine secolo a << 2°C?
È possibile rimandare le riduzioni delle emissioni?

nature COMMUNICATIONS

ARTICLE

DOI: 10.1038/s41467-018-02985-8 OPEN

Committed sea-level rise under the Paris Agreement and the legacy of delayed mitigation action

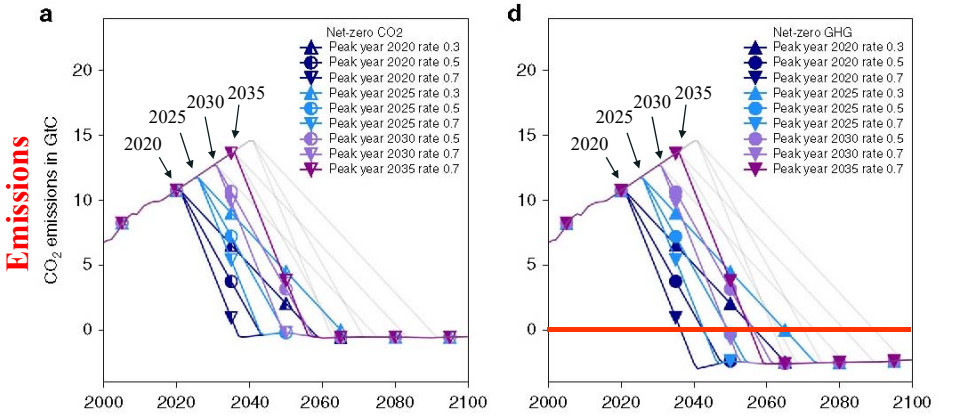
Matthias Mengel[1], Alexander Nauels[2], Joeri Rogelj[3,4,5] & Carl-Friedrich Schleussner[1,6,7]

Our results underline the importance of near-term mitigation action for limiting long-term sea-level rise risks.

Emission scenarios in line with Paris Agreement

Emission continued with the present day rate until peak year.
CO_2 emissions decline by 0.3, 0.5, and 0.7 GtC yr^{-2} thereafter until net-zero CO_2 or net-zero greenhouse gas emissions are reached.

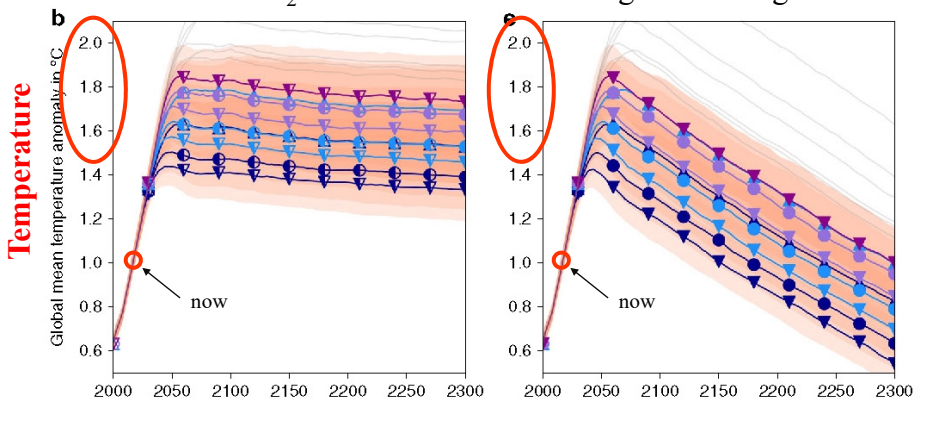
net-zero CO_2 emissions | net-zero greenhouse gas emissions



Source: Mengel et al., 2018

Global-mean temperature responses to emissions scenarios (°C above pre-industrial levels)

net-zero CO_2 emissions | net-zero greenhouse gas emissions

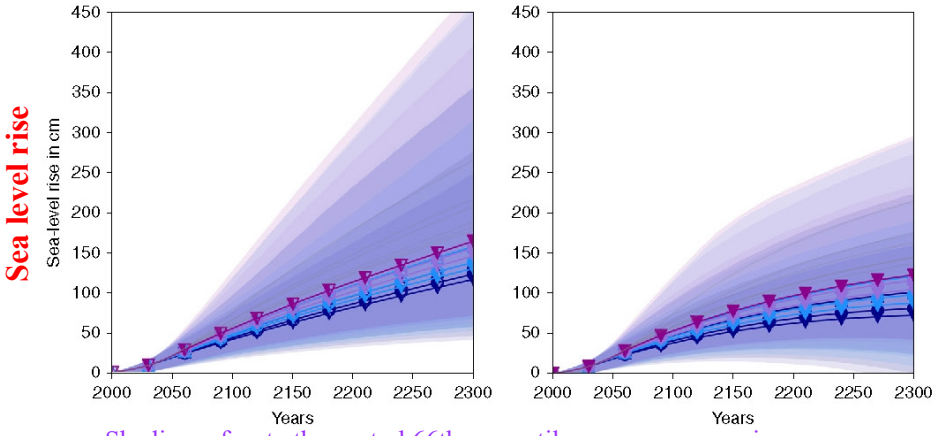


Shading refers to the central 66th percentile range per scenario

Source: Mengel et al., 2018

Committed sea level rise under the Paris Agreement

Temperature stabilization below 2 °C is insufficient to hold median sea-level rise until 2300 below 1.5 m. We find that **each 5-year delay in near-term peaking of CO_2 emissions increases median year 2300 sea-level rise estimates by ca. 0.2 m,** and extreme sea-level rise estimates at the 95th percentile by up to 1m.



Shading refers to the central 66th percentile range per scenario

Source: Mengel et al., 2018

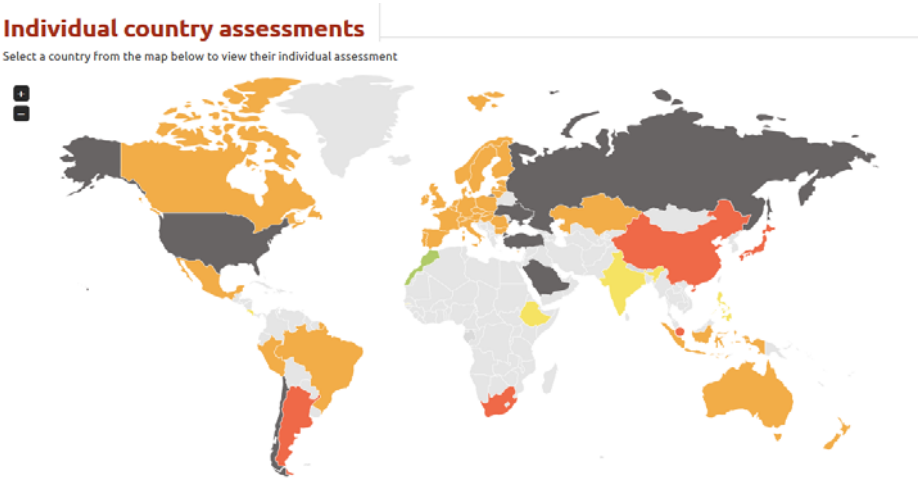
Decarbonizing the world economy will require renewable energy generation from vast solar farms, such as this one in Nevada.

Three years to safeguard our climate

Christiana Figueres and colleagues set out a six-point plan for turning the tide of the world's carbon dioxide by 2020.

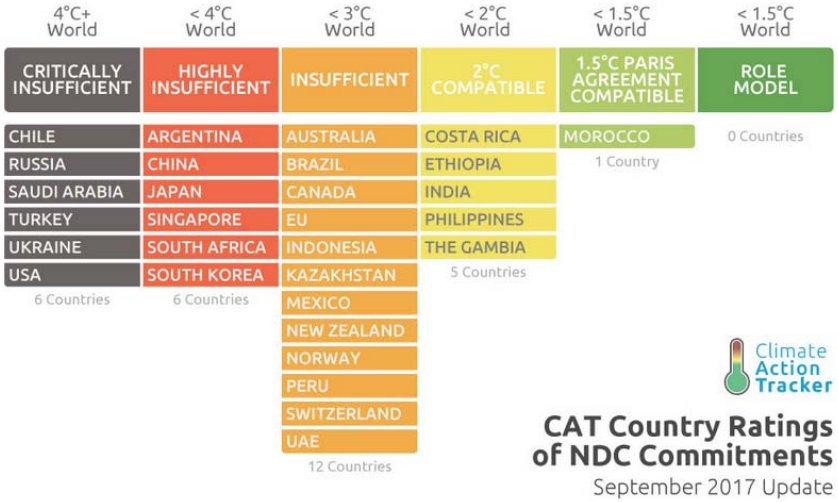
Figures et al. (2017) Nature, 546, 593-595

http://climateactiontracker.org/

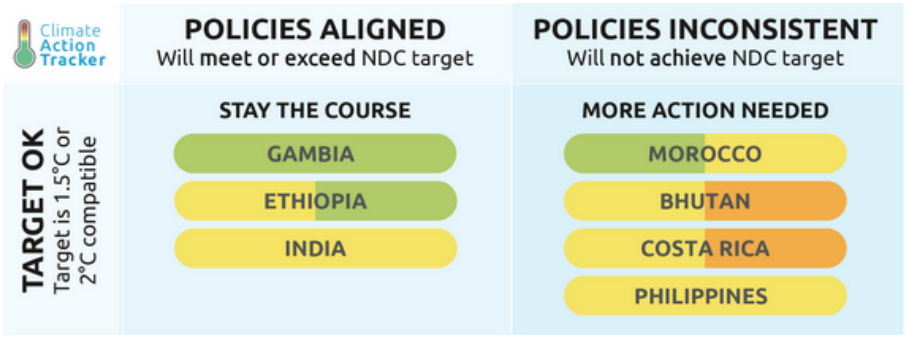


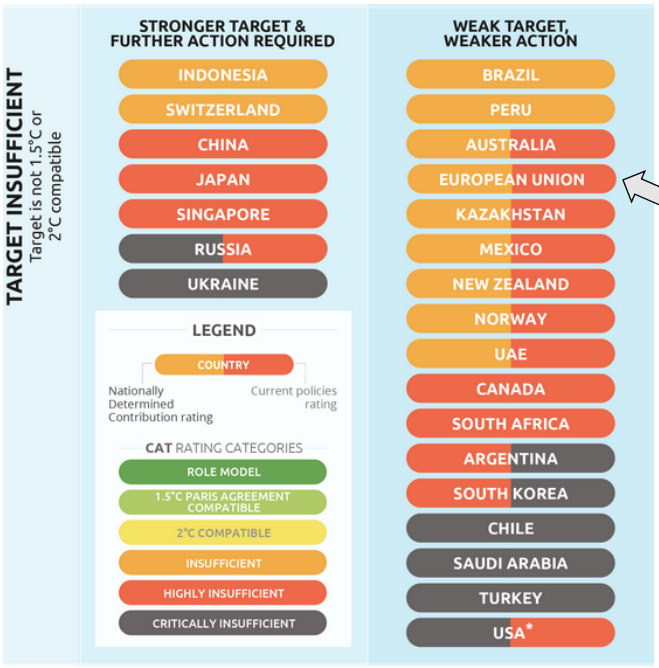
Source: Climate Action Tracker

Source: Climate Action Tracker http://climateactiontracker.org/



Source: Climate Action Tracker http://climateactiontracker.org/





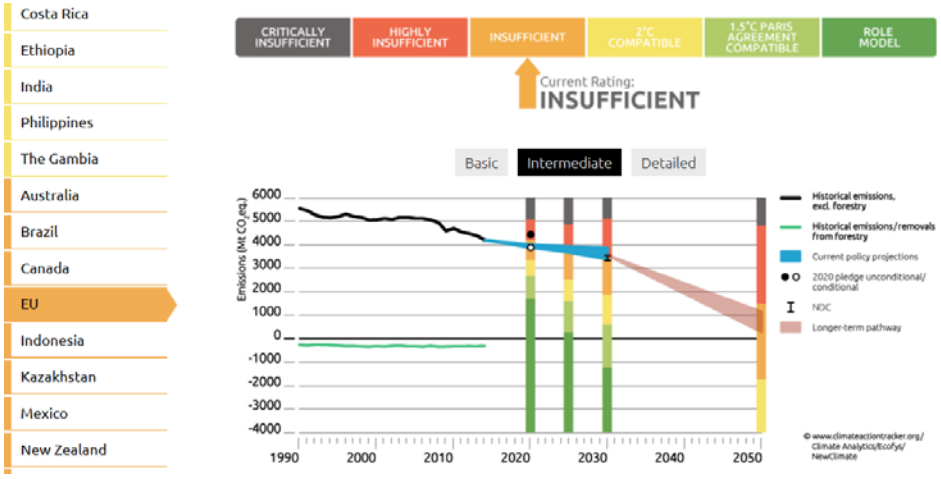
* The CAT rating for the US is "Critically insufficient", based on the Trump Administration's intent to withdraw from the Paris Agreement. Implemented policies are insufficient to meet the NDC target.

Valutazione del Carbon Action Tracker per l'Unione Europea:

NDC insufficiente

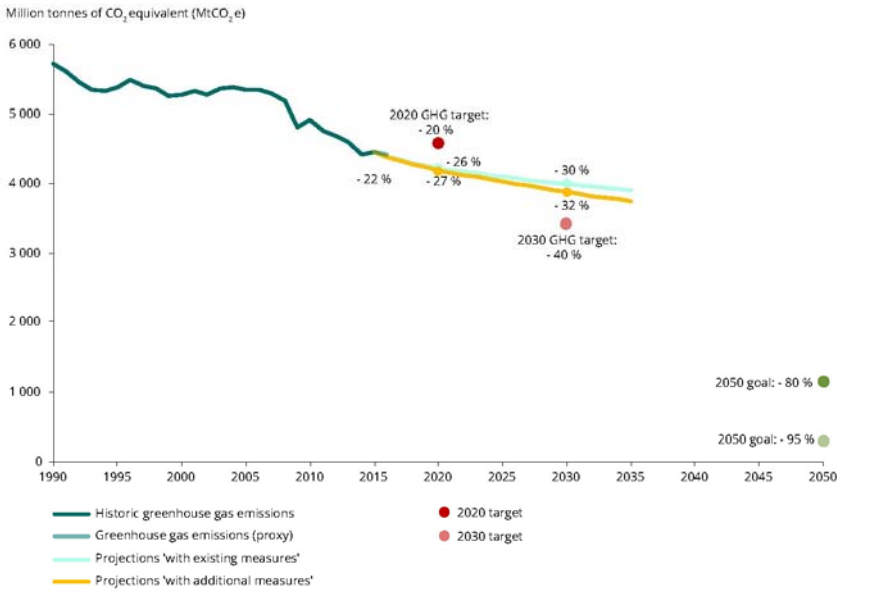
Politiche già decise altamente insufficienti anche per l'NDC approvato

EU



Source: Climate Action Tracker http://climateactiontracker.org/

Figure ES.3 Greenhouse gas emission trends, projections and targets in the EU



Source: Trends and projections in Europe 2017. Tracking progress towards Europe's climate and energy targets. EEA Report No 17/2017

Dutch PM calls for more ambitious 2030 EU climate target

Published on 05/03/2018, 4:22pm

Mark Rutte said Europe had a responsibility to align its targets with the Paris climate deal, joining the Swedes and French in pushing for sharper cuts

The Dutch prime minister has urged the EU to "raise the bar" on climate action by adopting a new emissions reduction target for 2030 of 55% below 1990 levels.

The high-profile intervention comes shortly after calls by Swedish and French ministers on the European Commission to commit to deeper, faster emissions cuts.

The EU's current goal of a 40% cut on 1990 levels by 2030 was "too low to keep warming below 2C, let alone 1.5C", said Mark Rutte in a speech in Berlin on Friday.

The 2015 Paris climate agreement formalised global goals to limit warming to "well below" 2C and ideally hold it to 1.5C. But Rutte said the EU's current goals, set in 2014, were insufficient and needed to be updated.

"We need to raise the bar... This will show that we're serious about the commitments we made in Paris. By adopting this target, the EU will be doing its share to get closer to the global ambition of keeping warming to 1.5C. So let's not delay. The current commission could start making preparations. I'd like to see the June European Council approve this."

Source: www.climatechangenews.com/2018/03/05/dutch-pm-calls-ambitious-2030-eu-climate-target/

…condivido la consapevolezza che i cambiamenti climatici sono il problema della nostra epoca, forse il più grande problema della nostra umanità.

Jonathan Franzen

Da «Scrivere saggi in tempi bui», Internazionale, 12 gennaio 2018

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