Climate Change Business Journal®

Climate Change Industry Overview 2023

Volume XVI, No. 4-5-6

Second Quarter 2023

Climate Change Industry Rides the EV Wave in 2022, But Several Segments Are Poised for Strong Growth

In spite of a challenging economic environment and ongoing supply chain issues, the United States climate change industry managed to post 16.5% growth in revenue to $576 billion in 2022. The pace of growth declined in major renewable energy categories wind and solar, adding only $4 billion in revenues in 2022 after more than $10 billion in additional revenues in each of the two previous years. Revenue growth of more than $70 billion in transportation segments, largely contributed by electric vehicles, accounted for the majority of the $83 billion additional climate change industry revenues in the United States in 2022.

U.S. carbon markets increased nearly two-fold from 2020 to 2022, mostly due to increased prices and demand for carbon credits and offsets in the regulated and voluntary markets in 2021, a trend expected to continue gaining traction in the coming years. Energy storage, a segment that supports and benefits from growth in both the renewable energy and transportation climate change industry segments, posted the highest percentage growth of U.S. climate change industry segments in 2022 and also almost doubled in size from 2020 to 2022.

The explosion of carbon market value in 2021 in Europe, based on its regulated markets and the increasing price of carbon credits in the European Union Emissions Training System, led to 17% growth in the global climate change industry in 2021 and, along with transportation and the EV market, continued to support record growth of more than 21% to a total of $3.5 trillion in 2022. The USA represents 25%

Climate Change Industry Overview 2023

Climate Change Business Journal® summarizes its annual quantification of the $3.5 trillion global and $576 billion U.S. climate change industries. Transportation and renewable energy segments add the most in revenues in 2022, but energy storage, adaptation & resilience and carbon markets post the highest growth rates.

Industry Segments: *Wind, Solar, Carbon, CCS, Forest Carbon*

Company Features

CLIMATE CHANGE BUSINESS JOURNAL

ISSN 1940-8781

Editor-in-Chief Grant Ferrier

Research Mgr. Laura Carranza

Editor Lyn Thwaites

Co-Founding Editor Jim Hight

Contributing Editors

Adriana Blair, George Stubbs, Brian Runkel, Charles Helget, Andrew Paterson, Tom Aarts

Subscriber Services

Laura Fernandes

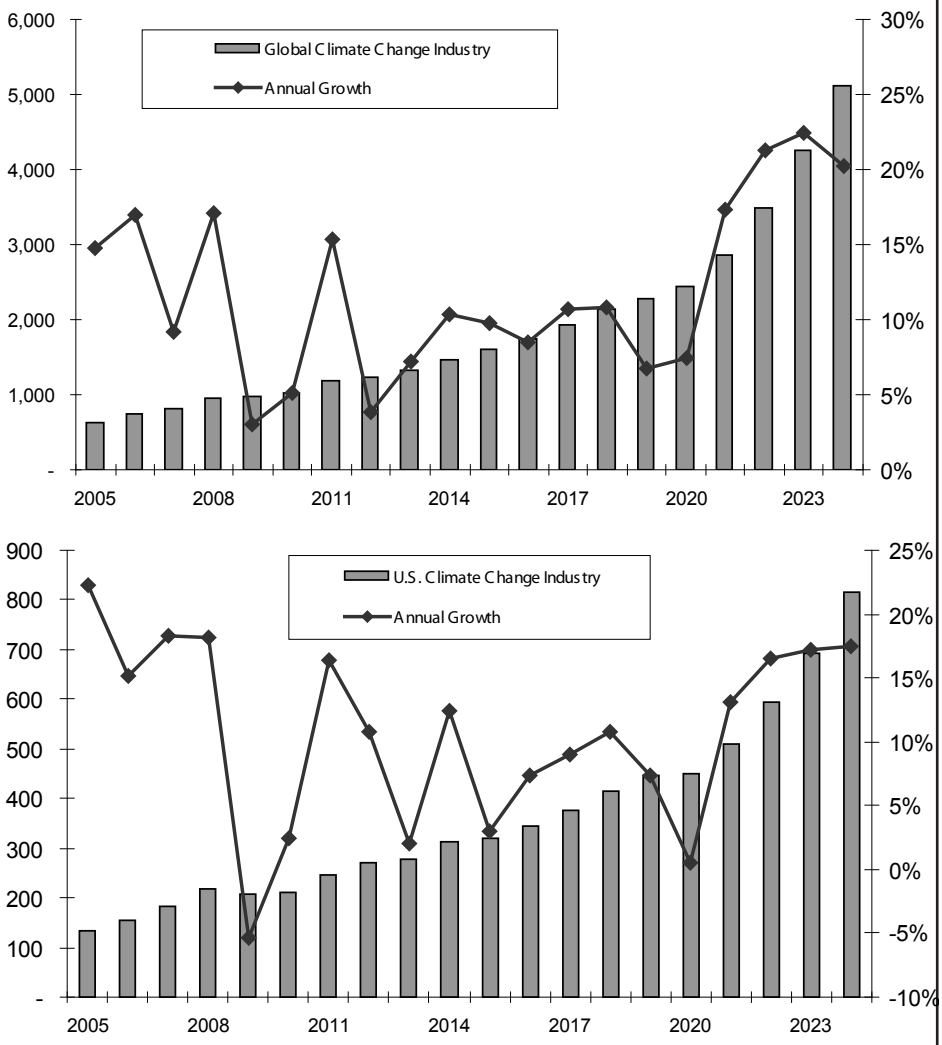
Climate Change Business Journal® newsletter is published in quarterly feature editions and special supplements by Environmental Business International Inc., 4452 Park Blvd., Suite 306, San Diego, CA 92116. 619-295-7685 or email info@ebionline.org

How to subscribe

Annual corporate electronic access subscriptions to CCBJ start at $995 (up to 5 users) and up to $1,995 for more than 20 users. Subscriptions may be available at discount to non-profits, research institutions, and for individual or single-use subscriptions;

To order or for more information call (619) 295-7685 x 15, email info@ebionline.org, or go to www.ebionline.org, where you can also sign up for email newsletters.

Global & USA Climate Change Industry Size & Growth 2005-2024



Source: Climate Change Business Journal; Environmental Business International, Inc., San Diego, Calif.

USA vs. Global Climate Change Industry in 2022 ($bil)

	USA 2022	Global 2022	% USA in 2022
Low-Carbon Power	90.9	822.0	11.1%
Carbon Capture & Storage	1.8	2.2	82.0%
Energy Efficiency & DR	72.7	292.7	24.8%
Energy Storage	5.8	26.3	22.1%
Green Buildings	98.7	518.9	19.0%
Transportation	295.1	1701.5	17.3%
Carbon Markets	6.4	98.5	6.5%
Adaptation & Resilience	1.6	7.4	21.7%
Research/C&E	3.2	10.7	29.8%
Total Climate Change Industry	576	3,480	16.6%
Total Environmental Industry	440	1,290	33.9%
Economic Output (GDP & GWP)	25,500	101,600	25.1%

Source: Climate Change Business Journal; Environmental Business International, Inc., San Diego, Calif.

also moving into offshore wind, utilizing this expertise and consultants are doing the same, moving staff from oil and gas projects to offshore wind projects to make use of expertise in ocean energy infrastructure.

CCBJ: What is your view of the evolution of wind power technology and manufacturing capacity over the last 30 years?

Diller: Wind power technology is evolving at a rapid pace. BOEM developed guidance to allow developers flexibility in their design as they move through BOEM's process. This is called the Design Envelop Approach and has been important to apply due to the changes in technology that are happening during the lifetime of project planning. This rapid increase in technology is happening throughout the renewables industry and is an exciting development at a time in which we aim to transition to a clean energy economy.

CCBJ: What originally inspired you to get involved in the wind industry?

Diller: The inspiration was to be part of an industry that can help the U.S. transition to a clean energy economy. The ability of offshore wind to make a difference is huge, given its high energy potential and proximity to load centers, which are typically along the coast. This work also allows our staff to be part of this transition and the ability to work on really interesting projects in an industry that is welcoming to new talent and new ideas. ☼

Private developers are the main client group pursing offshore wind in the U.S. with a strong influx of European developers in Orsted, RWE, and Equinor... with U.S.-based developers such as Invenergy.

Tetra Tech's Biodiversity and Climate Change Specialist Takes on Deforestation in Cambodia with USAID

CCBJ 2022 Award For Project Merit: FOREST CONSERVATION

Tetra Tech, in partnership with the **United States Agency for International Development** (USAID), for implementing the Greening Prey Lang (GPL) project in Cambodia to conserve biodiversity, sequester forest carbon, improve governance, and promote the well-being of rural communities. In 2022, GPL supported the development of three projects to reduce emissions from deforestation and forest degradation (REDD+), which will generate tens of millions of dollars for community co-benefits and the management of over 600,000 hectares of protected areas. In 2022 the project also finalized the first-ever genetic analysis of Asian Elephant populations in Cambodia, which found that elephant populations in targeted protected areas were double previous estimates. GPL also provided improved economic benefits to over 110,000 Cambodians through interventions including support to wildlife-friendly agricultural product value chains such as rice, cashew, and turmeric; promotion of 19 ecotourism sites which generated more than $30,000 of income for rural communities; and support to non-timber forest product value chains worth millions of dollars such as honey, resin, and talipot palm.

Matthew Edwardsen is Director, Environment and Natural Resources, Tetra Tech Inc and Chief of Party at Tetra Tech in Phnom Penh, Cambodia

CCBJ: Congratulations on implementing the U.S. Agency for International Development's Greening Prey Lang project in Cambodia. You mentioned improved governance as one of the approaches. What does that mean in the context of forest conservation in Cambodia?

Tetra Tech: Under USAID's Greening Prey Lang we focus on three principal approaches. Communities, conservation, and governance. Success lies where these three approaches overlap. Governance is undoubtedly the most important of the three approaches. Without effective governance, improving livelihoods for communities or conserving biodiversity is extremely difficult.

Our principal approach to improved governance involves a combination of alignment of our overall project activities with Cambodia's priorities, and direct support to over a hundred community-based organizations. For example, we have provided direct funding through grants to communities to implement activities which they have defined and prioritized. These activities complement larger country-wide efforts such as securing financial payments for forest carbon sequestration. When we provide grant funding it is complemented by technical capacity building, but the activities themselves are undertaken by communities.

Activities include patrolling forests to prevent illegal logging, poaching, or land clearance, improving ecotourism offerings, or holding monthly meetings with all local stakeholders. In each of these instances community ownership is the defining principle. While this approach requires significant human resources to implement, we have monitored demonstrable changes in forest governance taking place across dozens of communities due to this bottom-up effort.

CCBJ: Your project supported the development of Reduced Emissions from Deforestation and Forest Degradation (REDD+) projects, which you state will generate tens of millions of dollars. Where does this money come from? Is this a one-time payment or recurring?

Tetra Tech: We have supported three separate REDD+ projects under Greening Prey Lang. Two of them fall under Verra's Verified Carbon Standard program. The other falls under the Joint Credit Mechanism endorsed by the Japanese government. In all three instances a multi-year REDD+ project development process will result in verified reductions in greenhouse gas emissions resulting from avoided deforestation. Private sector companies purchase emissions reductions, known in the REDD+ vernacular as verified carbon units. The income received from sales is used to improve protected area management and support local communities in Cambodia. REDD+ projects are verified annually by a third party. Following each verification, a batch of verified carbon units is sold to private sector companies. We anticipate each of these REDD+ projects to run for ten years with payments taking place each time a batch of verified carbon units is sold.

CCBJ: It is exciting to hear that the Asian elephant population in the area might be double previous estimates. How did you come to this conclusion? What else makes where you work unique from a biodiversity standpoint?

Tetra Tech: Working with our partner **Flora and Fauna International*** we used non-invasive genetic sampling of dung samples in areas known to have regular elephant presence. Genetic analysis noted a high level of genetic diversity amongst the elephants and an overall population size that was approximately double the previous estimate.

While the overall population estimate of 51 individuals is still quite low, we believe these populations can recover if their habitat is protected. Their habitat includes several protected areas such as Prey Lang Wildlife Sanctuary, which is the largest lowland evergreen forest in Southeast Asia. This area is home to numerous endemic species, many of which are endangered. From gibbons to the giant ibis, the rich biodiversity of this landscape is of global significance and irreplaceable.

CCBJ: Agriculture has been a major driver of deforestation worldwide. Is that the case in Cambodia? If so, how are your approaches on agriculture commodities such as cashew and rice combatting this trend?

Tetra Tech: Cambodia is no exception to this global trend. Significant tracts of Cambodian forest have been cleared for both large cash crop plantations and smallholder agriculture. This has resulted in increased incomes and development for the Cambodian people, which is of great importance. That said, this trend is not sustainable, and Greening Prey Lang has been working with numerous partners to identify alternatives across numerous commodities. What we aim to do is link private sector partners who are committed to purchasing zero-deforestation agricultural products to communities which can grow them. This involves support along the entire value chain.

One great example of a company we partner with to achieve this goal is the Cambodian firm **IBIS Rice**. The rice they sell is certified as both organic and deforestation free. Given the high demand for their product they pay farmers a 70 percent price premium when rice is grown according to their specifications. Getting farmers to the point where they can become certified IBIS Rice farmers is something that Greening Prey Lang has supported through grants to a local agronomic nonprofit to train farmers and direct technical support for farmer compliance monitoring.

CCBJ: What is the most compelling example of climate change that you've observed in Cambodia? How is Tetra Tech addressing climate change in its activities?

Tetra Tech: The most compelling example of climate change I've seen in Cambodia has been weather variability. Rains come early, come late, or they don't come at all. This creates significant challenges for many of the individuals we're trying to support, as much of their income is linked to rain-fed agriculture.

Under Greening Prey Lang we're utilizing numerous approaches to help them adapt to this new normal. We need to ensure that communities have diverse options for income generation. For example, direct grants which support community members to conduct forest patrols also ensure that communities have long-term access to the numerous non-timber forest products they harvest such as honey and wild mushrooms. Private sector companies which develop buyer agreements with communities also provide drought resistant seeds.

We've also been supporting opportunities for communities to enter new sectors such as ecotourism, which has boomed domestically in the last few years. Through a combination of diversification of livelihood options, improved management of forest resources, and long-term access to financing through mechanisms such as REDD+, my hope is that we can improve the adaptive capacity of communities so that they can be resilient to the shocks of climate change. ☼

Rains come early, come late, or they don't come at all. This creates significant challenges for many of the individuals we're trying to support, as much of their income is linked to rain-fed agriculture.

** Fauna & Flora International (Cambridge, United Kingdom) is an international conservation charity and non-governmental organization dedicated to protecting the planet's threatened wildlife and habitats. Founded in 1903, it is the world's oldest international conservation organisation.*