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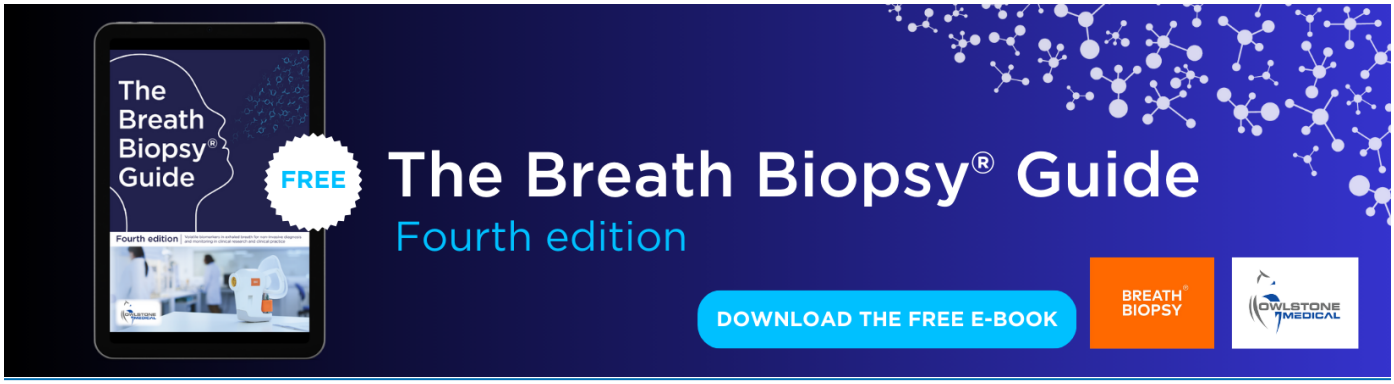

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From powerpoint to powerplant: evaluating the impact of the U.S.-China Sunnylands commitment to tripling global renewable energy capacity by 2030

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Abstract

In the Sunnylands statement, China and the U.S. committed to supporting efforts toward a global tripling of renewable energy by 2030. Despite unprecedented recent renewable energy growth, the world is currently off track by a substantial margin: 3,432 GW in 2030, a lacuna roughly equal to the world's combined renewables capacity in 2022. Closing this gap requires vastly increased ambition and cooperation. The U.S. would need to significantly raise its domestic renewables ambitions. Meanwhile, both China and the U.S. would need to launch new efforts to collaboratively accelerate financial, technological, and capacity-building support for renewables development elsewhere in the world.

> *Whatever words we utter should be chosen with care, for people will hear them and be influenced by them for good or ill.*
>
> *- Attributed to the Buddha*

1. Introduction

In the recent Sunnylands statement, signed by Presidents Biden and Xi, the U.S. and China agreed to 'work jointly and together with other countries to address the climate crisis' [1]. This statement crystallized the nations' visions on climate prior to the COP28 summit in Dubai and highlighted an important collaborative area for the two countries' relationship.

Amid escalating tensions, climate change is considered a key area of potential collaboration between the two countries. Presidents Xi and Obama first reached a climate agreement in 2014, each announcing commitments to curb emissions [2]. Arguably, the landmark Paris agreement in 2015 (and the subsequent Kigali agreement) was a direct result of this historic step forward.

This climate breakthrough was followed by ambitious domestic commitments by the two countries: China's NDC and the U.S.'s clean power plan. In 2021, during COP26, the two countries published another joint declaration with notable commitments on methane and acknowledgement of the $100 billion annual funds for developing countries, surprising the participants amid the tense negotiations at the conference [3]. The two countries have also made synergistic efforts in just transition and inclusive growth. In the U.S., environmental and economic justice is centered in the national climate resilience framework [4]. In China, meanwhile, just transition efforts follow language and frameworks appropriate to its policy system, such as achieving 'common prosperity' [5].

2. Tripling global renewables capacity

Among the 25 agreements listed in the Sunnylands statement, the two countries' joint support in 'efforts to triple renewable energy capacity globally by 2030'

stands out as the only quantitative target. This agreement between the world's two biggest emitters and key leaders in climate action seemed to shed optimistic light on the upcoming negotiations in Dubai. Indeed, only four days after the opening of COP28, 118 governments pledged to triple the world's renewable energy capacity by 2030 [6]. As Sunnylands suggests, this is not a new target. Both the IEA and IRENA forecast a global renewables capacity tripling by 2030 as part of their 1.5 °C scenarios [7, 8]. IRENA's scenario expects the G20 to be responsible for more than 80% of installed renewables by 2030. Subsequently, G20 leaders agreed to pursue this target in September, 2023 [9].

3. Is the world on track for a tripling?

Since 2015, when the countries of the world pledged to 'pursue efforts' to limit global warming to 1.5 °C above pre-industrial levels [10], global renewables capacity has grown exponentially at 9% per year [11]. Tripling renewables capacity from 2022 to 2030 will require an annual capacity growth rate of 14.7%. As figure 1 shows, the current growth rate is insufficient to reach this target: continued growth at 9% per year would result in just under a doubling of renewables capacity by 2030. In other words, tripling global renewables capacity will require 50% higher capacity in 2030 than a continuation of the current trend. These results align with previous work, which estimates current policies and optimistic development trends can only increase 2030 renewables capacity to 2.5 times 2020 capacity [12]. We echo the high-level takeaways of this existing body of research: a global tripling of renewables capacity is challenging, attainable, and necessary if the world is to achieve net zero emissions by midcentury.

4. Regional differences in clean energy growth

While the world as a whole is not on track to triple renewables capacity, the responsibilities and gaps look different across regions. To assess these sub-global contexts, we set 2030 regional renewables capacity targets in two ways: regional tripling and *ambition-adjusted* shares of a global tripling. These targets are described in further detail in the supplementary information.

Figure 2 shows 2015–2022 renewables capacity growth in China, the U.S., the E.U. (27 current member states), the African continent, Central and South America, and Rest of World. For brevity, we focus on these six world regions; see the supplementary information for analysis of other major economies and renewables hotspots. In each plot, the dashed gray line shows the historic exponential growth trend from 2015–2022, extended out to 2030. Also shown are exponential growth curves required for each region to triple its own renewables capacity by 2030, and to reach its ambition-adjusted share of a global tripling. Note the inconsistent *y*-axes, which highlight regional progress toward a global tripling. The same plots are shown with a consistent *y*-axis in the supplementary information (figure S1).

Of the studied regions, China is by far the closest to tripling its renewables capacity by 2030. Indeed, the country's renewables capacity tripled in the past decade [13]. Despite a low current explicit capacity target compared to the ambition-adjusted target, we can expect growth to continue along the historical trend. The country habitually overachieves conservative policy targets, and other related policies can facilitate growth beyond the explicit target. However, difficulty in continuing the growth should not be underestimated. China's historical growth was partly driven by subsidies which the national government has started to phase out. Incorporating a higher percentage of intermittent renewables will require a more flexible grid. Developing a unified national power market and expanding spot, ancillary service, and the voluntary green power markets will also be crucial to unlock further renewable energy integration.

In contrast, the U.S. is not on track to triple renewables capacity domestically by 2030, and it is equally clearly not on track to achieve its ambition-adjusted share of a global tripling (the U.S.'s high ambition in its announced pledges means this would require a more than quadrupling by 2030, which is admittedly unlikely). That said, recent policy reform, most notably the 2022 inflation reduction act (I.R.A.), has brought a domestic tripling by 2030 closer to reality. Due to increased competitiveness of renewables under the I.R.A., it is now estimated that U.S. renewables capacity will grow by a factor of between 2 and 3 by 2030 [14, 15]. Sunnylands shows the U.S.'s commitment to leadership toward a global tripling; clearly, a domestic tripling is a prerequisite. Indeed, given that its renewables capacity currently lags China's and the E.U.'s, the U.S. could show leadership by committing to an even more ambitious domestic target, such as 1200 GW of renewables capacity by 2030—about 3.4 times its 2022 capacity.

Beyond fulfilling their own contributions toward a global tripling, 'supporting' a tripling globally will entail the U.S. and China facilitating an acceleration of renewables deployment elsewhere. Indeed, continuing historical growth will be insufficient to achieve tripling anywhere outside of China. The E.U.'s recent REPowerEU Plan puts its ambition for renewables at 1236 GW by 2030: more than double 2022 capacity but well below a tripling [16]. Incidentally, this total is quite close to the bloc's ambition-adjusted share of a global tripling, which suggests its current ambition could be sufficient for a global tripling if and

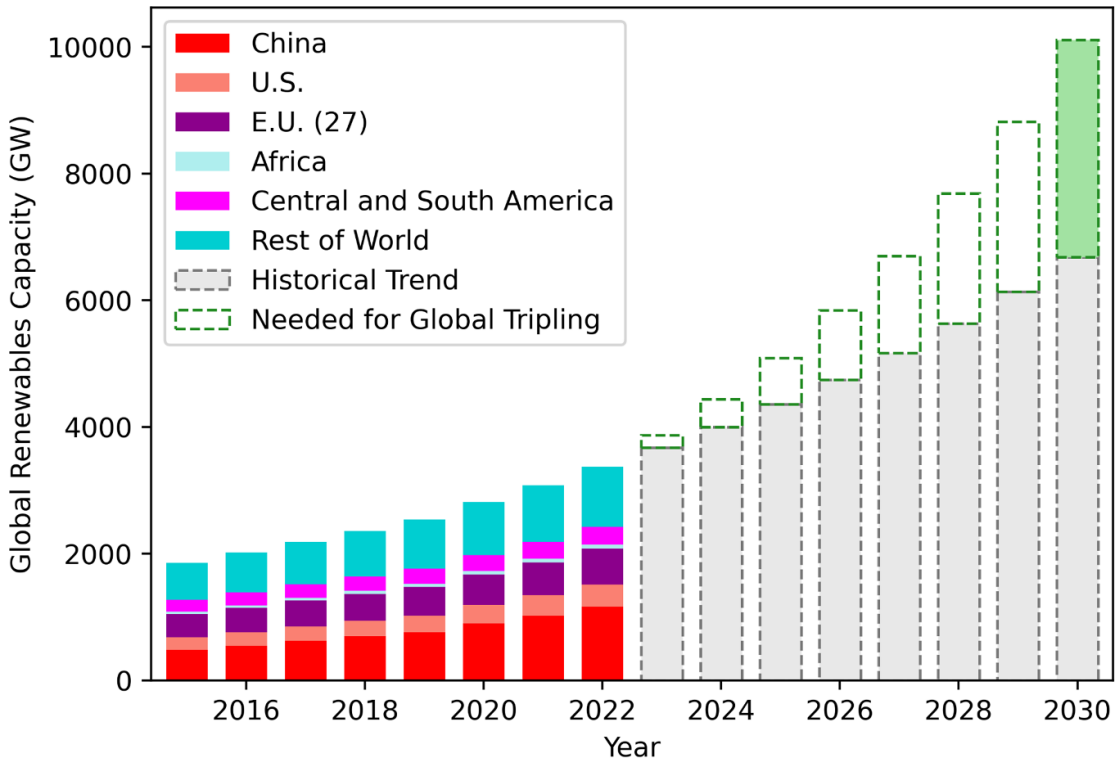

Figure 1. Historical (2015–2022) renewables capacity by world region and projections of renewables capacity growth to 2030 according to continued growth along the historical trend and the rate needed for a global tripling. The 'missing renewables' capacity bar (shaded green) represents 3432 GW of renewables capacity in 2030 above and beyond the current trend.

only if other regions (for instance, the U.S. and Africa) more than triple their capacity.

Africa requires the fastest growth among all studied regions, partly due to low existing capacity. However, the growth rate can be partly accelerated by expected rapid growth in electricity demand [17]. African leaders acknowledge this urgent need, pledging to increase renewables capacity from 56 GW in 2022 to at least 300 GW by 2030, just below our ambition-adjusted target. Renewables deployment and power sector expansion are crucial to Africa's sustainable development goals, yet the Continent's energy development has been historically underinvested [18]. The IEA estimates more than $200 billion per year of investment by 2030 is required to achieve key energy goals and facilitate a just and inclusive climate transition [18]. This pattern is consistent with Central and South America and our Rest of World region, the latter of which represents by far the largest absolute gap between 2030 renewables capacity following the historic trend and either 2030 target.

In short, China and the U.S.'s commitment to a global tripling will be tested in their own domestic power sectors, but the greatest challenge will be facilitating and supporting efforts toward a tripling elsewhere. This global challenge is fundamental to high-profile calls by heads of state, industry leaders, and civil society activists for inclusive growth, a circular economy, and a just energy transition.

5. What comes next?

Although the two countries' joint declaration sent an optimistic signal to international climate politics, much work remains to move toward a 1.5 °C pathway. Domestically, the U.S. should expand on the success of the I.R.A., by continuing to invest in renewables and addressing multiple barriers to deployment. China should mature its market mechanisms to provide flexibility for renewable integration.

Based on our analysis, we propose four actionable steps to ensure the Sunnylands tripling commitment is met:

1. **Turn commitments into delivered funds and lasting partnerships.**
   Urgent actions are required to fund an unprecedented acceleration of renewable energy growth worldwide. Although China and the U.S. backed the $100 billion fund to address the needs of developing countries in the 2021 Joint Glasgow Declaration, there is no actionable plan to assemble and distribute the fund. As two of the largest investors in energy development in the world, China and the U.S. can and should take

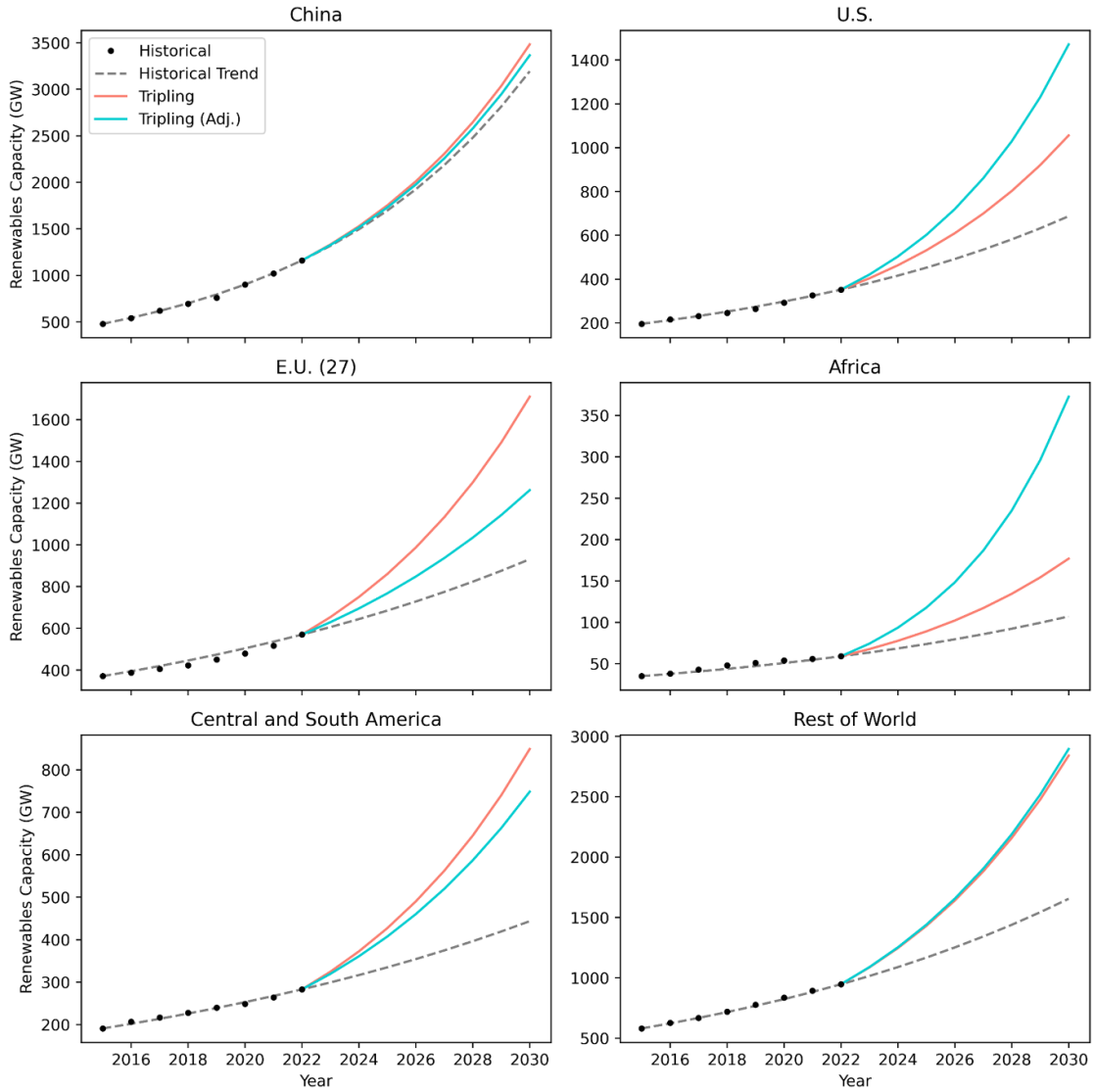

Figure 2. Historical renewables capacity, projected growth along the current growth rate, and two possible trajectories for a global tripling—regional tripling and ambition-adjusted shares of global tripling—for each of six world regions.

leadership in enabling a just and transparent funding mechanism.

2. **Accelerate technology and knowledge transfer efforts.**
   Sunnylands calls for an increase in subnational and ideally stable collaboration between the countries. The same should apply globally. China and the U.S.—two large countries with diverse cultures, economies, geographies, and climates—have experiences to share with each other and the world. Exchanges beyond formal national governmental settings will be invaluable in providing insights toward appropriate, effective, and efficient solutions, especially for the developing world.
3. **Prioritize collaboration over competition.**
   Historically, government support for renewables in China and the U.S. has focused on domestic competitiveness. Continuing this competitive focus could hinder the development of globalized supply chains, increasing renewables costs by up to 30% in 2030 [19]. The benefits of supply chain integration for low-carbon technologies likely outweigh the manageable domestic risks [20]. Heartened by the collaborative tone of the Sunnylands statement, we encourage China and the U.S. to further embrace and espouse a collaborative and inclusive approach to decarbonization.
4. **Foster inclusive global action.**
   While China and the U.S. are undoubtedly key leaders in global renewables development, the Sunnylands target requires collective efforts across the globe. Economies with abundant financial, technology, and knowledge resources must multiply domestic renewables while contributing internationally. Fostering an inclusive and collaborative climate discourse internationally is crucial for a speedy, just transition toward the net zero world. Doing so could also facilitate and accelerate

reforms in multilateral institutions to ensure just and viable institutional and financial mechanisms for renewables development in the Global South.

Ultimately, through a combination of increased domestic ambition; financial, technology, and knowledge transfer and support for renewables deployment elsewhere; an embrace of collaboration over competition; and leadership in fostering inclusive global action, the U.S. and China can fulfill their Sunnylands commitment. At the time of writing, China has yet to join the COP28 pledge led by the U.S. and others for tripling global renewable capacity and doubling energy efficiency [6]. We applaud Xi and Biden for the ambitious Sunnylands agreement and urge the two countries, along with all world leaders, to each take further steps toward implementing this critical renewables tripling objective.

Data availability statement

The data that support the findings of this study are available upon reasonable request from the authors.

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