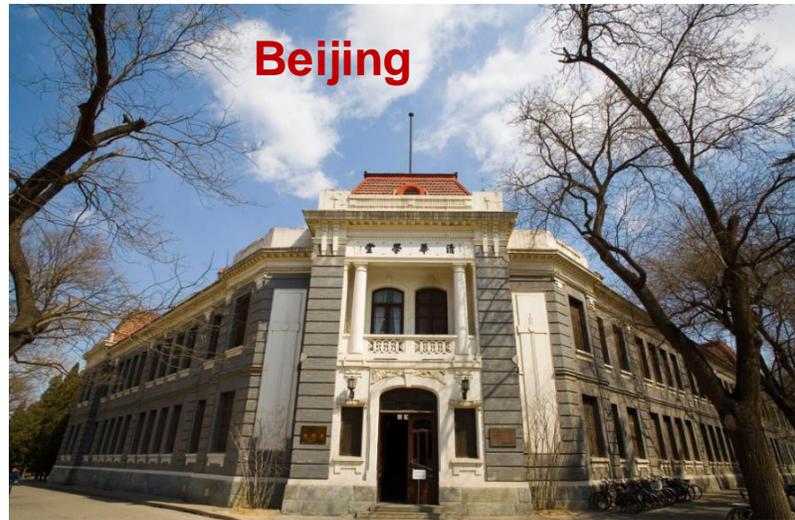


# Addressing Climate Change through Innovation and Digital Technologies

——Tencent's Approach and Practices

Dr Yongping Zhai  
Senior Advisor, Tencent  
Former Energy Chief, Asian Development Bank  
6 February 2025

# Personal Footprint: Asia, to Europe and Africa and back to Asia



# Joining Tencent in July 2021

Tencent 腾讯

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## Tencent's New Strategic Development Expert on a Carbon Neutral Future

2022.06.08

*At an age when many people start to think about retiring, Yongping Zhai is helping Tencent pursue the dream of carbon neutrality and reduce the global competition for resources.*



### Sharing the Dream of Carbon Neutrality

Emerging low-carbon technologies need policy support, incubation and most importantly, investment to support their broad expansion and development.

The early investment in the renewable energy sector, especially in solar photovoltaics and wind power, was mostly driven by policies all over the world. With such supporting policies and subsidies, around the time of Paris Agreement in 2015, we found that solar and wind energy technologies could yield considerable commercial returns without subsidies.

Now, further deployment of these mature renewable energy technologies can be sustainable, driven by the market and funded by commercial banks. Some other emerging low-carbon technologies will be essential to realize carbon neutrality in the future, but they need to be nurtured in the early stages in the same way solar and wind power were. These new technologies include hydrogen energy and carbon capture, utilization and storage, among others.

### Making Quality Lifestyle with Carbon Neutrality

During the industrial revolution, James Watt invented the steam engine and the application of fossil energy changed the world. In the 1990s, information technology made the world take another giant step forward. So, what is next?

I think carbon neutrality will lead to a better quality of life. The realization of carbon neutrality will address problems such as pollution and climate change caused by fossil energy, optimize the global economic structure with increasing proportion of service industry and information technology industry.

The application of digital technology will improve production efficiency, and people's food, clothing, housing and transportation will be provided in a comfortable, low-carbon or even zero-carbon way. We will enter a circular and sustainable economy, in which everyone does their best to work and consumes rationally with less carbon footprint.

以史为镜，可知兴替

Taking history as a mirror, you can see the ups and downs

# 1754: Discovery of "Fixed Air"

Joseph Black (1728-1799) was a Scottish chemist working in Edinburgh during the Enlightenment. In 1754, Black noticed that upon heating, calcium carbonate ( $\text{CaCO}_3$ ) produced a gas that was denser than air and could not sustain fire or animal life. He called this gas 'fixed air'.

In 1781, A.L. Lavoisier (1743-1794), French Chemist, introduced the term *carbonic acid* ( $\text{CO}_2$ ) in place of the old terms "fixed air".

In 1896, Svante Arrhenius (1859-1927), a Swedish scientist, was the first to claim in 1896 that fossil fuel combustion may eventually result in enhanced global warming.

B

EXPERIMENTS  
UPON  
MAGNESIA ALBA, QUICK-LIME,  
AND OTHER  
ALCALINE SUBSTANCES.

PART I.

HOFFMAN, in one of his observations, gives the history of a powder called *Magnesia Alba*, which had been long used, and esteemed as a mild and tasteless purgative; but the method of preparing it, was not generally known before he made it public.\*

It was originally obtained from a liquor called the *Mother of nitre*, which is produced in the following manner:

SALT-PETRE is separated from the brine which first affords it, or from the water with which it is washed out of nitrous earths, by the process commonly used in crystallizing salts. In this process, the brine is gradually diminished, and at length reduced to a small quantity of an unctuous bitter saline liquor, affording no more salt-petre by evaporation, but, if urged with a brisk fire, drying up into a confused mass, which attracts water strongly, and becomes fluid again when exposed to the open air.

To this liquor the workmen have given the name of

\* Hoff. Op. T. 4. p. 479.

# 1896: "Enhanced Global Warming"



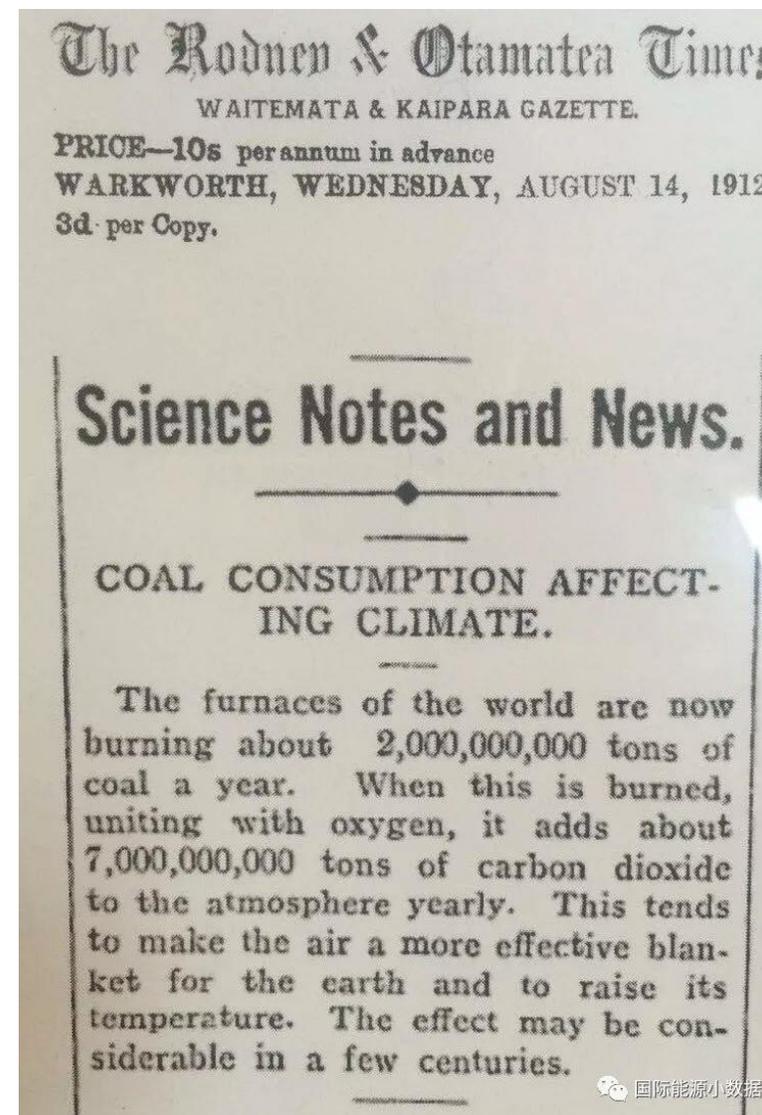
- Svante Arrhenius (1859-1927) was a Swedish scientist that was the first to claim in 1896 that fossil fuel combustion may eventually result in enhanced global warming.
- He proposed a relation between atmospheric carbon dioxide concentrations and temperature. Arrhenius suggested a doubling of the CO<sub>2</sub> concentration would lead to a 5 °C temperature rise.
- In 1903, he received the Nobel Prize for Chemistry in 1903, becoming the first Swedish Nobel laureate in recognition of the advancement of chemistry by his electrolytic theory of dissociation.

# 1912: Press Report on Coal Burning's Climate Impact

The earliest media to mention the impact of coal consumption on climate to the public was a newspaper in the northern Auckland region of New Zealand. *Rodney and Otamatea Times*, Waitemata and Kaipara gazette, published on August 14, 1912, 7th edition.

## Coal Consumption Affecting Climate

The furnaces of the world are now burning about 2 billion tons of coal a year...about 7 billion of CO<sub>2</sub> to the atmosphere yearly...this tends to raise its temperature. The effect may be considerable in a few centuries.

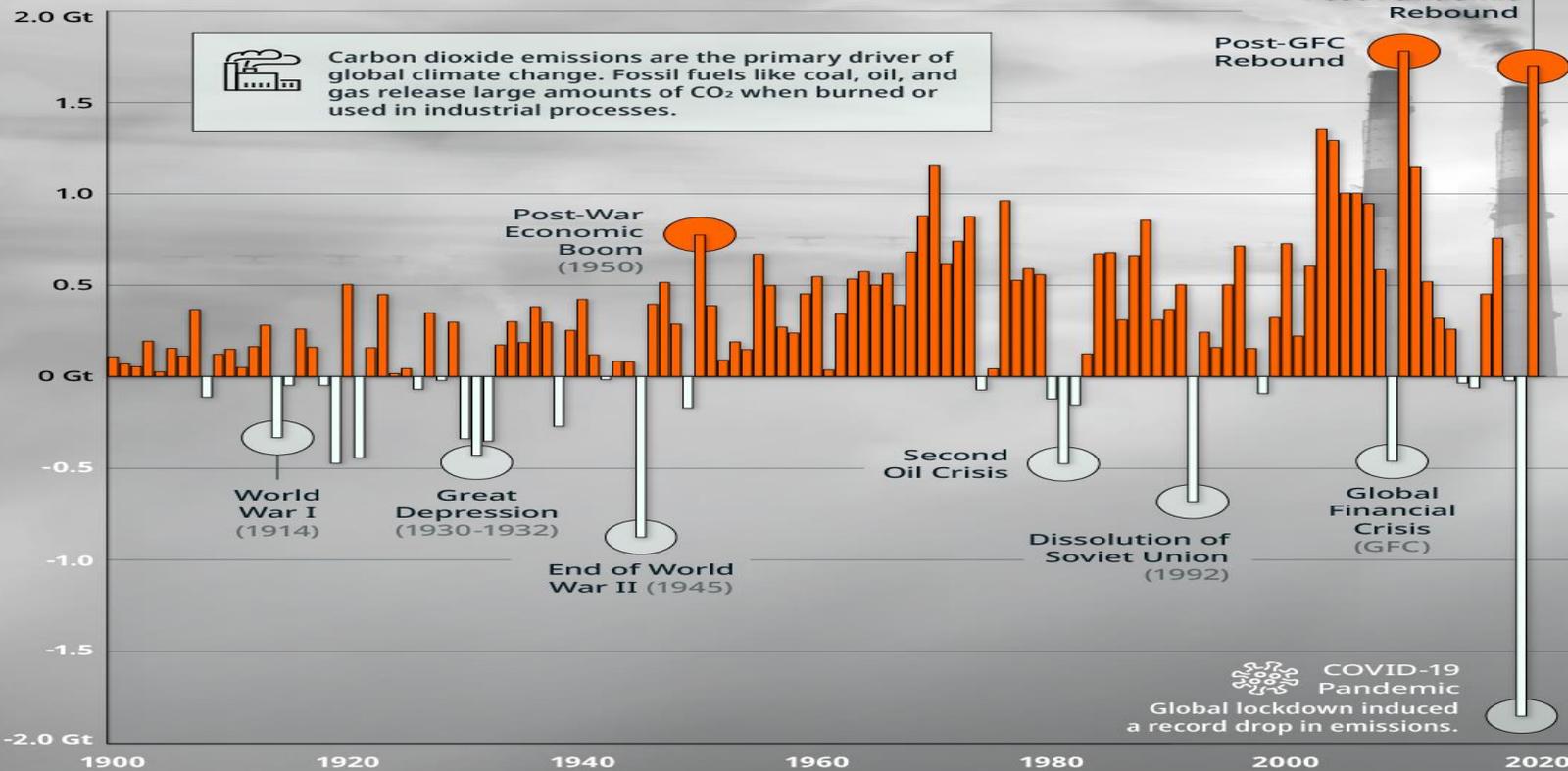


# CO2 Emissions since 1900

## Visualizing CO<sub>2</sub> EMISSIONS SINCE 1900

The COVID-19 pandemic lockdowns led to the biggest drop in CO<sub>2</sub> emissions. The level of CO<sub>2</sub> emissions has, however, risen since the pandemic.

**GLOBAL FOSSIL CO<sub>2</sub> EMISSIONS** Annual Changes  
Gigatons\* (Gt) of CO<sub>2</sub> increase or reduction vs. previous year



\*Equivalent to one billion metric tons

Prior to the Industrial Revolution (1760-1840), global carbon dioxide emissions were very low. However, with the increasing use of fossil fuels to power machines, carbon dioxide emissions increased to 6 billion tons in 1950. By 1990, this quantity had almost doubled, reaching a rate of over 22 billion tons per year. Currently, global carbon dioxide emissions exceed 37 billion tons <sup>2</sup>

# Four Key Questions on Climate Change



Syukuro  
Manabe

Klaus  
Hasselmann

“for the physical modelling  
of Earth’s climate, quantifying  
variability and reliably  
predicting global warming”

Syukuro Manabe and Klaus Hasselmann provided a solid physical foundation for our knowledge of Earth’s climate.

- *Is Earth heating up?*  
Yes
- *Is the cause the increased amounts of greenhouse gases in the atmosphere ?*  
Yes
- *Can this be explained solely by natural factors?*  
No
- *Are humanity’s emissions the reason for the increasing temperature?*  
Yes

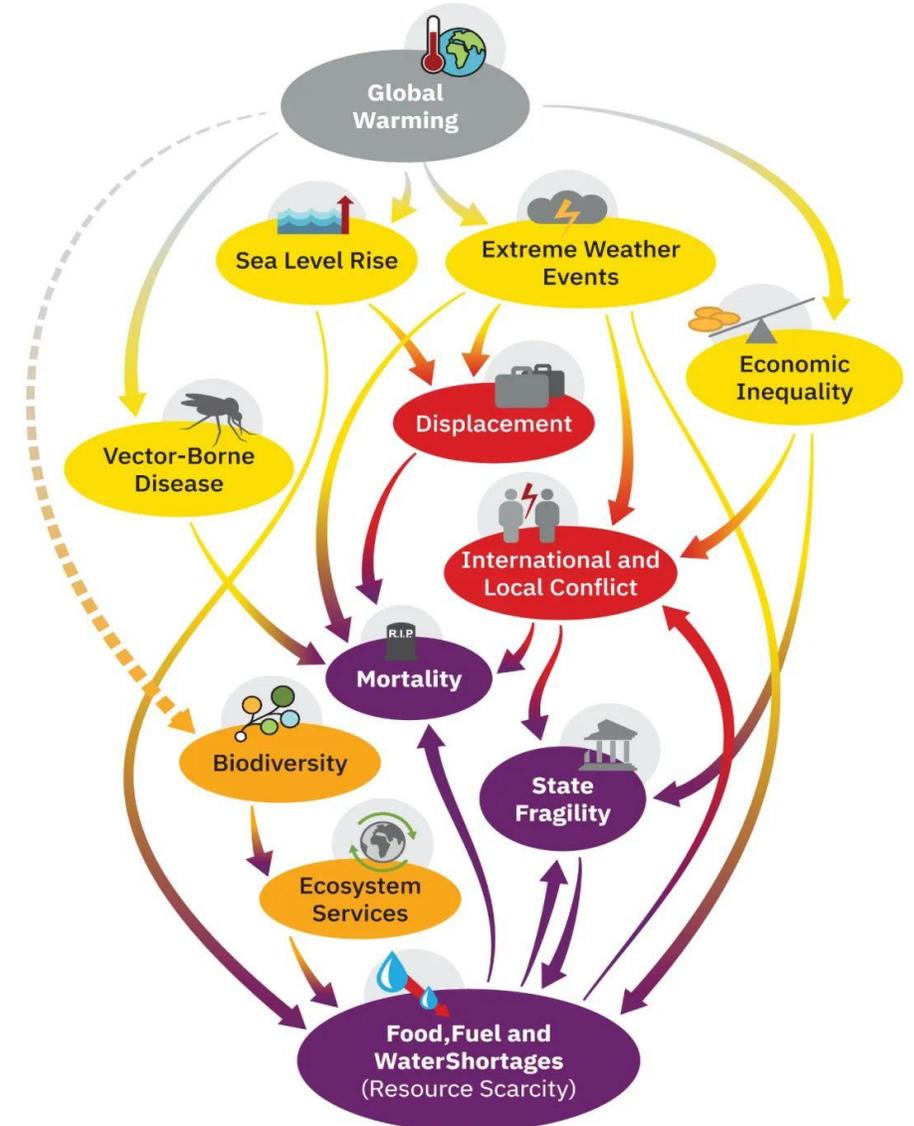
# Impact of Climate Change

First, the cumulative impact of climate change may overwhelm society's ability to adapt.

Secondly, climate change may directly trigger other catastrophic risks, such as international conflicts, or exacerbate the risk of infectious disease transmission and spill over.

Thirdly, climate change may exacerbate vulnerability and cause multiple indirect pressures (such as economic losses, land losses, water and food insecurity). Sudden changes in climate may trigger system failures, leading to the disintegration of global society.

<https://www.pnas.org/doi/10.1073/pnas.2108146119>



# Progress of Clean Technologies

# IEA: Tracking the Clean Technology Progress

## Cross-cutting

### Energy system overview

- Energy efficiency
- Behavioural changes
- Electrification
- Renewables
- Bioenergy
- Hydrogen
- Carbon capture & storage

- Innovation
- Digitalisation
- International collaboration

### Technology deep dives

- Direct air capture
- Bioenergy with carbon capture & storage
- CO<sub>2</sub> capture & utilisation
- Electrolysers

### Infrastructure deep dives

- CO<sub>2</sub> transport & storage
- Data centres & transmission networks
- District heating

## ● Electricity

### Technology deep dives

- Coal-fired electricity
- Gas-fired electricity
- Solar PV
- Wind
- Hydro
- Nuclear
- Demand response

### Infrastructure deep dives

- Grid-scale storage
- Smart grids

## ● Oil & natural gas supply

### Subsectors

- Methane emissions from oil and gas operations
- Flaring

## ● Low-emission fuel supply

### Subsectors

- Biofuels supply

## ● Transport

### Subsectors

- Cars and vans
- Trucks and buses
- Rail
- Aviation
- International shipping

### Technology deep dive

- Electric vehicles

## ● Industry

### Subsectors

- Steel
- Chemicals
- Cement
- Aluminium
- Paper
- Light industry

## ● Buildings

### Subsectors

- Heating
- Space cooling
- Lighting
- Appliance & equipment

### Technology deep dives

- Buildings envelope
- Heat pumps

● On track   ● More efforts needed   ● Not on track

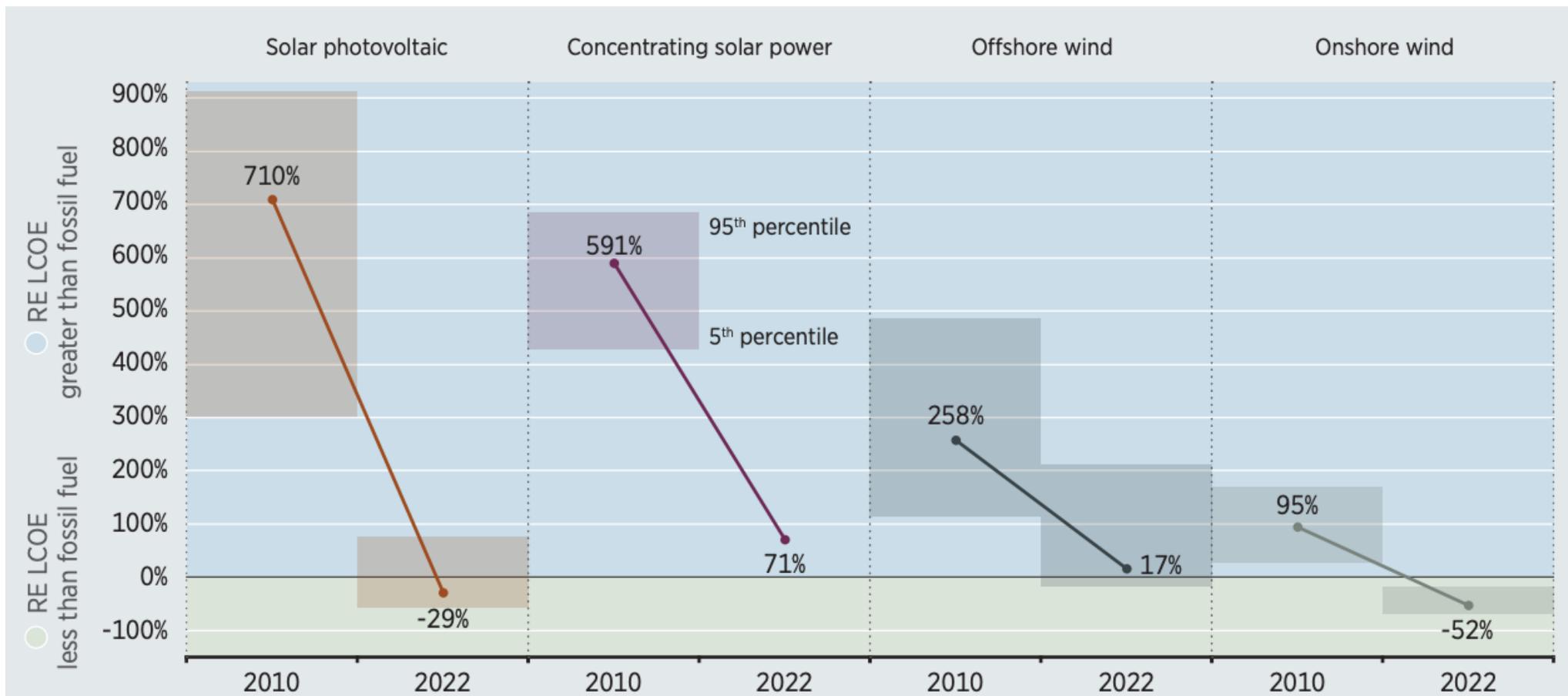
Progress is assessed at the global level against the Net Zero by 2050 Scenario trajectory for 2030.

# 2010-2022: Huge Decline in Cost of Solar and Wind

	Total installed costs			Capacity factor			Levelised cost of electricity		
	(2022 USD/kW)			(% )			(2022 USD/kWh)		
	2010	2022	Percent change	2010	2022	Percent change	2010	2022	Percent change
Bioenergy	2 904	2 162	-26%	72	72	1%	0.082	0.061	-25%
Geothermal	2 904	3 478	20%	87	85	-2%	0.053	0.056	6%
Hydropower	1 407	2 881	105%	44	46	4%	0.042	0.061	47%
Solar PV	5 124	876	-83%	14	17	23%	0.445	0.049	-89%
CSP	10 082	4 274	-58%	30	36	19%	0.380	0.118	-69%
Onshore wind	2 179	1 274	-42%	27	37	35%	0.107	0.033	-69%
Offshore wind	5 217	3 461	-34%	38	42	10%	0.197	0.081	-59%

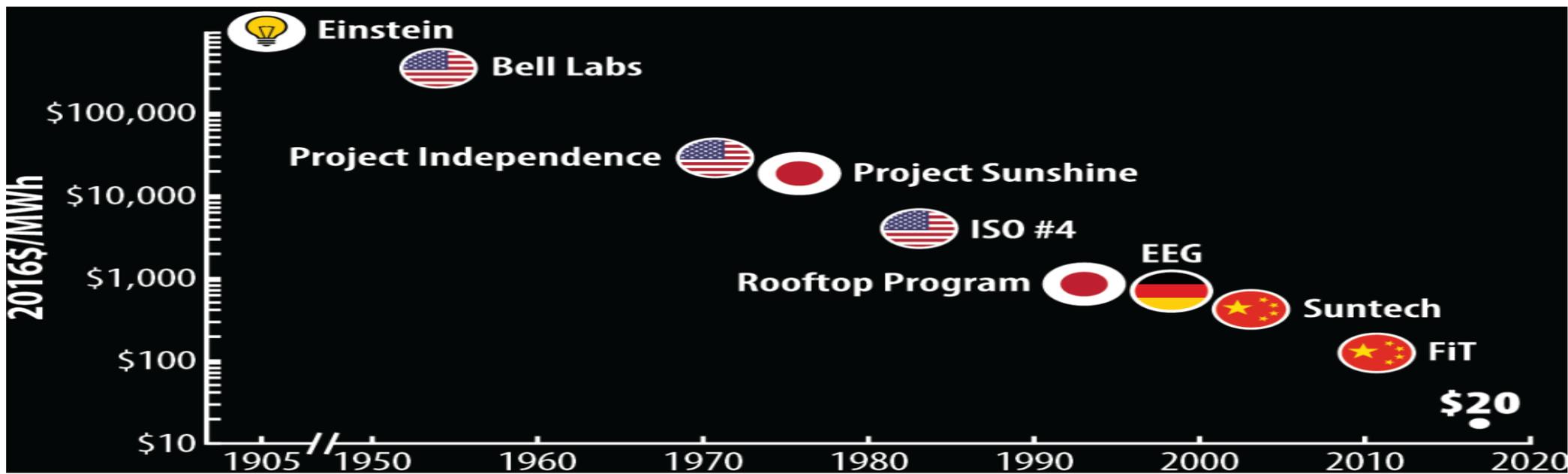
Source : <https://www.irena.org/Publications/2023/Aug/Renewable-Power-Generation-Costs-in-2022>

# Increasing Competitiveness of Renewable Energy



Source : <https://www.irena.org/Publications/2023/Aug/Renewable-Power-Generation-Costs-in-2022>

# How Solar Energy Became Cheap?



Source : <https://www.howsolargotcheap.com/>

# Wright's Law: Decline of the Cost of Solar PV

- Pioneered by Theodore Wright (a U.S. aeronautical engineer) in 1936, Wright's Law aims to provide a reliable framework for forecasting cost declines as a function of cumulative production.
- Specifically, it states that for every cumulative doubling of units produced, costs will fall by a constant percentage.

$$Y = aX^b.$$

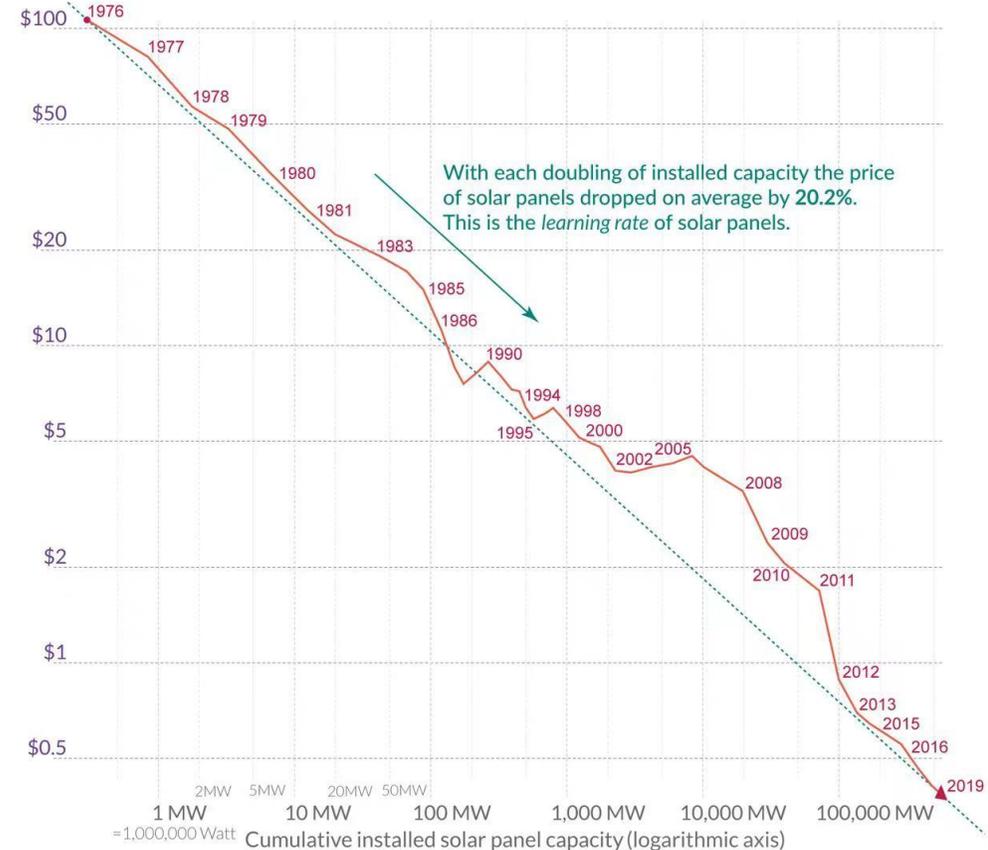
## Wright's Law Formula

- Y = cumulative average time (or cost) per unit
- X = cumulative number of units produced
- a = time (or cost) required to produce 1st unit
- b = slope of the function

**Following Wright's Law:** the price of solar panels declined by 20% with each doubling of global cumulative capacity



Price per Watt of solar panels (logarithmic axis)  
The prices are adjusted for inflation and presented in 2019 US-\$.



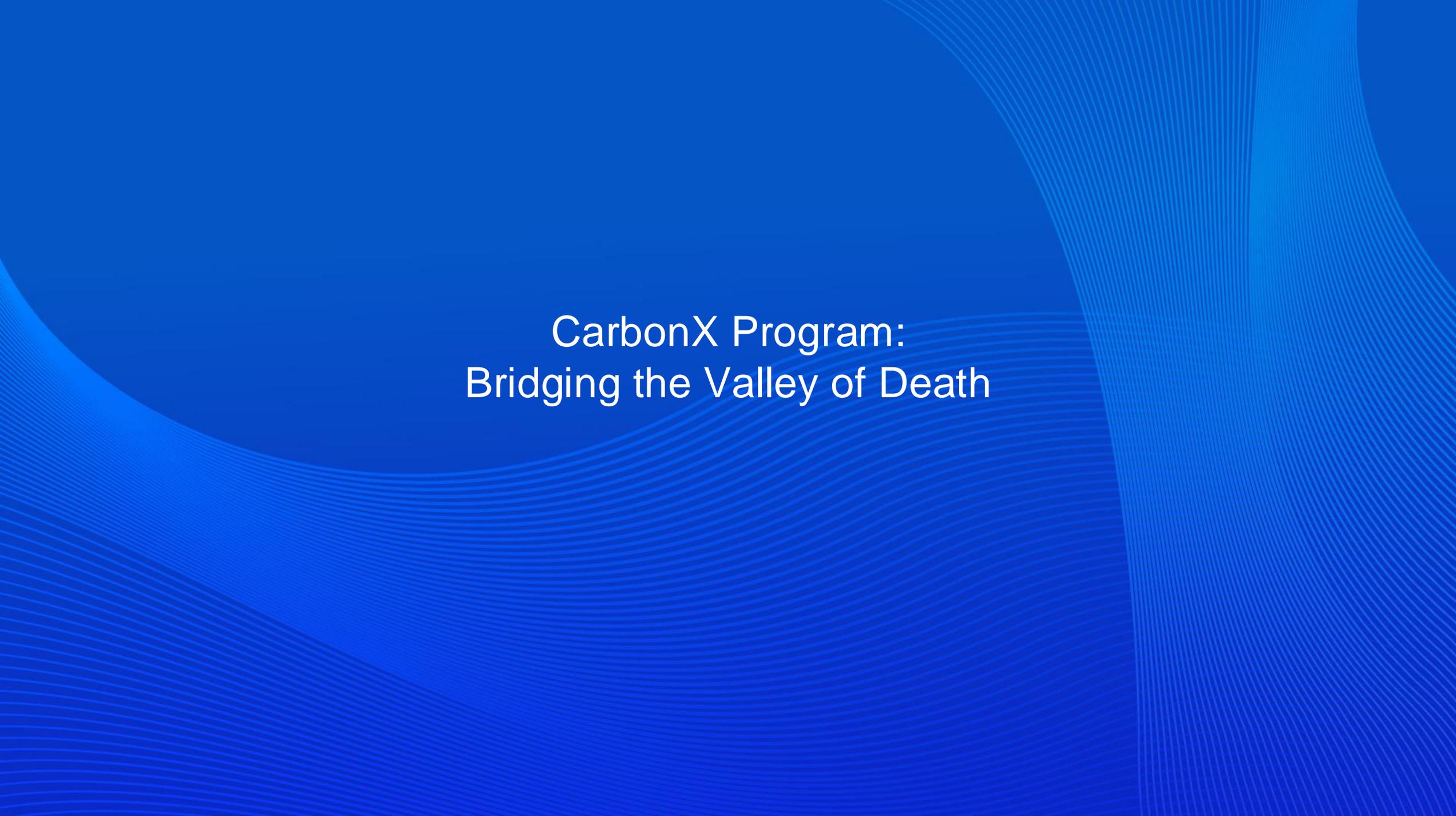
Data: Lafond et al. (2017) and IRENA Database; the reported learning rate is an average over several studies reported by de La Tour et al (2013) in Energy. The rate has remained very similar since then.  
OurWorldinData.org - Research and data to make progress against the world's largest problems.

Licensed under CC-BY by the author Max Roser

# Global Renewable Energy Capacity Ranking in 2023

Rank	Hydro	On Shore Wind	Off Shore Wind	Solar PV	CSP	Biomass	Geoth.	Ocean	Total
1	China 422 GW	China 405 GW	China 37 GW	China 609 GW	Spain 2.30 GW	China 31 GW	USA 2.7 GW	Korea 0.256 GW	China 1454 GW
2	Brazil 110 GW	USA 148 GW	UK 15 GW	USA 138 GW	USA 1.48 GW	Brazil 18 GW	Indonesia 2.6 GW	France 0.211 GW	USA 385 GW
3	USA 103 GW	Germany 61 GW	Germany 8 GW	Japan 89 GW	China 0.57 GW	USA 11 GW	Philippine 1.9 GW	UK 0.022 GW	Brazil 194 GW
4	Canada 83 GW	India 45 GW	Netherl. 4 GW	Germany 81 GW	Morocco 0.54 GW	India 11 GW	New Zealand 1.0 GW	Canada 0.021 GW	India 176 GW
5	Russia 52 GW	Spain 31 GW	Danmark 4 GW	India 73 GW	South Africa 0.50 GW	Germany 10 GW	Mexico 0.9 GW	China 0.005 GW	Germany 167 GW
Global	1407 GW	944 GW	73 GW	1411 GW	6.9 GW	149 GW	15.0 GW	0.508 GW	3865 GW

Source: IRENA: Global Renewable Energy Statistics 2024; CSP=Concentrated Solar Power

The background is a solid blue color with a pattern of white, wavy, concentric lines that create a sense of depth and movement. The lines are most prominent on the right side, where they form a large, curved shape that resembles a stylized letter 'C' or a similar abstract form. The overall effect is modern and dynamic.

# CarbonX Program: Bridging the Valley of Death

# The Valley of Death for Emerging Technologies

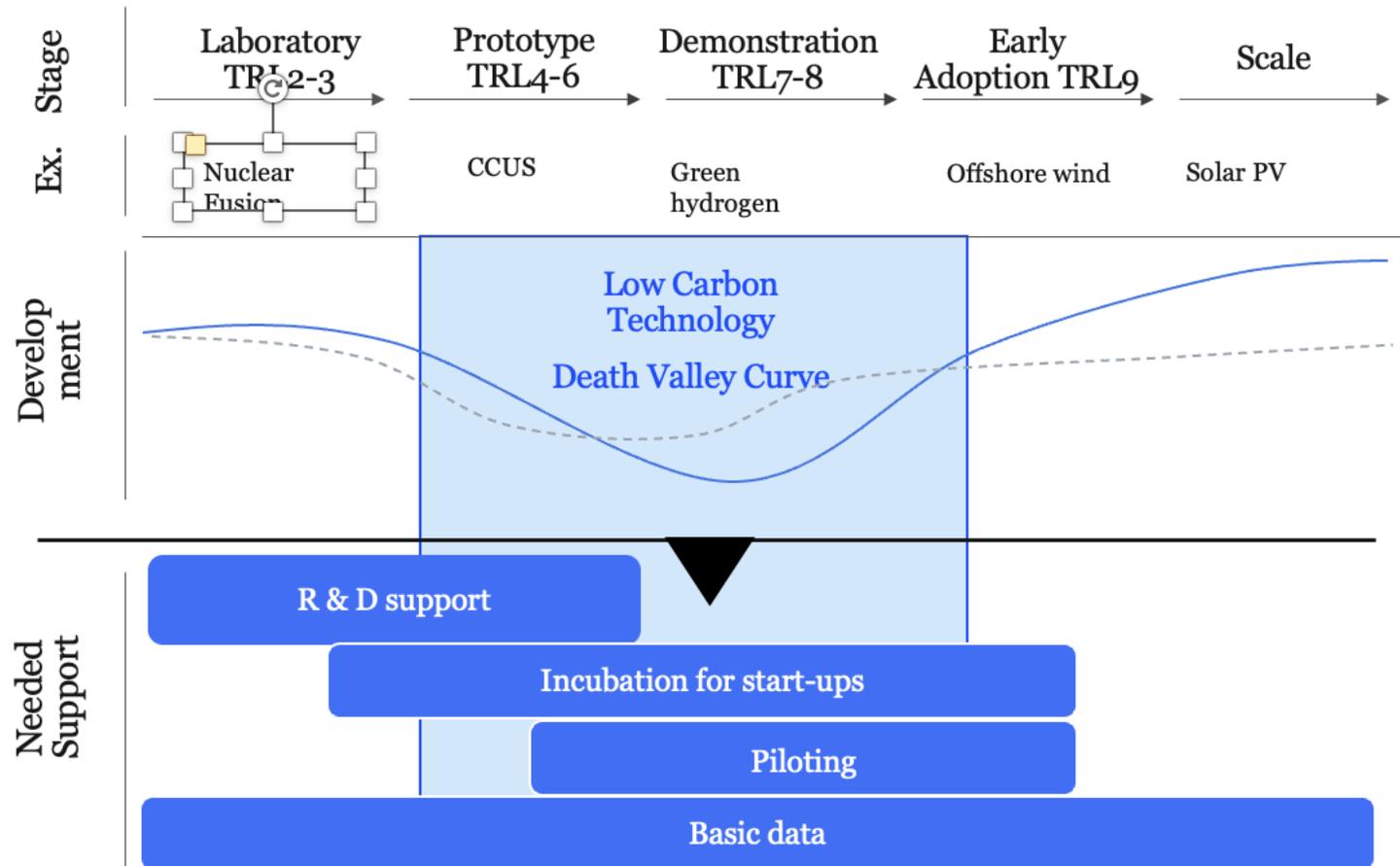


腾讯元宝AI生成

The "valley of death »: the gap between scientific research and commercial success, where many promising technologies fail to make the transition from the laboratory to the market.

- **Funding Gap:** Many projects struggle to secure sufficient funding during this phase, as they are still in the early stages of development and may not have demonstrated significant commercial potential.
- **Market Acceptance:** Even if a technology is technically sound, it may face resistance from the market if it does not meet specific user needs or if the market is not ready for the technology.
- **Technical Challenges:** During the development process, unforeseen technical hurdles can arise, making it difficult to bring the technology to market.

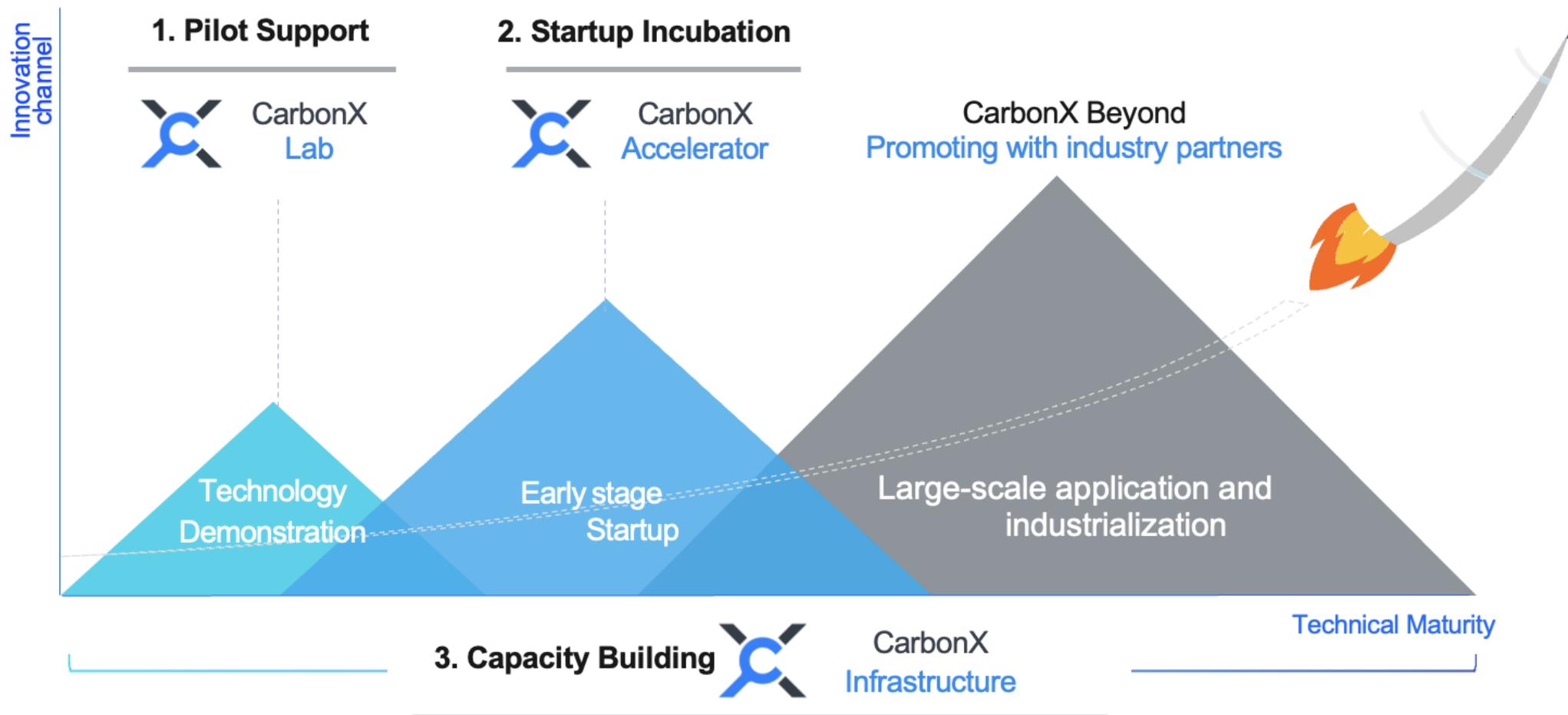
# Low Carbon Technology Beyond Death Valley Curve



- More than 30% of the technologies needed to achieve carbon neutrality have not yet been commercialized.
- It will take five years or more for the market to embrace innovation on a large scale .

Source:  
International Energy Agency

# CarbonX program for the cutting-edge techs

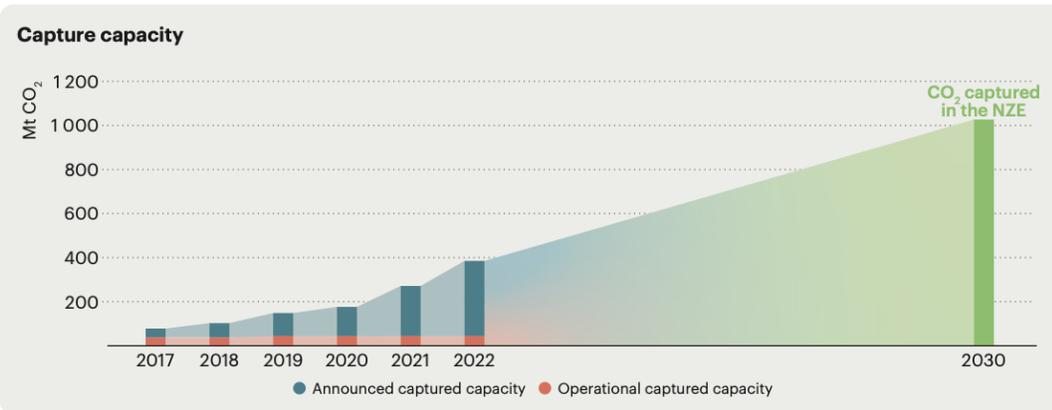


# Role of CCUS in Achieving Carbon Neutrality

## Carbon capture, utilisation and storage

If all announced CO<sub>2</sub> capture capacity is realised and the current growth trend continues, global capacity could reach NZE levels by 2030. Reducing project lead times, particularly related to the development of CO<sub>2</sub> storage, will be critical to achieve those levels.

**8%**  
OF CUMULATIVE  
EMISSIONS  
REDUCTIONS

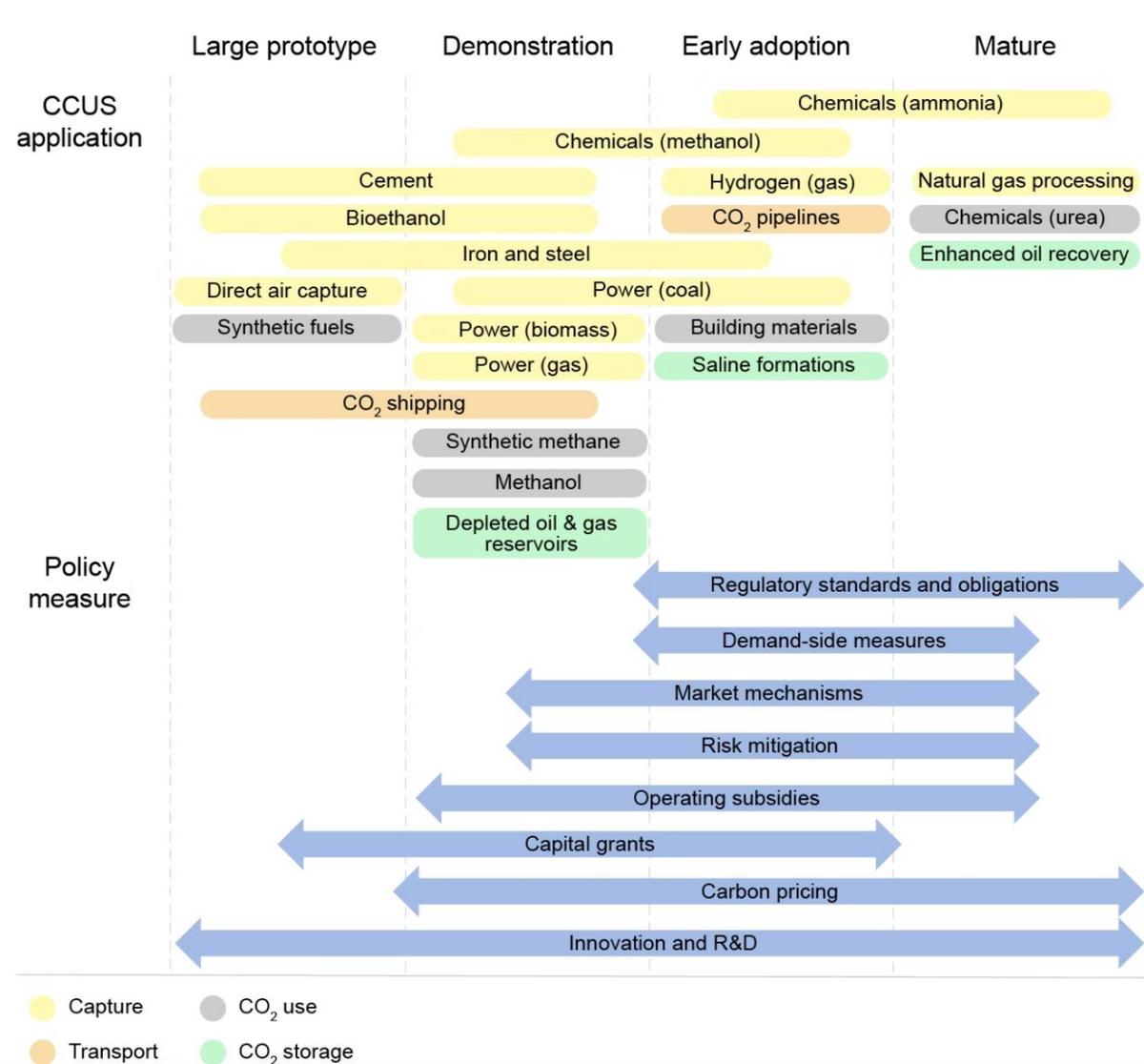


Milestones	2022	2030	2035	2050
<b>Total CO<sub>2</sub> captured (Mt CO<sub>2</sub>)</b>	<b>45</b>	<b>1 024</b>	<b>2 421</b>	<b>6 040</b>
<b>CO<sub>2</sub> capture from fossil fuels and industrial processes</b>	<b>44</b>	<b>759</b>	<b>1 712</b>	<b>3 736</b>
Power	1	188	568	811
Industry	4	247	769	2 152
Merchant hydrogen	0	161	285	756
Other fuel transformation	38	163	90	17
<b>CO<sub>2</sub> capture from bioenergy</b>	<b>1</b>	<b>185</b>	<b>506</b>	<b>1 263</b>
Power	0	44	204	438
Industry	0	23	77	232
Biofuels production	1	114	213	474
Other fuel transformation	0	5	13	121
<b>Direct air capture</b>	<b>0</b>	<b>80</b>	<b>203</b>	<b>1 041</b>
<b>Total CO<sub>2</sub> removed (Mt CO<sub>2</sub>)</b>	<b>1</b>	<b>234</b>	<b>632</b>	<b>1 710</b>

The International Energy Agency's assessment projects that, under a "net zero emissions scenario" for the global energy system by 2050, the annual CO<sub>2</sub> capture requirement will be 6.04 billion tons globally.

This includes 3.736 billion tons from fossil fuels, 1.263 billion tons from biomass energy, and 1.041 billion tons from DAC technology. Cumulatively, from now until 2050, when the global net-zero economy is anticipated, CCUS is projected to contribute 8% to emission reduction efforts.

# TRL of select technologies along the CCUS value chain



- CCUS technologies are at varying levels of maturity today.
- There is a disconnect between the level of maturity of individual CO<sub>2</sub> capture technologies and the areas in which they are most needed.
- CCUS applications that will require a major innovation push include chemicals and steel production, gas-fired power generation, BECCS and DAC.

# CarbonX Program 1.0 in 2024: CCUS in China



## Innovation and application

To promote innovation, piloting and sizable application of CCUS in China



## Capability building

Promote the set-up of industry norms and build capabilities



### Projects

1

#### CarbonX Lab

- For: universities and research institutes etc.
- To support the first pilot out of lab

2

#### CarbonX Accelerator

- For: early startups
- To speed up the incubation of startups with business potential

3

#### CarbonX Infrastructure

- For: government, NGOs, and universities etc.

### Initiatives

**Support several pilots with a total funding of hundreds of millions RMB**

- Capacity less than 1000 tonnes
- Single project funding ranges from millions to dozens of millions RMB
- Partners will provide use case scenes

**Speed up the incubation of several high-potential startups**

- Top-tier course and expert support
- Partner resources sharing
- Tencent equity investment (selective)

**Support several capability building projects with a total funding of dozens of millions RMB**

- Target bottle-neck tools, norms etc.
- Single project funding up to millions RMB
- Tencent digital team support

### Scope



Capture

Industrial source, DAC etc.



Storage

Geological storage, mineral carbonation etc.



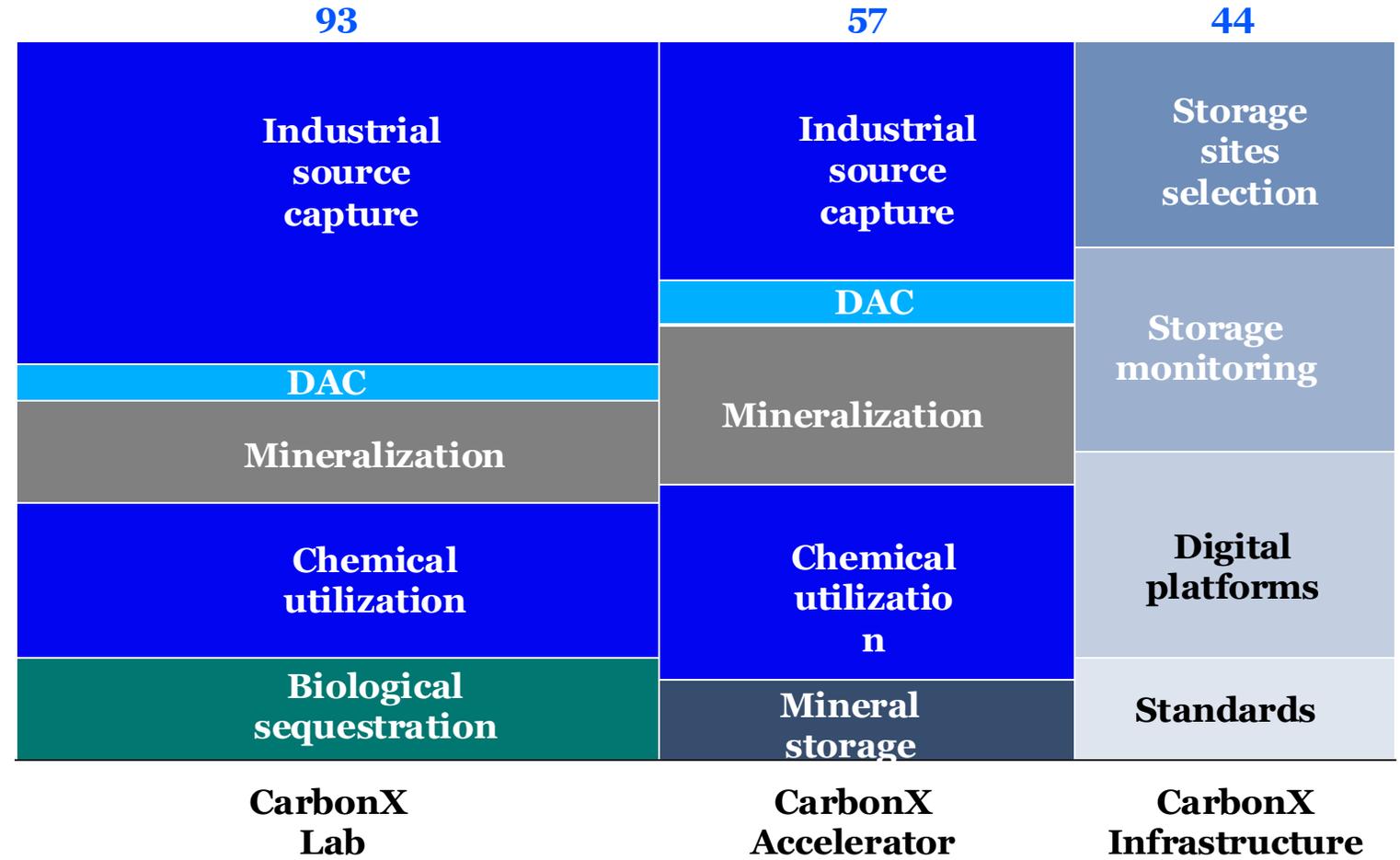
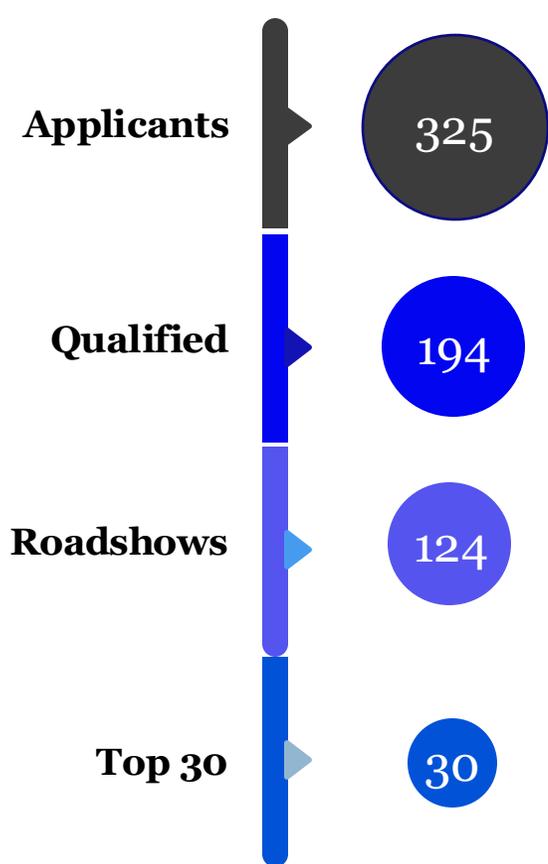
Utilization

Mineral, chemical, biological, geological etc.

MRV tools

Digital tools or solution (storage siting data base, source sink matching data base, storage modeling etc.)

# CarbonX program for CCUS: Profile of 300+ Applicants



# CarbonX program for CCUS : "3Is" Evaluation Criteria

The evaluation criteria are anchored by the "3Is":

- Innovation: This criterion seeks solutions that address critical challenges within the CCUS domain, demonstrating a notable leap forward from current technologies or methodologies.
- Impact: It evaluates the potential for substantial contributions to carbon storage, the capacity for market expansion, or the magnitude of cost reduction.
- Implementation: This aspect gauges the project's preparedness for real-world application, aligning with the tangible requirements of industry collaborators.

# The CarbonX 2.0 in 2025 solicits technical proposals globally

## Collaborate with global partners to design the tech demonstration scenarios

**First round: Select the top 10-20 teams in each scenario**

### Main Support

**Second round: 1-3 final winning teams in each scenario will be selected; the CarbonX Program will support them in constructing first-of-its-kind pilots with millions to tens of millions RMB in funding; estimated total budget is ~120-150 million RMB**

**Launch the MRV Initiative with international organizations; estimated budget is ~20-30 million RMB**

### Financial attributes

- For: **Universities, research institutes, and other non-profit organizations**
- **Grants:** Direct grant support for demonstration pilot projects

- For: **Early-stage startups**
- **Grants + future investment terms:** grant support for pilot demonstration projects and future equity investment rights through warrants

- For: **Universities, research institutes, and other non-profit organizations**
- **Grants:** Targeted support for select MRV projects

### Demonstration Scenarios



Kenya  
DACCS



Maldives  
Long-duration Energy Storage



Serbia  
CCUS of Steel Industry



CarbonXmade  
CO2 Utilization in Consumer Products



Measurement, reporting and verification of carbon reduction and sequestration benefits of cutting-edge technologies (MRV)



**CarbonX Lab & CarbonX Accelerator**

**CarbonX Infrastructure**

# Long Duration Energy Storage

## Why? A Maldives residential island?



Appropriate project Scale, quick increase on ratio of RE, suitable application scenarios for LDES.



Mainly rely on imported diesel, RE+ES can significantly reduce energy costs and carbon emissions.



ADB POISED program, great project foundation.

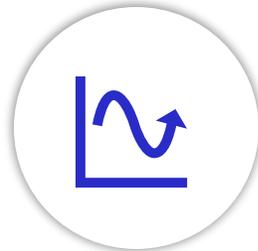
## Selection Targets

100s-kilowatt scale  
6 hours+ of storage

non-lithium  
ion

next-generation  
technologies

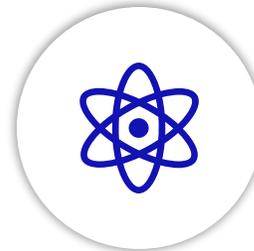
## Challenges and opportunities



50%-80%

### Significant increase of RE Generation

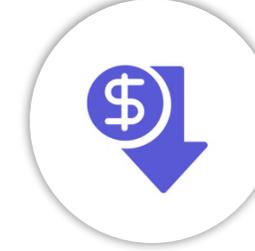
- Grid fluctuations are increasing; large-scale long-duration energy storage is crucial for power transition.



N+technologies

### Uncertainties of technology directions

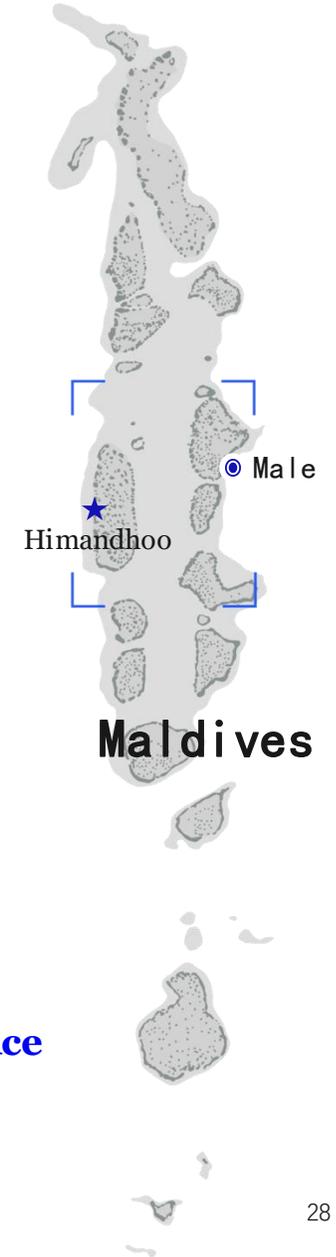
- Lack of definitive technologies across scenarios hinders supporting industrial chain development.



~90%

### Great potential for systematical cost reduce

- Current long-duration storage systems are costly, with a 90% cost-reduction potential.



# Island Selection

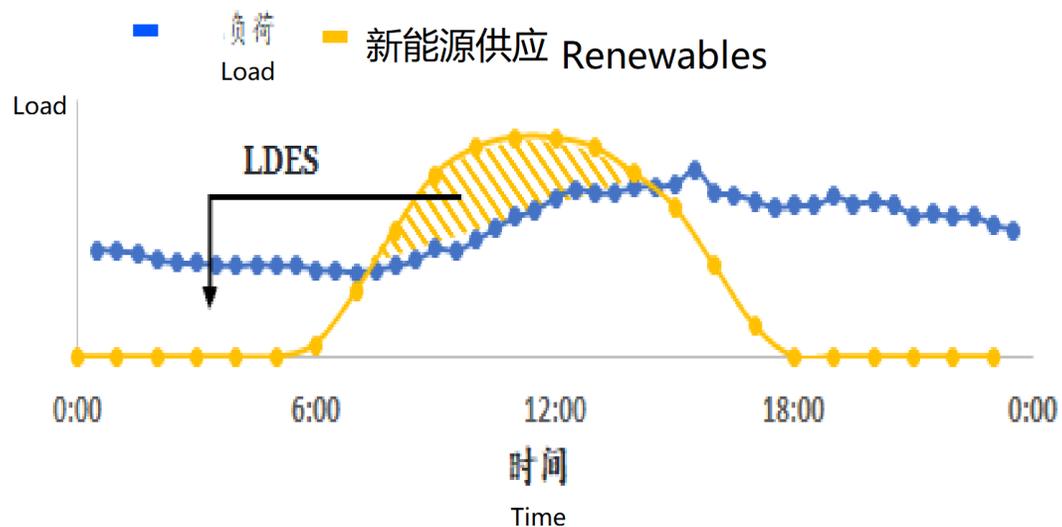


## Recommended by Ministry

- Himandhoo island.
- Extra PV installation on lagoon (approx. 1MW PV 70m\*70m; )
- Energy storage near STELCO power plant (approx. 150kW/900kWh)



Floating PV



Flow Battery



Compressed air energy storage



Gravity energy storage



Metal Storage Battery

# Expert Committee of the CarbonX Program 2.0

## Co-Chairs of the Expert Committee



**金红光 院士**  
**Hongguang JIN**  
Academician, Chinese Academy of Sciences



**姜培学 院士**  
**Peixue JIANG**  
Academician, Chinese Academy of Sciences  
Vice President, Tsinghua University



**严晋跃 院士**  
**Jinyue YAN**  
Academician, European Academy of Sciences and Arts



**黄晶 主任**  
**Jing HUANG**  
Expert Member, National Climate Change Expert Committee



**Sally Benson**  
Stanford University  
美国AAAS院士

## Members of the Expert Committee



**高林**  
**Lin GAO**  
Researcher, Huairou Laboratory



**李小春**  
**Xiaochun LI**  
Researcher, Institute of Rock and Soil Mechanics, Chinese Academy of Sciences



**梁斌**  
**Bin LIANG**  
Professor, Sichuan University



**梁希**  
**Xi LIANG**  
Secretary-General, Guangdong CCUS Center



**林千果**  
**Qianguo LIN**  
Vice-Dean, Research Institute of Carbon Neutrality, Shanghai Jiao Tong University



**罗海中**  
**Haizhong LUO**  
Director, Environmental Protection Center, China Energy Engineering Group Guangdong Electric Power Design Institute CO., LTD.



**马新宾**  
**Xinbin MA**  
Vice-President, Tianjin University



**魏伟**  
**Wei WEI**  
Vice-Dean, Shanghai Advanced Research Institute, Chinese Academy of Sciences



**胥蕊娜**  
**Ruina XU**  
Professor, Department of Energy and Power Engineering, Tsinghua University



**杨晓亮**  
**Xiaoliang YANG**  
China Country Manager, Global CCS Institute



**张九天**  
**Jiutian ZHANG**  
Executive Director, Green Development Institute, Beijing Normal University



**赵良**  
**Liang ZHAO**  
Vice-Dean, School of Sustainable Energy and Resources, Nanjing University



**张华民**  
**Huamin ZHANG**  
Chief Researcher, Dalian Institute of Chemical Physics, Chinese Academy of Sciences (CAS)



**Makoto Akai**  
Professor, National Institute of Advanced Industrial Science and Technology (AIST), Japan, one of the founding directors of GCCSI, and lead author of the IPCC CCS Special Report.



**Jarad Daniels**  
CEO, Global CCS Institute



**Tim Dixon**  
Director and General Manager, IEAGHG



**Julio Friedmann**  
Chief Scientist, Carbon Direct



**Niall Mac Dowell**  
Professor in Energy Systems Engineering, Imperial College London



**Christopher Jones**  
Georgia Tech  
美国国家工程院院士



**David Keith**  
Harvard University  
IPCC CCS 特别报告主要作者, DAC 专家



**Klaus S. Lackner**  
Founding Director and Professor, Center for Negative Carbon Emissions, Arizona State University



**Justin Raade**  
Principal Project Manager, Electric Power Research Institute



**Julia Souder**  
CEO of the Long Duration Energy Storage Council (LDESC), Chair of the Global Renewables Alliance



**Olufunso Somorin**  
Regional Principal Officer, Climate Change and Green Growth Program, African Development Bank (AfDB)



**Priyantha Wijayatunga**  
Chief of Energy Sector Group, Asian Development Bank (ADB)



**Jennifer Wilcox**  
Presidential Distinguished Professor of Chemical Engineering and Energy Policy, the University of Pennsylvania

## Convenor of the Expert Committee



**翟永平**  
**Yongping ZHAI**  
Tencent  
Senior Advisor for Carbon Neutrality



**吕学都**  
**Xuedu LYU**  
Tencent  
Senior Advisor for Carbon Neutrality

## Secretary-General of the Expert Committee



**张贤**  
**Xian ZHANG**  
Director, Administrative Center for China's Agenda 21, Ministry of Science and Technology

\*To be finally confirmed

# CarbonX Program 2.0 Partners

\* Please note that this list is not final and is not comprehensive



**Industry Partners**



**Investment Partners**

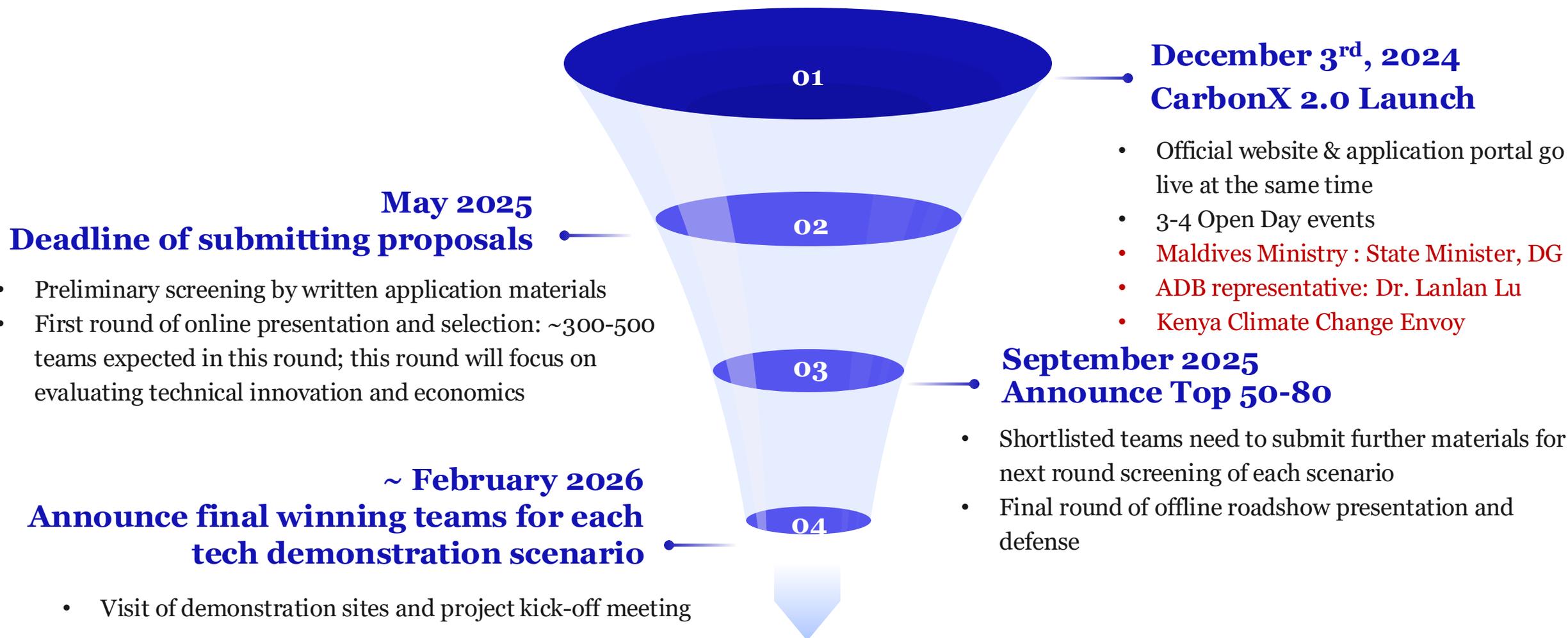


**Ecosystem Partners**



# Timeline and Selection Process Overview

\* Please note that the specific schedule and arrangements may be subject to adjustments throughout the program.





# CarbonX 2.0

## Boundless Innovation

Application Guide

Apply Now 

<https://carbonxprogram.com/en>

AI Powered Tan Live for Low Carbon Innovation Community

# Need for Reliable, Detailed, and Systematic Climate-tech Informatio

## Adopters

“ We need beyond news: we are looking to learn **ground-up practices** and **know-how**



**Sustainability head at a mid-sized cosmetics company:**

**How can we gain a **systematic** view to decarbonize the entire value chain? Who are the potential solution providers?**

## Innovators

“ We need beyond funding: we are looking for **comprehensive support at different stages**



**Founder at a series A startup in energy:**

**Who are the large corporates that are open to pilot collaboration? What are the other funding sources we could look at besides equity?**

## Investors

“ We need info beyond company basic : we want benchmark the **technology, product, and industry practice worldwide**



**VC Investor in climate tech:**

**How can we have more pipelines of a specific tech area? Where can we learn comparable products and solutions in other countries?**



## 资源星球

开放性共创低碳资源库

Programs

“Github” for climate-tech supporting resources



## 创新库

低碳解决方案聚合数据库

Solutions+Innovators

Showroom for Climate innovators and climate technologies, bridging innovators, adopters and investors



## 工具实验室

数据与洞察工具库

Tools

Gadget box for climate-tech data and insights



# 双碳创新者的引擎与生态 Eco-system for Climate Tech Innovator

## 4. 跨平台的账户互通



## 碳LIVE Passport

开放的共创站点联邦基础，低碳社区用户、信息互通体系

TanLIVE Passport

Open federation basis for partner nodes to exchange info



Shanghai



MAKEABLE.CN

PLUGANDPLAY CHINA

璞跃中国

能见

# Innovate for Climate Tech Coalition



## Facilitator

## Program

## Knowledge

## Rollout



## Anchor



# AI Climate Knowledge Partner Program

AI and large models have driven innovation in many fields. How can organizations in climate sector also leverage these technologies?

TanLIVE empowers partners with free AI tools: to build your own AI conversational robot without any coding; to automatically parse complex reports into knowledge maps. This program aims to foster the promotion of climate technologies and knowledge.

Apply Now

 AI Chat

 AI Parsing

Interested in building your own AI bot?  
Visit <https://tanlive.com/@aipartners>



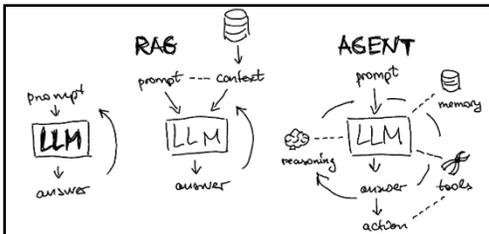
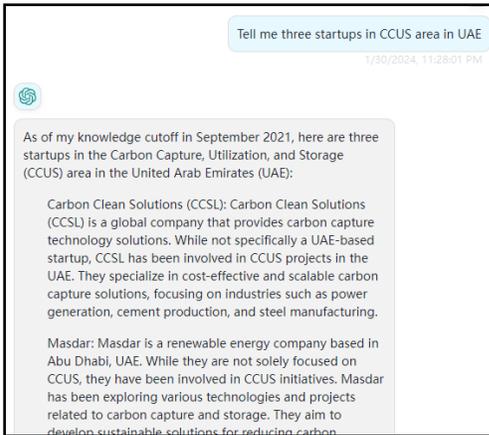
# Build-your-own LLM Conversational Robot with TanLive



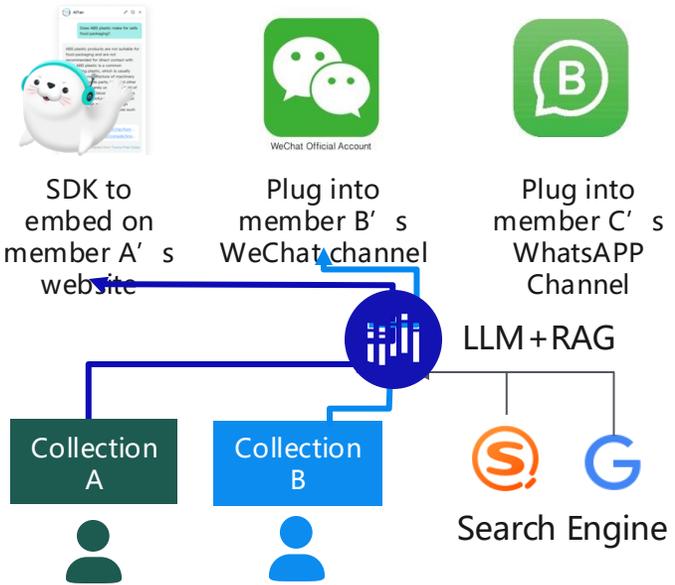
The current general LLMs cannot differentiate the professionalism and relevance of public knowledge, which often result in inaccurate information or vague expressions when answering related questions.



Building dialogue-style LLMs based on one's own accumulated knowledge base involves multilingual embedding, RAG, Langchain, and LLM prompt engineering, etc. Low-carbon professional organizations may need to invest a lot of IT resources to build from scratch.

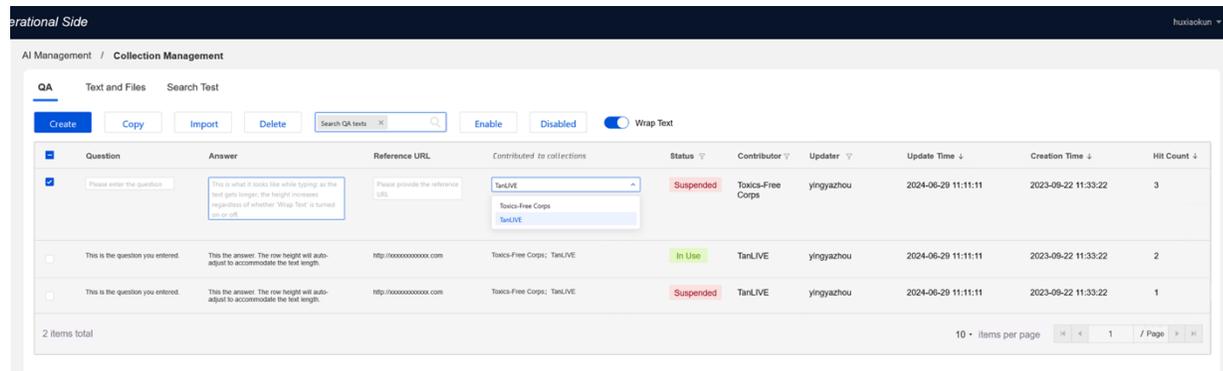


## How to build your own robots?\*

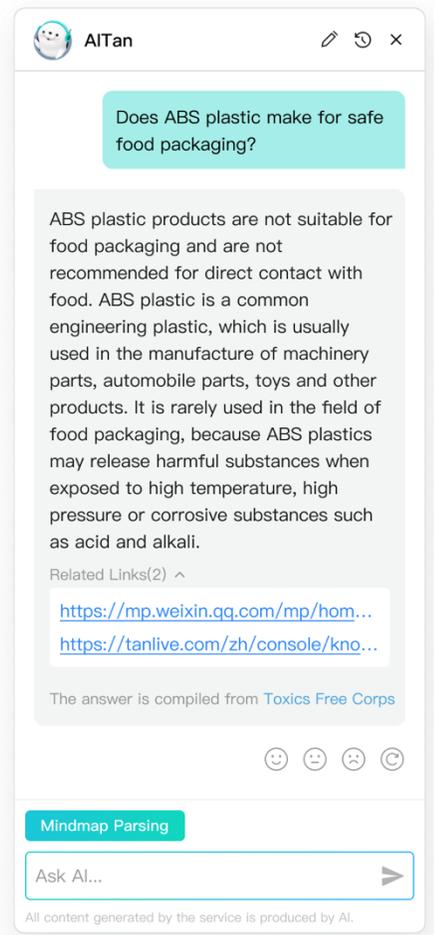


② Choose your desired channel and help with the plug-in

① Each member edits/import its own collection(knowledge base) on a GUI  
Collection supports QA, text, pdf, docx



## What you will get



\*Free to all non profit organizations or non-profit projects of for-profit organizations

# Use Cases of Build-your-own LLM Conversational Robot

## Enjoy alone

### Fast Search



Search contents in 100 pdfs within 5 seconds

- Already have abundant reports published on your website. Enable users to search contents in one stop
- Get cross-document summarization

### Interact



Interact with users with your organization knowledge base

- Education
- Publish new reports/insights also in conversational mode
- Real-time answer to customers with accumulated organizational knowledge

## Enjoy with others

### Community



Share knowledge to others' robots

- Share each piece of the knowledge to others' AI robots by easy-switching on/ off the share function on GUI
- Broadcast your knowledge, let the users of other robots can show your knowledge, with reference leading to your organization

How About the Impact of AI on Carbon Neutrality?

# Warning from Elon Musk

“I’ve never seen any technology advance faster than this. The chip shortage may be behind us, but AI and EVs are expanding at such a rapacious rate that the world will face supply crunches in electricity and transformers next year.

The artificial intelligence compute coming online appears to be increasing by a factor of 10 every six months. Like, obviously that cannot continue at such a high rate forever, or it'll exceed the mass of the universe, but I've never seen anything like it. The chip rush is bigger than any gold rush that's ever existed.”

——Elon Musk, Bosch Connected World conference, 1 March 2024

TECHNOLOGY

## Elon Musk: AI will run out of electricity and transformers in 2025

By Loz Blain  
March 01, 2024



Elon Musk gave a closing Q&A (albeit a remote one) at the Bosch Connected World conference [Bosch Connected World conference](#)

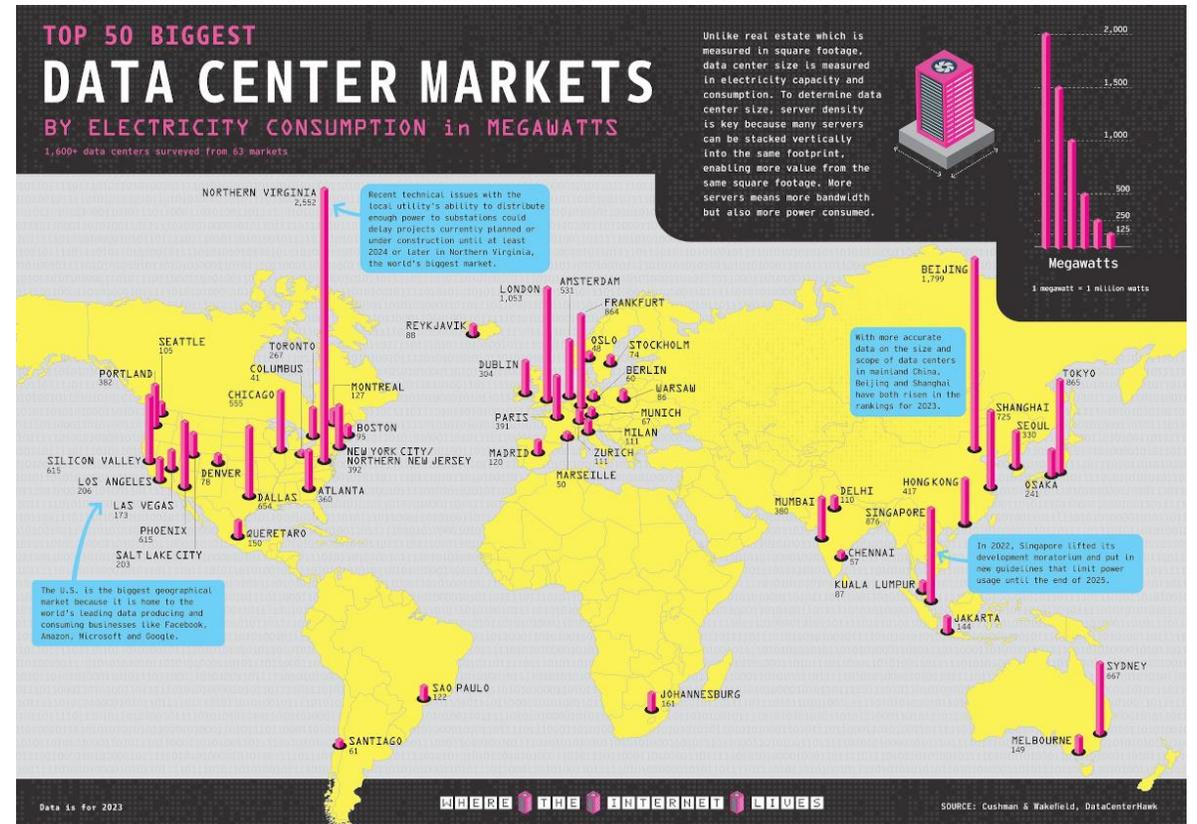
# Global internet traffic increased 25 times since 2010

Since 2010, the number of global Internet users has more than doubled, while global Internet traffic has increased 25 times.

In 2022, global data centers, cryptocurrencies, and artificial intelligence consumed approximately 460 TWh electricity, accounting for approximately 2% of the total global electricity demand.

The carbon emissions of global data centers and related data transmission networks are approximately 330 million tons of carbon dioxide equivalent (including implicit carbon), equivalent to 0.9% of global energy related greenhouse gas emissions.

Source: International Energy Agency

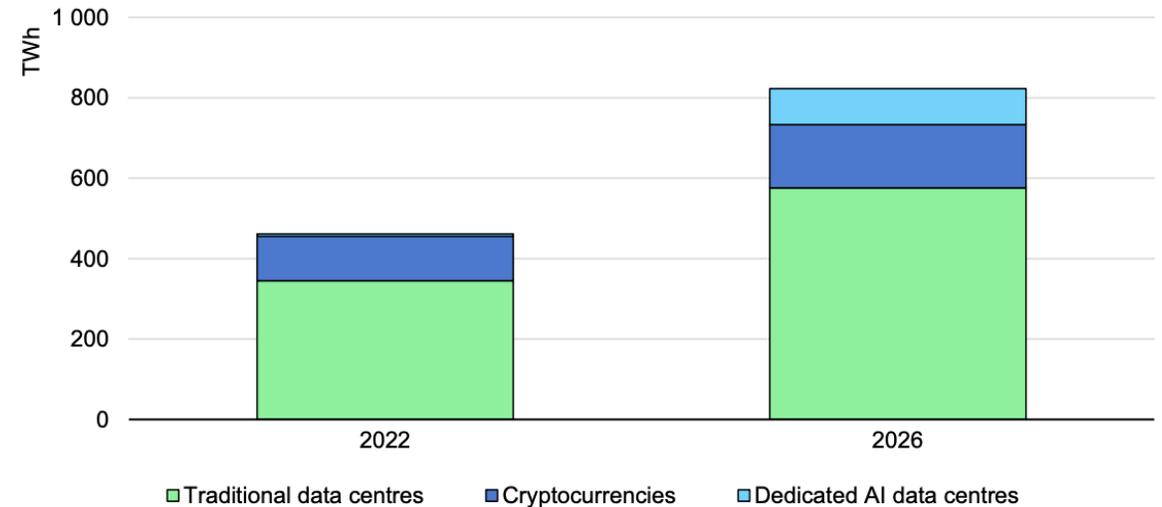


# International Energy Agency's predictions

The global electricity consumption related to data centers (including artificial intelligence) will reach 800–1100 TWh in 2026.

Based on this, it is estimated that the corresponding carbon emissions are approximately 560–770 million tons.

Estimated electricity demand from traditional data centres, dedicated AI data centres and cryptocurrencies, 2022 and 2026, base case



IEA. CC BY 4.0.

Note: Data centre electricity demand excludes consumption from data network centres.

Sources: IEA forecast based on data and projections from [Data Centres and Data Transmission Networks](#); Joule (2023), Alex de Vries, [The growing energy footprint of artificial intelligence](#); Crypto Carbon Ratings Institute, [Indices](#); Ireland Central Statistics Office, [Data Centres Metered Electricity Consumption 2022](#); and Danish Energy Agency, [Denmark's Energy and Climate Outlook 2018](#).

# However, AI applications can also reduce emissions!

The high energy consumption and potential carbon emissions brought about by AI applications cannot be viewed in isolation, as AI can reduce energy consumption and emissions.

After considering the carbon emissions of AI (ChatGPT) and comparing them with those using laptops or desktops to write the same page, AI writing one page of text emitted 130 to 1500 times less carbon dioxide than people writing one page of text.

And, the new generation of AI (eg Deep Seek) consumes 1/10 of the previous AI models!

**Table 4: Carbon footprint (grams CO<sub>2</sub>e) for using a human (in the states) versus AI (BLOOM/Midjourney) for certain tasks**

	AI	Laptop	Desktop	Human
<b>Writing a page of text</b>	0.95	27	72	1,400
<b>Creating an image</b>	1.90	100	280	5,500

According to the SMARTer2030 report released by the Global Initiative for Sustainable Development (GeSI) and Accenture, the widespread application of digital technology will enable other industries to significantly reduce carbon emissions. By 2030, various industries will benefit from the reduction of carbon emissions from digital technology, which is about 10 times that of the digital industry itself.

# About AI's energy consumption, what does AI say?



Artificial intelligence and big language models consume a lot of energy, so will their widespread application contribute to carbon neutrality? Can you make the answer short so it can fit in half page of a ppt slide

## 腾讯混元助手

AI & large language models (LLMs) do consume significant amounts of energy, primarily due to the computational requirements of training and running them. This energy consumption contributes to carbon emissions, as most electricity is still generated from fossil fuels.

However, the relationship between AI/LLMs and carbon neutrality isn't straightforward. Here are some key points:

1. **Energy Efficiency:** Technological advancements are improving the energy efficiency of hardware used for AI/LLMs, which can help reduce their carbon footprint.
2. **Renewable Energy:** The trend towards using renewable energy sources (e.g., solar, wind) to power data centers is growing. If AI/LLMs are powered by renewables, their net carbon impact could be reduced.

3. **Carbon Offsetting:** Some organizations invest in carbon offset projects to mitigate the emissions caused by their AI/LLM operations.
4. **Indirect Benefits:** AI/LLMs can potentially contribute to carbon reduction efforts by optimizing energy usage in other sectors, enabling more efficient manufacturing processes, or supporting climate modeling and prediction.
5. **Widespread Application Impact:** Whether the widespread application of AI/LLMs will contribute to carbon neutrality depends on several factors, including the balance between energy consumption and efficiency improvements, the adoption of renewable energy, and the overall carbon management strategies adopted by governments and organizations.

In summary, while AI/LLMs do contribute to carbon emissions, their impact on carbon neutrality will depend on how effectively their energy consumption is managed and the extent to which they can support broader carbon reduction efforts.

## CHINA HELPS OXFORD'S FIRST LIGHT FUSION CLOSE \$45 MILLION FUND RAISE

15th February 2022



**First Light Fusion**, the Oxford company researching energy generation via inertial fusion, has closed its Series C fund raise, raising \$45 million from both existing and new investors.

Existing investors who have backed the fund raise include **Oxford Science Enterprises** (formerly OSI), **Hostplus** and **IP Group plc**. New investors include **Braavos Capital** and the Chinese multinational company **Tencent**.

2021 has been another year of significant development for First Light Fusion. The Company procured, installed and commissioned its latest piece of equipment, a two-stage hyper-velocity gas gun nicknamed the “Big Friendly Gun” or BFG, which at 22 metres long and weighing 25,000 kg, is the largest of its kind in the UK. The BFG fires a 100 g projectile at a velocity of 6.5 km/s or 14,500 mph (about 20 times the speed of sound) into the “target”, the centre piece of First Light’s unique technology. The BFG complements First Light’s electromagnetic launch device “Machine 3” enabling the team to explore a different parameter space by launching larger but “slower” projectiles.



The background is a solid blue color with a pattern of white, wavy, concentric lines that create a sense of depth and movement. The lines are more densely packed in some areas and more spread out in others, creating a dynamic, organic feel.

# Tencent Carbon Neutrality Strategy

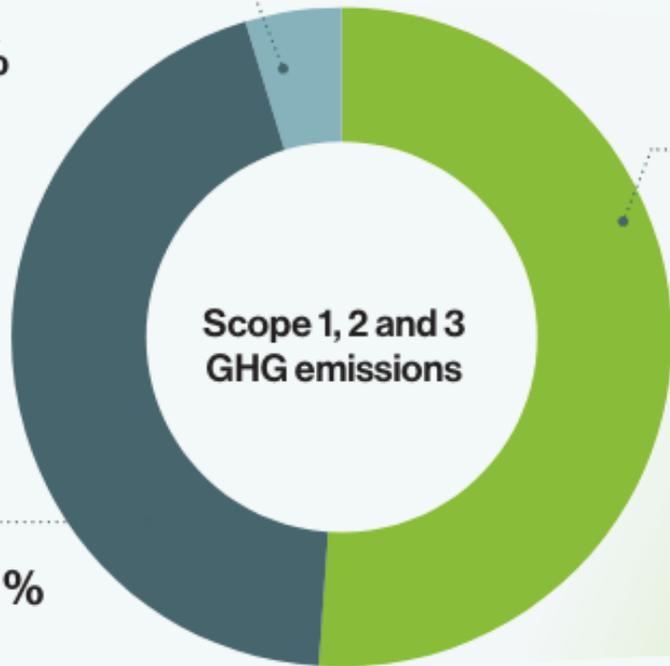
## Internal: Target and Road Map

# Tencent: Breakdown of emissions by the type of sources

In 2023, Tencent's total GHG emissions were 5,793,823.7 tCO<sub>2</sub>e.

Scope 1  
**4.75%**

Scope 2  
**44.21%**



Scope 3  
**51.04%**

Scope 3 emissions categories

Purchased goods and services  
0.05%

Capital goods  
17.60%

Fuel- and energy-related activities (not included in scope 1 or scope 2)  
22.43%

Upstream transportation and distribution  
0.34%

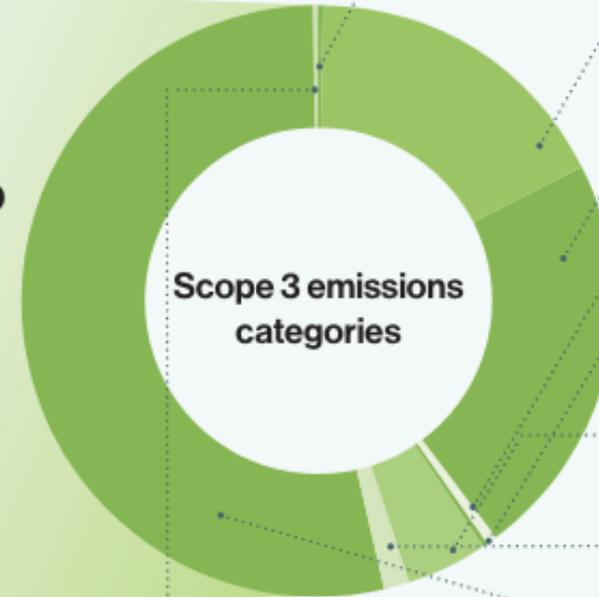
Waste generated in operations  
0.03%

Business travel  
4.35%

Employee commuting  
1.30%

Upstream leased assets  
53.83%

Downstream leased assets  
0.07%



# Our carbon neutrality target and roadmap

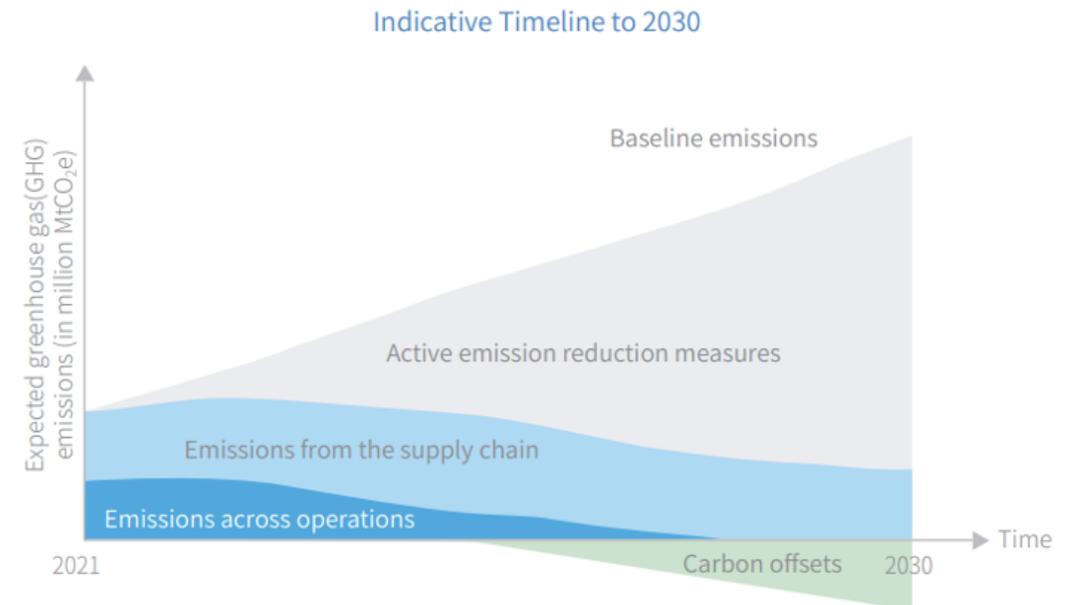
## Comprehensive Roadmap



By **2030**:  
**Carbon Neutrality of self operations and supply chain**

By **2030**:  
**100% Renewable Energy utilized**

## Indicative timeline and measures



# 3 Key initiatives to achieve Tencent's self carbon-neutrality

## Energy Efficiency



### Energy Efficiency Datacenter Design:

- Modularization
- Power supply optimization
- IT usage optimization
- Cooling optimization
- Site selection
- Load optimization



### Energy Efficiency Building:

- LEED certification
- Employee education

## Renewable Energy



### Renewable Energy procurement:

- Sourcing long term renewable energy contract



### Distributed RE and microgrid

- Installing onsite solar, wind turbine and batteries
- Optimize microgrid energy flow



## Low Carbon supply chain and offset



### Advocate for low carbon supply chain

- Partnership with suppliers on low carbon servers procurement and rented datacenters
- Low carbon construction materials sourcing



### Carbon offsets:

- Exploring nature-based solutions such as marine and forestry carbon sink
- Support carbon offset technology development

以史为镜，可知兴替

Taking history as a mirror, you can see the ups and downs

# 2025: Fixing CO<sub>2</sub> (back) into Stone

CarbonX 2.0 will support direct air capture of CO<sub>2</sub> and pilot the sequestration of CO<sub>2</sub> through mineralization in Kenya – turning CO<sub>2</sub> into stone!





# THANKS

/ FOR WATCHING

科技向善 共享发展

TECH FOR GOOD, TOGETHER FOR BETTER