

# Busting the myths around public investment in clean energy

Critics have opposed clean energy public investment by claiming that governments must not pick winners, green subsidies enable rent-seeking behaviour, and failed companies means failed policy. These arguments are problematic and should not determine the direction of energy investment policies.

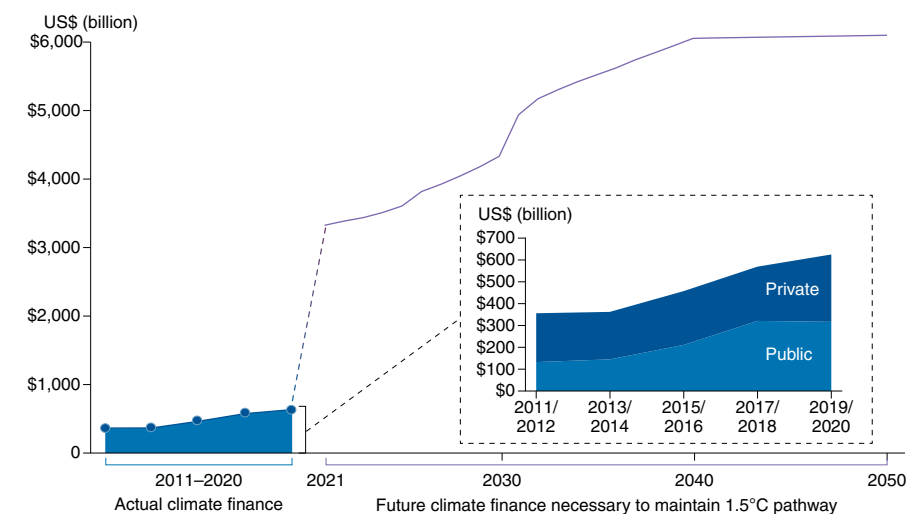
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A slew of recent studies has made clear that the pathways to net-zero greenhouse gas (GHG) emissions by 2050 demand significant re-gearing of the global economy — which will require major governmental funding across the world<sup>1–3</sup>. These public investments need to go beyond research and development — and support technology demonstration, manufacturing, and deployment as well as energy efficiency and the build-out of electricity infrastructure at scale.

Public finance focused on climate change has grown significantly over the last decade (Fig. 1) and is currently accelerating further. The European Union's Green Deal, the Biden Administration's climate change investment plans, South Korea's green spending, and other government initiatives reflect this shift. To put this trend into perspective: The European Green Deal includes €503 billion for clean energy over the next ten years<sup>4</sup>, compared to €30 billion of climate spending in the 2008/09 stimulus response over two years<sup>5</sup>.

Public investment plays a vital role in mobilizing greater sums of private capital to achieve climate goals. Worldwide investments in the low-carbon energy transition were US\$755 billion in 2021 (ref. <sup>6</sup>), yet this remains far below what is required. Climate finance needs to grow by a factor of almost six by 2030 to limit global warming to 1.5° (ref. <sup>7</sup>) (Fig. 1).

While scaling up public investment represents a major policy challenge, getting public investment right must be understood as important to achieving net-zero emissions goals — and governments are creating new strategies and agencies to rise to the challenge. The European Union just launched the European Climate, Environment, and Infrastructure Executive Agency; the United States is considering the creation of a Clean Energy and Sustainability Accelerator; and international development



**Fig. 1 | Global tracked climate finance flows and the average estimated annual climate investment need through 2050.** Historical public finance data includes adaptation finance, which is generally less than 10–15% of overall public finance, and <1% of overall private finance. Estimated annual climate investment is based on a combination of scenarios from Bloomberg New Energy Finance, Global Commission for Adaptation, International Energy Agency, International Renewable Energy Agency, and United Nations Environment Programme. Analysis by Matthew Solomon, with data from Climate Policy Initiative<sup>7</sup>.

banks are increasingly committed to reorient their portfolios to achieve climate objectives.

Yet, policy myths permeate the debate on public investment in clean energy that threaten to discourage the use of public funds to advance decarbonization. These include the beliefs that policymakers should never be in the business of picking winners, rent-seeking behaviour (that is, firms seeking excessive government support) will inevitably become pervasive, and failed investments are tantamount to policy failure. In this Comment, we challenge these myths as reasons for inaction, argue why each is inherent to good policy, and propose how they can be managed well.

## Picking winners

Conventional wisdom suggests that governments know too little about market trends to effectively pick economic winners by directly investing in firms and technologies<sup>8</sup>. Economists typically advocate for the alternative approach: that policy should be designed to set a price on GHG emissions so that the private sector itself has the financial incentive to pick its own winners in line with the goal of reducing emissions.

We highlight three reasons that picking winners is necessary. First, political reality makes it unlikely that GHG price signals will be widely enough adopted with high enough prices in the near future to drive technological change at the required pace

in most markets<sup>9</sup>. Indeed, efforts to advance pricing mechanisms at the federal level remain elusive in the United States. Instead, technology-specific and sector-specific policies have emerged as the centrepiece of decarbonization policies in the power and transport sectors<sup>10</sup>, including the Biden administration's climate strategy. These initiatives tend to focus less on policy outcomes, such as emission reductions, and more on policy inputs such as technology choices. While technology subsidies and standards may also face political opposition — especially at later stages<sup>11</sup>, they tend to mobilize more political support than GHG pricing.

In many cases, governments thus already pick winners, contrary to much rhetoric. And, even in the presence of GHG pricing, the path-dependent nature of technological change suggests that subsidizing clean energy has an important role to play<sup>12,13</sup>. Carbon-intensive technologies have accumulated a much greater knowledge stock over time, making investments in them more profitable compared to those in clean energy. Public investment can help clean energy technologies overcome this challenge.

Another reason to re-examine the role of government is the need to invest in technologies that require high capital investments today but have great future potential to reduce emissions. In these cases, picking winners means advancing policies that drive down cost curves and thus produce benefits further in the future than the private sector is likely to find attractive today<sup>14</sup>. This market dynamic is particularly true for innovation in hard-to-abate sectors such as aluminium, cement, steel, and aviation and for negative emission technologies.

An important secondary benefit to driving down costs of high capital investment technologies — especially ones that make their way into homes to promote energy efficiency — is that it will help those households that are energy insecure by reducing their energy burden. Studies have revealed those households to be disproportionately low-income and of colour<sup>15</sup>.

Finally, picking winners through public investment can help to build the political constituency and community involvement required to further advance climate change and clean energy policies. As governments invest in low-GHG technologies, they begin to mobilize beneficiaries — both firms and communities — and thus shift the balance of power from polluters to the economic winners in decarbonization<sup>16</sup>.

Picking winners is inevitable and not bad per se. The real question is how to do it well. First, the nature of picking winners needs to change as technologies and markets mature. In early-stage investments in demonstration and initial deployment, policymakers will need to bet on individual companies and consortia. As technologies mature and the potential for different technologies becomes clearer, they should shift to focusing on picking technologies. Then, once various technologies in a sector mature, public support could transition to other, early-stage technologies, and regulatory standards and carbon pricing policies could drive demand for continued deployment of these maturing clean energy technologies.

Second, investment decisions need to be more rules- and goals-based. This principle argues for setting targets for the environmental performance of investments, including cost declines, efficiency increases, or GHG reductions. For instance, the SunShot Initiative of the Department of Energy in the United States set a goal for the per kilowatt hour cost of solar energy. Picking winners thus becomes a strategy to focus and intensify competition toward clean energy.

Third, policymakers should focus on technologies that maximize emission reductions over time, as a function of both emission reductions per unit deployed and scalability. Markets by no means can be counted upon to optimize these critical policy dimensions.

Fourth, bridging the valley of death — the funding gap in early-stage technology commercialization — should be a priority. The use of advanced market commitments is one proven policy, that is, governments providing an advance contract to purchase a certain amount of a new technology once it is commercialized. This has been successful for vaccine development<sup>17</sup>. IBM only needed one major government contract to move forward with the development of the personal computer<sup>18</sup>.

### Managing rent-seeking

Some critics have taken aim at subsidizing the deployment of low-carbon technologies, suggesting that government support inevitably devolves into rent-seeking by green industries<sup>19</sup>. This argument points to the risks of pork barrel politics — politicians buying political support by providing excessive rents to favoured industries and interests. These concerns do not, however, fully capture the challenge of managing economic rents (the extra profit of an investment beyond opportunity cost) in decarbonization processes.

To effectively redirect investment toward decarbonization, governments need to subsidize clean technologies to lower their cost below that of dirty alternatives. No single policy can, however, be fine-tuned enough to avoid rents in any given project, since the costs of clean technology deployment vary significantly across place and time. This means that some transient policy rents are unavoidable<sup>20</sup>. The urgency of rapid deployment, as well as the need to address energy injustices, further exacerbates this challenge of tailoring rents through careful policy design and evaluation — large amounts need to be invested quickly, leading inadvertently to some rents.

Rents are thus unavoidable and need to be managed by defining the right amount, the best way of delivering support, and the point in time at which subsidies should be scaled back<sup>20</sup>. Multiple policy instruments across several political levels affect the profitability of any low-carbon technology investment<sup>21,22</sup>. In the United States, a single renewable energy project can claim a large array of subsidies from local, state, and federal governments. For example, the Shepherds Flat Wind Farm in Oregon, one of the largest onshore wind farms in the world, benefited from five different subsidies, amounting to more than 65% of project cost<sup>23</sup>. In addition, many of these subsidies exist over long time horizons. Taken together, this creates the real risk that desirable rents turn into excessive rents and transient rents become permanent ones.

The state can effectively manage rents through discipline and accountability. First, governments can impose discipline on those receiving public support for investment through cost and productivity targets as well as automatic sunset clauses. In assessing public support options, governments should also undertake the due diligence necessary to understand the presence and magnitude of other policies and subsidies that may benefit firms pursuing clean energy investment. This will enable the government to determine if additional public support drives additional clean energy investment, or simply increases firms' rents. Second, agencies administering public investment need to be held accountable. Agencies can facilitate accountability through high levels of transparency in managing, monitoring, and evaluating the performance of investments and by appointing leaders with high visibility<sup>24</sup>.

### Expecting some failure

Picking winners does not mean winning all the time — nor avoiding risk-taking. Critics have challenged public investment for

decarbonization on the grounds of historical failures of public investment. Indeed, the bankruptcy of the solar firm Solyndra, which received a loan guarantee under the Obama administration, gets cited repeatedly as an example of failed government policy<sup>25</sup>. Yet singling out individual bankruptcies misunderstands the role of public investment in de-risking the clean energy transition. It is the nature of early-stage, high-risk investments that some will fail. Decarbonization is an exploratory process that requires experimentation and learning<sup>26</sup>.

The challenge lies in managing risk and facilitating learning. First, to manage risk, policymakers need to spread risk. This involves diversifying their portfolio across technologies and types of firms, resulting in some major successes, along with some failures<sup>27</sup>. The goal of spreading risk in public investment is to maximize energy innovation returns, not — as for venture capitalists — to maximize financial returns. Facilitating learning also requires investing in stages and basing next funding rounds on firms meeting milestones.




In addition, and perhaps counterintuitively, acknowledging upfront the potential that public investments may not always lead to market successes makes large failures less likely. If policymakers believe that they must show that every company receiving public funds is a success, then they may be hesitant to pull the plug in cases where success becomes increasingly unlikely. This is one of the lessons from Solyndra: the Obama administration doubled down in public investment at a point when global market trends made Solyndra's success unlikely<sup>24</sup>. Moreover, policymakers need to know the development of technology cost and the broader support policies available to firms to be able to carefully design policy, monitor firm performance, and withdraw support. This requires learning through systematic policy evaluation, including identifying key outcomes of interests and related metrics, establishing data collection protocols, developing evaluation strategies, and implementing policy in a manner that facilitates estimation of causal impacts. Policy evaluation is, of course, also key to effectively managing rents, as discussed above.

In the United States, for example, policy evaluation could build on the emerging “learning agendas” as federal agencies implement the Foundations for

Evidence-Based Policymaking Act<sup>28</sup>. Given fundamental information asymmetries between government and firms, such program evaluation will benefit from networks among governments and research organizations that more closely understand market trends. These partnerships can serve to share and compare evaluation approaches and measures of interest, identify future data needs, and enable the export of policy successes to other jurisdictions around the world.

### The road ahead

The role of public investment in decarbonization is beginning to change rapidly. As funding becomes available, the scale-up challenge is now joined by the challenge of getting investments right. Governments have started to expand capacity to make, manage, and monitor low-carbon investments. As governments embark on these efforts, it is pivotal to embed the right expectations, decision processes, and evaluation mechanisms in agencies and institutions to effectively advance decarbonization. It is also critical to shape the public debate on the role of government investment and the metrics for success. Otherwise, the great public investment push will fail to accelerate decarbonization and result in political backlash instead. □

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### Competing interests

The authors declare no competing interests.