

# The 2021 Global Energy Innovation Index: National Contributions to the Global Energy Innovation System

David Hart, Senior Fellow and Director  
ITIF Center for Clean Energy Innovation

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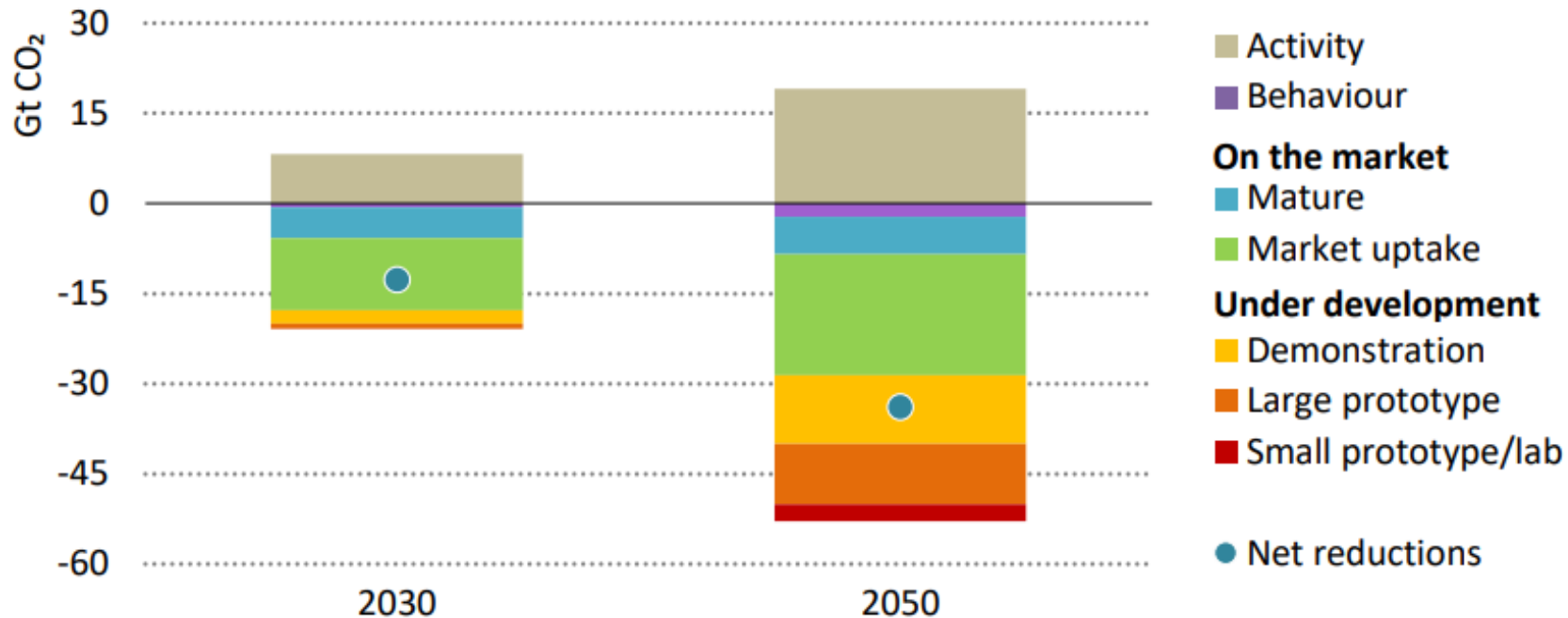
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@ProfDavidHart

# The Climate & Clean Energy Innovation Imperative

Nearly **half** of annual emissions reductions necessary to decarbonize the global economy by **2050** will likely come from technologies that are in the demonstration or prototype stage.

Global CO<sub>2</sub> emissions changes by technology maturity category in the IEA Net-Zero Emissions by 2050 Scenario



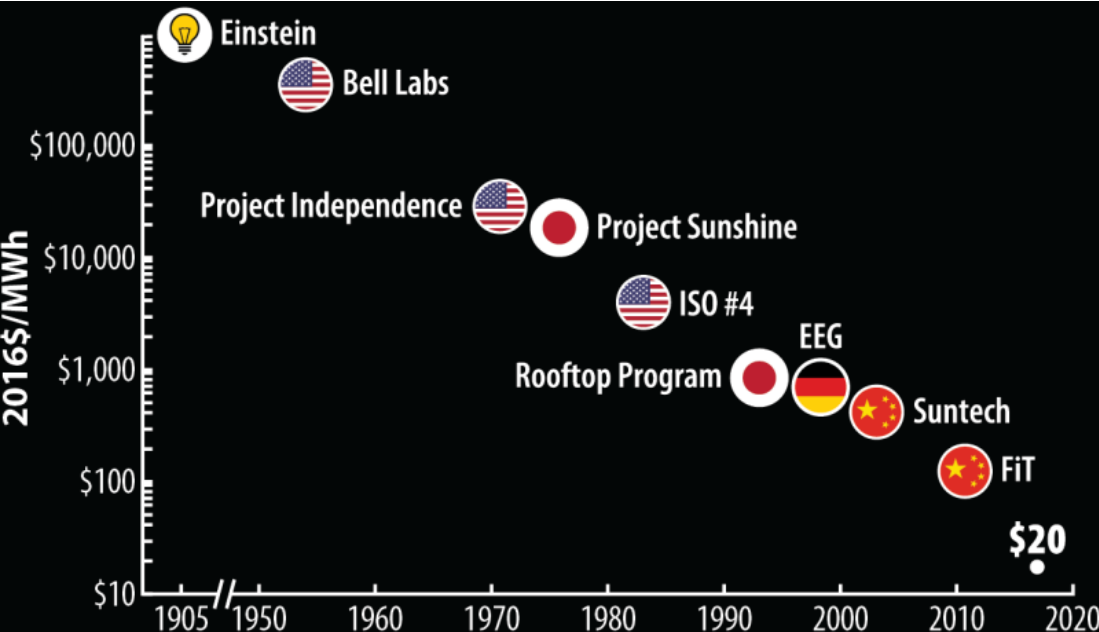
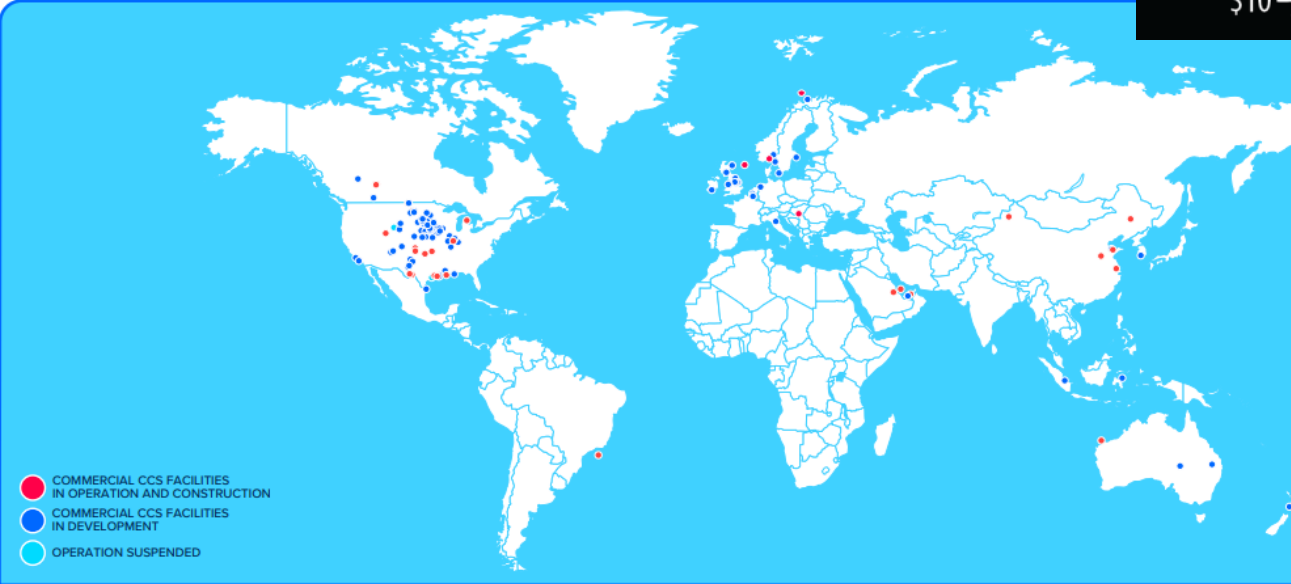
Source: IEA, 2021

# Energy Innovation Is Global

Nemet, "How Solar Became Cheap"

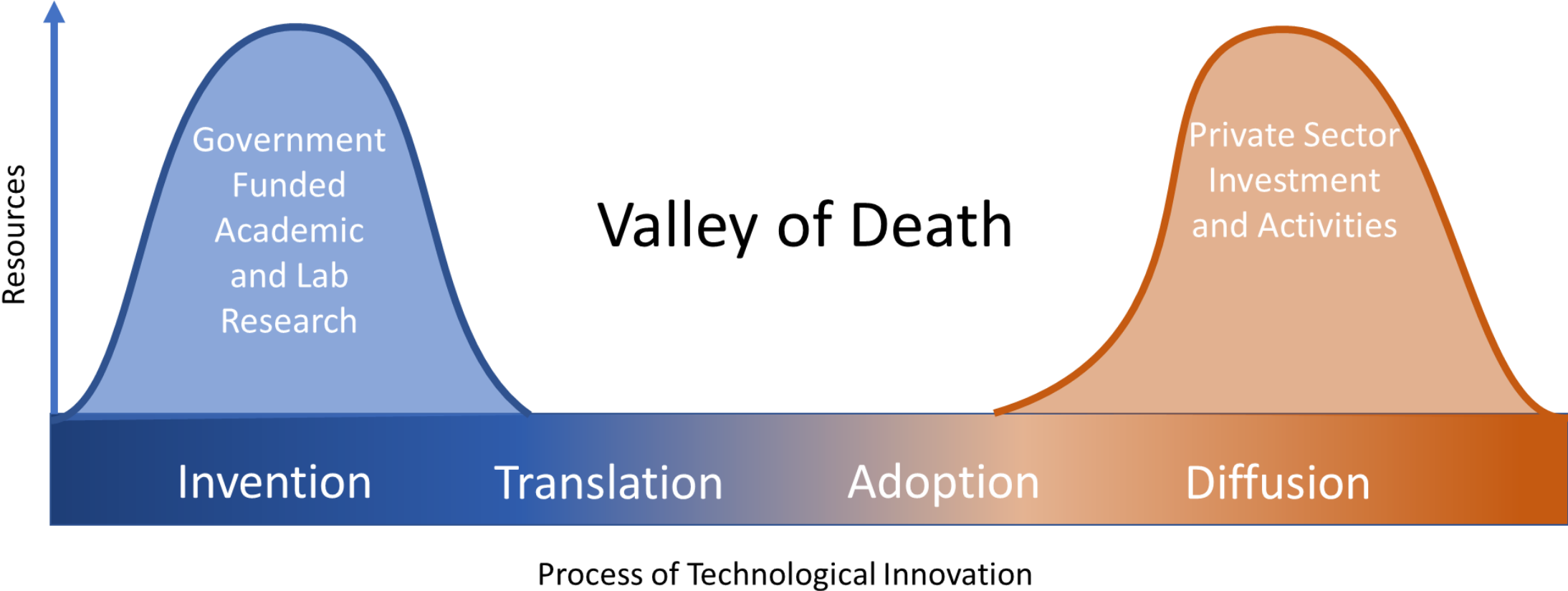
Global CCS Institute

## 2.2 GLOBAL CCS FACILITIES UPDATE AND TRENDS



2019 Nobel Prize winners for Li-ion battery

# National Governments Must Step Up – Nobody Else Can or Will



# Measuring Innovation & Energy Innovation: Hard and Harder

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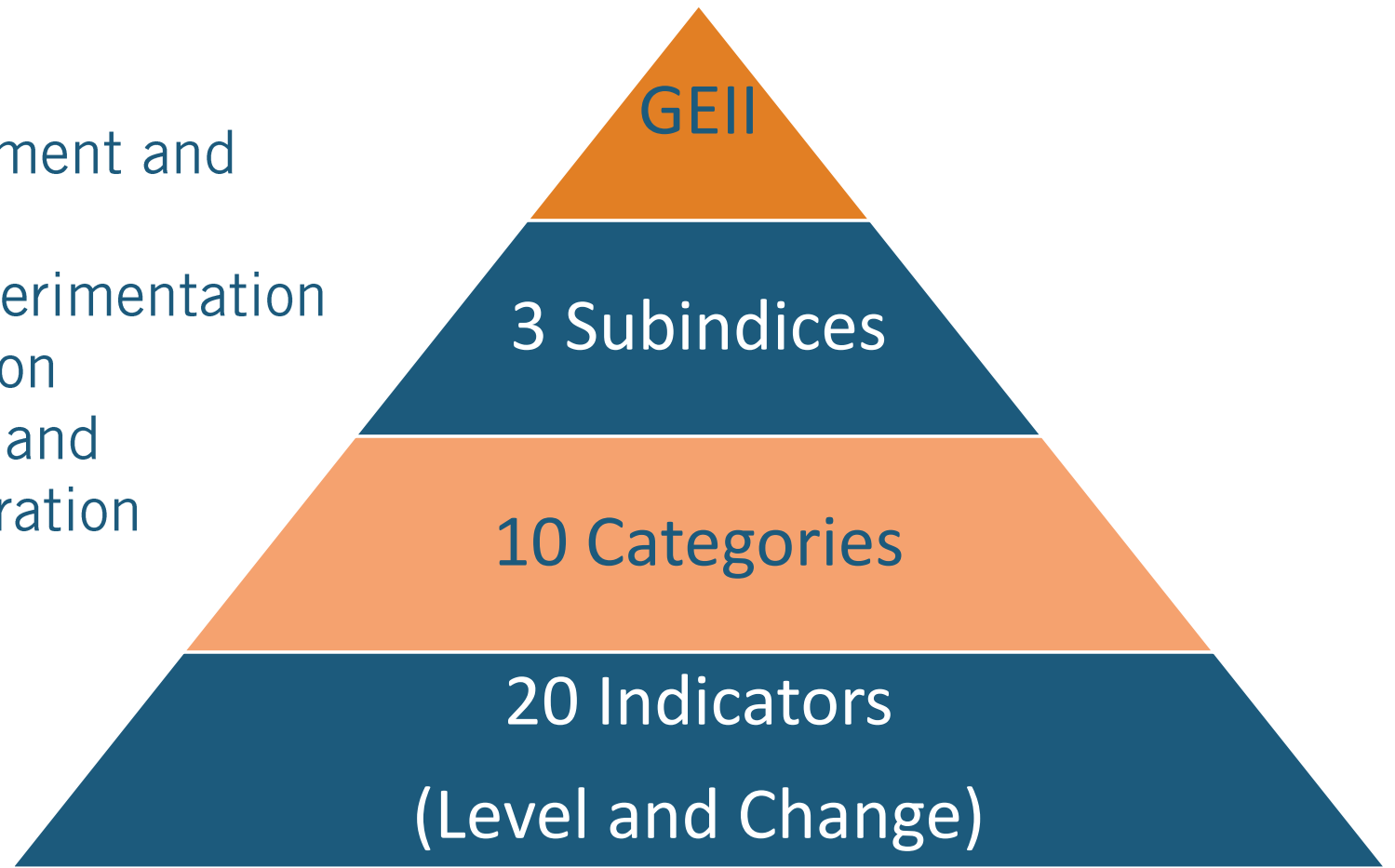
- Complicated
- Indirect
- Slow
- Tacit
- Fuzzy
- Opaque
- Etc.



# But Anyway, Here's What We Did

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- 3 Subindices
  - Knowledge Development and Diffusion
  - Entrepreneurial Experimentation and Market Formation
  - Social Legitimation and International Cooperation



# Example: Knowledge Development and Diffusion Subindex

**Table 2: Indicators and Weights in the 2021 Global Energy Innovation Index**

Subindices, Categories, and Indicators	Subindex Weight	Category Weight	Indicator Weight (Category)	Indicator Weight (Overall)
<b>Knowledge Development and Diffusion</b>	<b>40%</b>			
Public Investments in Low-Carbon Energy R&D		50%	100%	20.0%
<b>Knowledge Generation</b>		<b>25%</b>		
• Number of Publications			30%	3.0%
• Share of Highly Cited Publications			70%	7.0%
<b>Invention</b>		<b>25%</b>		
• Development and Diffusion			75%	7.5%
• Attraction and Absorption			25%	2.5%

## The Rankings: Top 4

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2021 Rank	Country	2016 Rank	Change
1	Finland	1	0
2	Denmark	2	0
3	Sweden	3	0
4	United Kingdom	9	+5



## The Rankings: 2<sup>nd</sup> Tier

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2021 Rank	Country	2016 Rank	Change
5	Switzerland	8	+3
6	Belgium	10	+4
7	Netherlands	5	-2
8	Germany	11	+3
9	Canada	13	+4
10	France	6	-4
11	Norway	23	+12

## The Rankings: 3<sup>rd</sup> Tier

2021 Rank	Country	2016 Rank	Change
12	Japan	19	+7
13	Austria	12	-1
14	South Korea	22	+8
15	Australia	17	+2
16	Czech Republic	18	+2
17	United States	4	-13

# Top of the Subindices

**Table 5: Knowledge Development and Diffusion Subindex Rankings**

2021 Rank	Country	2021 Score	2016 Rank	Change
1	Denmark	14.67	3	+2

**Table 6: Entrepreneurial Experimentation and Market Formation**

2021 Rank	Country	2021 Score	2016 Rank	Change
1	Finland	14.68	1	0

**Table 7: Social Legitimation and International Collaboration subindex**

2021 Rank	Country	2021 Score	2016 Rank	Change
1	United Kingdom	14.03	1	0

## United States

Overall Rank:

17

Overall Score:

10.82

### Knowledge Development & Diffusion Sub-Index

Rank: 9

Public R&D Investments  
Knowledge Generation  
Invention

### Entrepreneurial Experimentation and Market Formation Sub-Index

Rank: 12

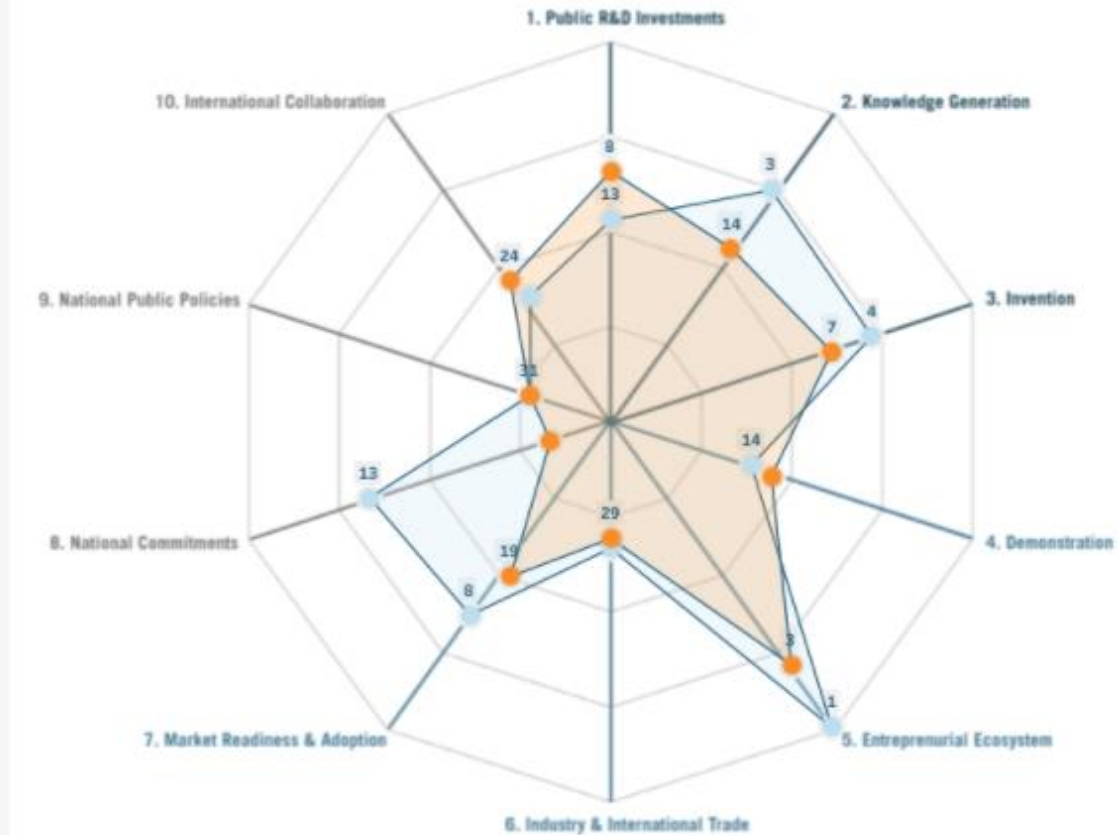
Demonstration  
Entrepreneurial Ecosystem  
Industrial & International Trade  
Market Readiness & Adoption

### Social Legitimation and International Collaboration Sub-Index

Rank: 31

National Commitments  
National Public Policies  
International Collaboration

10 categories make up the 3 sub-indices. See the scores for each category below. Hover over a data point to see the rank and score for that category. Choose a year from the dropdown below.



2021

2016

Year

(All)

# A Taste of Other Findings

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- National contributions vary widely & are often complementary
- The rankings are pretty stable over time & alternative weightings
- Aggregated global indicators suggest a lack of urgency, e.g.:
  - Public R&D/GDP has been flat
  - Effective carbon pricing has risen very slowly
- But there are also bright spots:
  - Venture capital has been rising rapidly

# More! Full Report and Data Visualization Site

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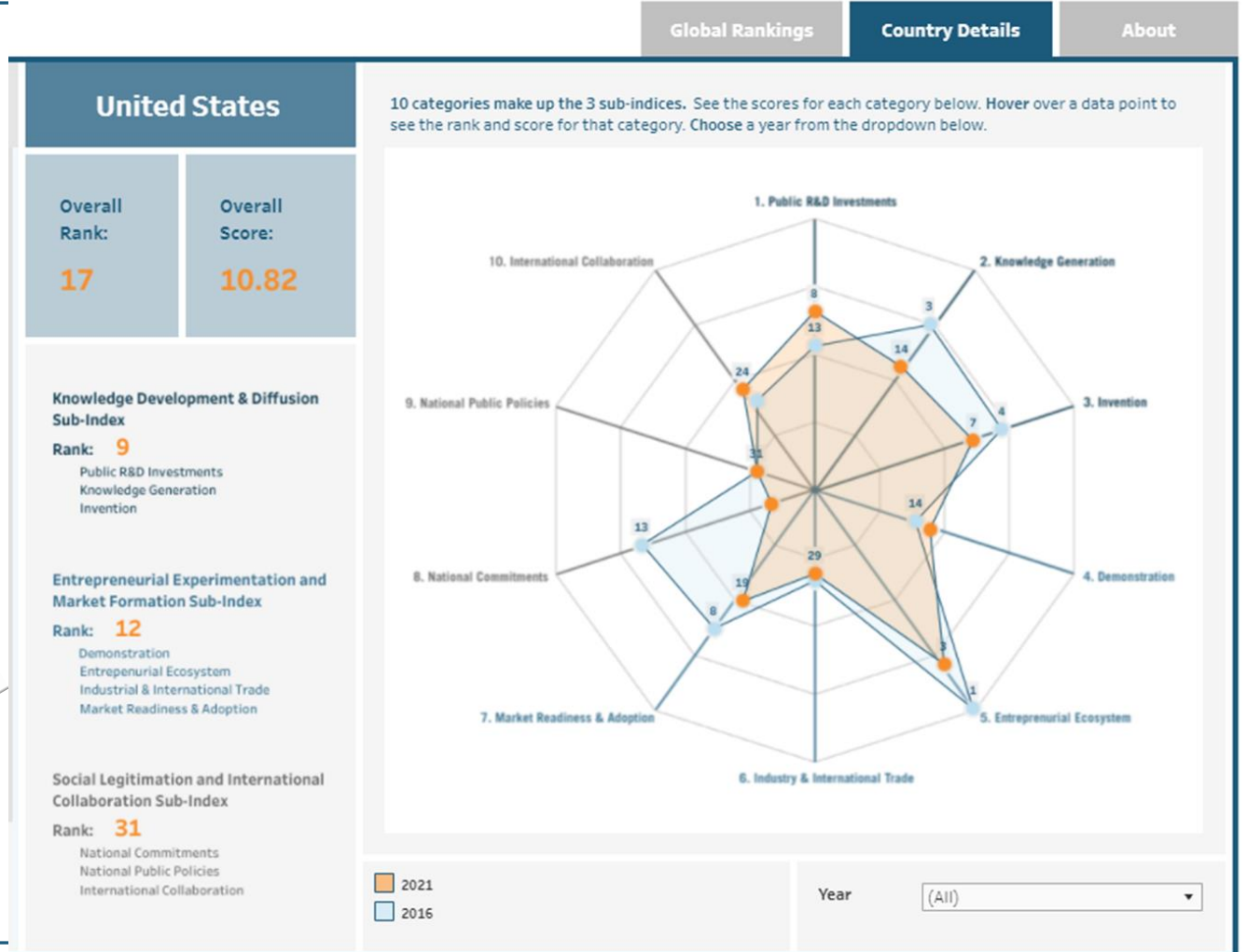
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To meet growing global demand for energy services while averting the worst consequences of climate change, the world must accelerate clean energy innovation. Western Europe contributes most to this global process. The United States has faltered. And China has a long way to go.

### KEY TAKEAWAYS

- National governments are the most important contributors to global energy innovation. Their aggregated contributions indicate a lack of urgency, which undermines progress toward net-zero emissions by 2050.
- The 34 countries covered by the Index make widely varying contributions to the global system. As such, their rankings frequently differ dramatically across subindices measuring diverse knowledge, market, and social factors.
- Finland, Denmark, Sweden, and the United Kingdom are the pacesetters in ITIF's Global Energy Innovation Index.
- Switzerland, Belgium, the Netherlands, Germany, Canada, France, and Norway form a stable second tier of contributors behind the top four, while Japan, Austria, South Korea, Australia, the Czech Republic, and the United States are in the third tier.
- The 2021 rankings are quite similar to those for 2016.
- Together, the 34 national governments in the Index invested over \$27 billion in clean energy R&D in the most recent year for which data are available—but as a share of their economies, this investment has not grown since 2015.
- The flow of early-stage venture capital into clean energy start-ups, and their ability to exit via private equity buyout, merger or acquisition, or IPO, are bright spots for the global energy innovation system.

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# Thank You!

David M. Hart | [dhart@itif.org](mailto:dhart@itif.org) | [@ProfDavidHart](https://twitter.com/ProfDavidHart)