



# Unlocking Potential

State of the Voluntary Carbon Markets 2017

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## State of the Voluntary Carbon Markets 2017

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## Foreword

Last year, the earth surpassed a critical marker in our fight against climate change. For the first time in human history, scientists recorded more than 400 parts per million (ppm) of carbon dioxide (CO<sub>2</sub>) in the atmosphere. The “safe” level of CO<sub>2</sub> concentration in the atmosphere, according to most scientists, is 350 ppm. In 2015, leaders from around the globe came together to negotiate the Paris Climate Agreement, where they agreed on goals and strategies to reduce emissions and curb climate change. While the Agreement represented a remarkable achievement, negotiators still need to debate how to operationalize the agreement, and countries still need to figure out how meet their individual commitments to reduce emissions under the Paris Agreement.

In the meantime, concerned citizens, corporations, and sub-national leaders have already started and will continue to combat climate change. Many of these actors have voluntarily measured and reduced their emissions by investing in renewable energy, energy efficient technologies, and more. They have purchased carbon offsets to close the gap on any emissions they currently can’t reduce on their own—and in doing so, they have been supporting the climate and a host of other biodiversity, employment, and health benefits associated with many of these carbon offset projects.

Forest Trends first started tracking these voluntary offset purchases in 2006 and since then, has seen the products and buyers in this space become increasingly sophisticated. As a result, we have seen the voluntary offset markets serve as a source of innovation and inspiration, incubating projects and ideas that are too unproven for current compliance markets. We have seen third-party standards emerge as a way to verify offsets with consistency and legitimacy.

Yet going forward, we need to unlock the full potential of carbon markets in order to quickly and significantly combat dangerous climate change. As countries shift from debating climate change to implementing their proposed solutions, voluntary offsetting can help tackle climate change now and explore new avenues of emissions reductions that may be included in compliance programs in the future.

To accomplish these goals, activity on the voluntary markets first needs to be tracked and recognized. This annual report attempts to facilitate transparency and a flow of information about non-regulated efforts to combat climate change and provide an understanding of their accomplishments. This requires outreach to hundreds of organizations willing to take time to complete our surveys and provide market insights on actual offset transactions valued by voluntary buyers. Despite tremendous efforts to contact and collect data from as many market participants as possible, we caution readers that our numbers should be viewed as conservative. We would like to thank all the companies and organizations who graciously shared their data for helping to foster a more transparent and effective marketplace.

Finally, we would like to encourage all readers of this report to take action against climate change. As findings in the report show, we need scale up our efforts to meet this gap and try to reverse emissions to 350 ppm or fewer. To accomplish this, everyone needs to step up from individuals to countries. It’s all hands on deck in a post-400 ppm world.



**Michael Jenkins**

Founding President and CEO

Forest Trends



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## Introduction

Following record-setting temperatures last year, the need for action against climate change is higher than ever. But even the most concerned individuals, corporations, and states will still emit **greenhouse gases (GHGs)**<sup>1</sup> in an industrial society—despite their best efforts to install more efficient light bulbs, use low-carbon transportation, or otherwise try to lower their footprint. After reducing GHG emissions as much as possible internally, organizations need to support low carbon activity externally—typically by purchasing carbon **offsets**.

A carbon offset represents one **tonne of carbon dioxide equivalent (tCO<sub>2</sub>e)** that *hasn't* been emitted into the atmosphere. Offsets come from on-the-ground **projects** and activities to reduce carbon emissions; they may even use many of the same activities listed above—for example, by switching to more sustainable fuel sources, or by planting trees that soak up CO<sub>2</sub> from the air.

But offsets differ from just any low carbon activity because their impact is calculated, measured, and typically verified by a third-party. In **compliance markets** (in those that allow offsets), a government agency makes the rules about what types of offsets are permitted and with what rigor they must prove to be included in the market. In contrast, offsets sold on the **voluntary carbon markets** typically follow rules prescribed by one of a handful of voluntary **standard** bodies.

Compliance offsets are usually allowed in limited quantities because they are able to provide cheaper alternatives than emissions reductions within regulated sectors and therefore can act as a cost-containment mechanism. In unregulated sectors, concerned citizens and organizations choose to offset emissions reductions in the absence of government regulation anyway. These purchases are voluntary.

Every year, since 2006, Forest Trends' Ecosystem Marketplace has distributed surveys to our network of **project developers**, investors, **retailers** and **brokers** to collect information about **transactions** during the previous year—along with detailed information about the sold offsets, including project type, location, and standard. These transactions can be grouped into **primary market** transactions (comprised of offsets sales from project developers to intermediaries or directly to **end buyers**) and **secondary market** transactions (comprised of offset sales among intermediaries or from intermediaries to end buyers).

For more info on our methodology, see “Frequently Asked Questions,” on page 22.

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<sup>1</sup> All terms in bold green text are defined in the Glossary in Appendix 2.

## The Voluntary Carbon Offset Lifecycle

To ensure that emissions reductions are real and “additional,” meaning they would not have been achieved without carbon finance, the vast majority of voluntary carbon projects now use third-party verified standards to approve their offsets. These standard bodies require a number of steps before a project developer can turn a project idea into reality.

Moving a project from conception to final **issuance** of offsets takes two and a half years on average.\* Common steps required by some—though not all—standard bodies appear in Figure 1, starting with a **Project Idea Note** that assesses the feasibility and risks of a project and a **Project Design Document** that lays out how the project will calculate and reduce or avoid emissions. A third-party auditor then “**validates**” these assumptions, and, after project implementation and monitoring, another audit process called “**verification**” assesses the delivery of greenhouse gas mitigation.

Offset project **registries** then issue each tonne of emissions reductions (now an eligible offset) a unique serial number that can be transacted multiple times before an owner can choose to “**retire**” it. A retired offset is flagged as unsellable on the registry so that the end buyer can claim the offset’s impact.

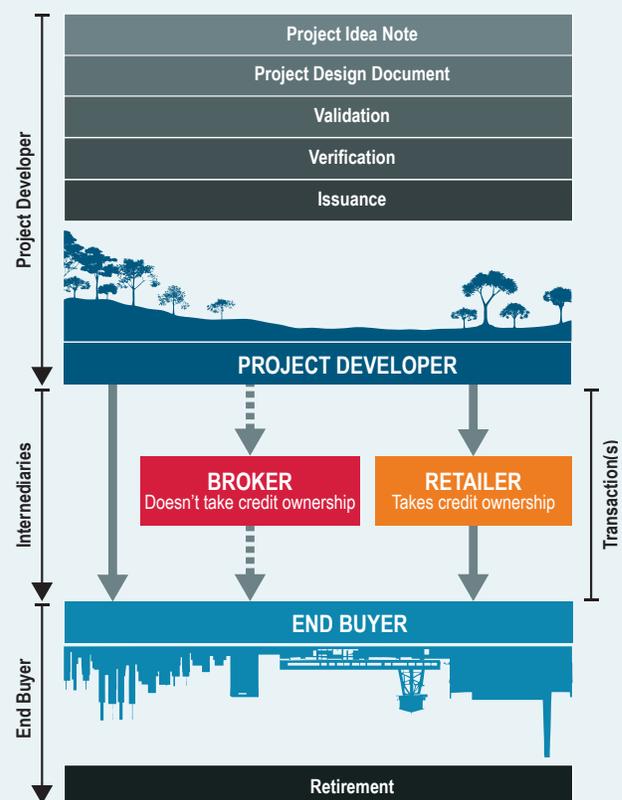
Different standards certify different project types and use different processes for achieving offset issuance. Some standards also include requirements that the project not only reduce emissions, but also include additional benefits (called **co-benefits**), such as employment or training for local populations, the preservation of biodiversity, or other non-carbon impacts.

### Selling a Voluntary Offset

Once a project developer is ready to market offsets, they must find a **buyer**. This can be a complicated process since there is no single marketplace for voluntary offsets. Some project developers develop their own marketing and advertising teams to identify and promote their project directly to end buyers. Others prefer to sell their offsets to intermediaries like a broker or a retailer, who takes responsibility for marketing those offsets to end buyers.

When an offset is sold, the transaction marks a transfer of ownership. An offset can be resold, e.g., by retailers who purchase offsets from project developers and resell them, but once it has been permanently sold to an end user who wants to claim the offset’s impact, it can no longer be resold. To ensure that it isn’t, this offset must be listed as retired on a registry that keeps track of offsets’ issuance and retirement.

Figure 1: The Offset Cycle, from Project Development to Retirement



\*Goldstein, Allie and Gloria Gonzalez. 2014. *Turning over a New Leaf: State of the Forest Carbon Markets 2014*. (Washington, DC: Forest Trends, 2014).

## Key Findings 2016

### Despite affordable prices, market volume decreased this past year.

The overall amount of carbon offsets bought and sold on the voluntary carbon markets dropped 24% in 2016 from the previous year. We tracked a total of 63.4 million (M) tons of carbon dioxide equivalent, compared to 84.1 MtCO<sub>2</sub>e traded in 2015, earning a total market value of \$191.3M.<sup>2</sup>

### Prices remained highly variable and differed based on particular project location, standard, project type, or other attributes.

Prices ranged from less than \$0.50/tCO<sub>2</sub>e to more than \$50/tCO<sub>2</sub>e. For example, wind offsets from Asia were bought and sold at an average of \$0.7/tCO<sub>2</sub>e, while afforestation/reforestation offsets from Africa transacted at an average of \$6.7/tCO<sub>2</sub>e. The average price across all transactions was \$3.0/tCO<sub>2</sub>e. In general, prices were lower on higher volumes traded.

### Most offsets sold came from wind, REDD+, or landfill methane projects, but smaller or more community-focused project types were more prominent on the primary markets.

**Reduced Emissions from Deforestation and Forest Degradation (REDD+)**, community-focused energy efficiency, and clean cookstove projects produced most of the 18.5 MtCO<sub>2</sub>e offsets sold by primary market<sup>3</sup> participants. In contrast, most of the 44.8 MtCO<sub>2</sub>e offsets sold by brokers, retailers and other intermediaries were from REDD+, wind and landfill methane projects. Many more project types sold offsets on both primary and secondary markets, though in smaller amounts.

Table 1: Market Size by Primary and Secondary Market, 2016

MARKET:	TOTAL	PRIMARY	SECONDARY
VOLUME:	63.4 MtCO <sub>2</sub> e	18.5 MtCO <sub>2</sub> e	44.8 MtCO <sub>2</sub> e
VALUE:*	\$191.3M	\$76.0M	\$107.0M

\*Market value is volume-weighted.

Notes: Based on market data provided by 139 organizations. Respondents did not always respond to all survey questions; differences in the totals (for example, between the total and the sum of primary and secondary market volume) can be attributed to this. An additional 61 organizations responded to the survey but did not provide voluntary offset transaction data. These organizations either did not transact any offsets in 2016, despite looking for buyers, or only sell offsets to compliance markets now.

### While nearly half of all offsets came from Asia, buyers placed higher value on offsets from Africa, Latin America, and North America.

**Suppliers** transacted 21.5 MtCO<sub>2</sub>e offsets from Asia, which comprised 46% of all offsets transacted worldwide. However, these offsets sold at lower average prices (\$1.6/tCO<sub>2</sub>e) than in many other regions, leading to a total

<sup>2</sup> All monetary values are reported in US\$ (\$) unless otherwise noted.

<sup>3</sup> Note that in our research, we track activity in both the primary and secondary offset markets, as an indicator of total market activity. However, the emissions reduction impact is the volume of offsets sold on the primary market.

value of \$35M (30% of the total value tracked from all project locations). North America (primarily the United States) generated the second-largest number of offsets, totaling 10.1 MtCO<sub>2</sub>e for a total value of \$29M. Meanwhile, offsets transacted from Latin America (5.8 MtCO<sub>2</sub>e) and Africa (5.8 MtCO<sub>2</sub>e), home to more forestry and land-use projects, represented total values of \$22M and \$24M respectively.

### **It's a buyers' market—almost as many offsets remain unsold as sold.**

It's not easy for many organizations to sell an offset. Since there is no centralized marketplace, finding **buyers** for carbon offsets can be an exercise in patience and persistence. Although we do not know how many offsets were produced in 2016, we do know that organizations produced many more offsets than they sold, as they reported 56.2 MtCO<sub>2</sub>e of unsold offsets in their portfolios (see page 17)—some of which were still languishing from years past.

### **While total voluntary offset emissions reductions remain small compared to what's needed to combat climate change globally, actions on the voluntary markets have a ripple effect into compliance markets.**

Despite the comparatively small volume, voluntary offsets have an outsized impact on compliance markets and on emissions reductions activities in general. Voluntary markets are a valuable testing ground for new types of emissions reductions and have also drawn important attention to non-carbon impacts from projects like biodiversity, employment, health and more (called “co-benefits”).



## Volume of Offsets Transacted

The volume of offsets sold represents total voluntary market activity (and by extension, market health). Yet on the primary market, volumes sold are also indicative of climate impact as well. For example, if many offsets are sold, more project developers may be interested in entering the market, thus driving up global emissions reductions. Lower volumes sold mean that sellers couldn't find enough buyers, which may result in some project developers discontinuing their projects.

In 2016, we tracked 63.4 MtCO<sub>2</sub>e transacted in the voluntary carbon markets. This is on the lower end of the spectrum of volumes tracked by us over the years, which has ranged from 12 to 135 MtCO<sub>2</sub>e.

Throughout the history of the voluntary carbon markets, the total volume of offsets traded has varied greatly from year to year. In fact, the average annual percent change in annual market volume between 2005 and 2016 is 50%. When Ecosystem Marketplace first began tracking the market in 2005, just 12.5 MtCO<sub>2</sub>e were traded. The market grew from 2005 to 2008, when it peaked at 134.5 MtCO<sub>2</sub>e. Between 2008 and 2010, the market saw peak voluntary offset sales, and volume of transactions remained at or above 100 MtCO<sub>2</sub>e per year through 2012. However, the total market volume has contracted since 2013; hovering between approximately 60 and 85 MtCO<sub>2</sub>e per year. Several different factors shape the size of the voluntary carbon markets each year, making it difficult to pinpoint one reason for the 2016 drop in market size.

One factor that drives both supply and demand is the interaction between the voluntary and compliance markets. For example, when California introduced its cap-and-trade program in 2013, it allowed some United States (US) voluntary offsets and voluntary projects to convert into compliance offsets. This could explain the lower voluntary offset activity seen in North America in subsequent years, as offsets sold in the California market average between \$10–\$11/tCO<sub>2</sub>e<sup>4</sup> compared to the voluntary North America average of \$2.9/tCO<sub>2</sub>e reported last year. Similar shifts may occur in China and South Africa, where compliance markets are in the process of being created and may allow for the transfer of voluntary carbon offsets or projects.<sup>5</sup>

While the volume of pre-compliance offsets rises and falls according to the establishment of compliance markets, demand for other offsets traded voluntarily remains hard to predict and varies depending on the region and project type. But on the global scale, one impetus for future supply could be the 2015 Paris Agreement. The Agreement made climate change a particularly high-profile issue in 2015, and spurred many companies to announce new or more ambitious GHG mitigation commitments. These companies may offset more in the future as they start to implement the new commitments. The fact that this was not yet reflected in an uptick in the market in 2016 might be because these companies were still re-orienting or updating their climate change policies. However, it is also feasible that organizations saw the Paris Agreement as a sign that governments will address climate change, and have shifted to focus more on climate-friendly activities within their own operations (perhaps excluding voluntary offsetting from their considerations), in anticipation of being regulated post 2020.

Although the annual volume of offsets transacted in the voluntary market decreased in 2016, the cumulative volume transacted reached a new milestone in 2016, as we have now tracked 1,057,212,302 offsets transacted. This makes 2016 the first year that the voluntary carbon markets topped 1 billion tCO<sub>2</sub>e in cumulative volume sold.

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<sup>4</sup> "Trading and Auctions," California Carbon, accessed May 16, 2017, <http://californiacarbon.info/>.

<sup>5</sup> Allie Goldstein: *Buying In: Taking Stock of the Role of Offsets in Corporate Carbon Strategies*. (Washington, DC: Forest Trends, 2016).

Figure 2: Historical Market-Wide Voluntary Offset Transaction Volumes



Notes: Based on survey responses representing 1,057 MtCO<sub>2</sub>e transacted pre-2005 to 2016. The Chicago Climate Exchange (CCX) volume represents transactions from US-based projects by US buyers anticipating regulation. It is considered "pre-compliance" because at the time, buyers were acting voluntarily in anticipation of cap-and-trade in the United States. After the legislation failed to pass in 2009, CCX tonnes continued to be traded on a voluntary basis, "off-exchange." Additional pre-compliance volumes were documented in the lead-up to California cap-and-trade and Australia's (now repealed) carbon tax.

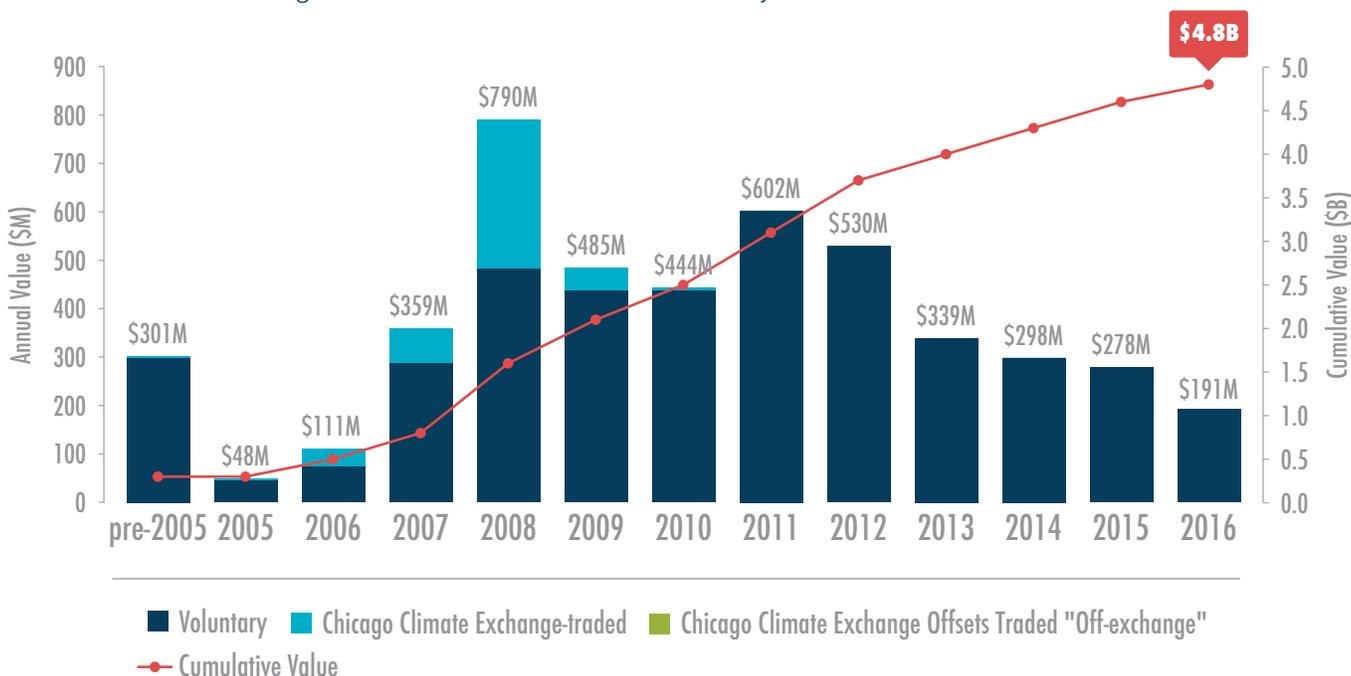
## Value of Offsets Transacted

Offsets produced by primary market actors represent real change as each tonne of carbon dioxide equivalent produced has been **permanently** removed from the atmosphere. However, value is just as—if not more—important to track. If buyers don't value offsets, then project development will dry up and investment into projects will cease. If value increases, project developers can maintain their projects and possibly expand their operations—and new organizations may enter the market and start reducing emissions.

To achieve widespread action against climate change, the market value needs to rise far above the total 2016 value of \$191.3M. The main reason for this low market value is the fact that lower volumes of offsets were transacted last year: the average *price* paid for offsets remained relatively stable at \$3.0/tCO<sub>2</sub>e. Drilling down to the transaction level, we see that buyers value offsets for a number of different reasons; sometimes because of project location, type, or standard (breakouts of these offset attributes are detailed in pages 10–16).

Buyers also tend to value newer offsets over older offsets, which may be a byproduct of supply and demand. There are many more offsets available for sale that were issued before 2016, and thus those suppliers may have been more competitive and offered lower prices to attract buyers. While pre-2016 **vintage** offsets sold at a lower average price of \$2.9/tCO<sub>2</sub>e for a total value of \$136.3M, such offsets made up the bulk (88%) of all offsets sold last year (compared to 7% of 2016 vintage and 5% of post-2016 vintage). Buyers proved willing to pay slightly more for offsets issued in 2016 or due to be issued in the future, perhaps because they wanted to support more recent emissions reductions activities, or perhaps because they wanted to support an earlier-stage project. Current vintages (2016) sold at an average price of \$3.5/tCO<sub>2</sub>e for a total value of \$13.7M, while future vintages (post-2016) sold at an average price of \$4.0/tCO<sub>2</sub>e for a total value of \$10.5M.

Figure 3: Historical Market-Wide Voluntary Offset Transaction Values



Notes: Based on survey responses representing 1,053 MtCO<sub>2</sub>e transacted over time. The CCX “off-exchange” value is too small to be visible.

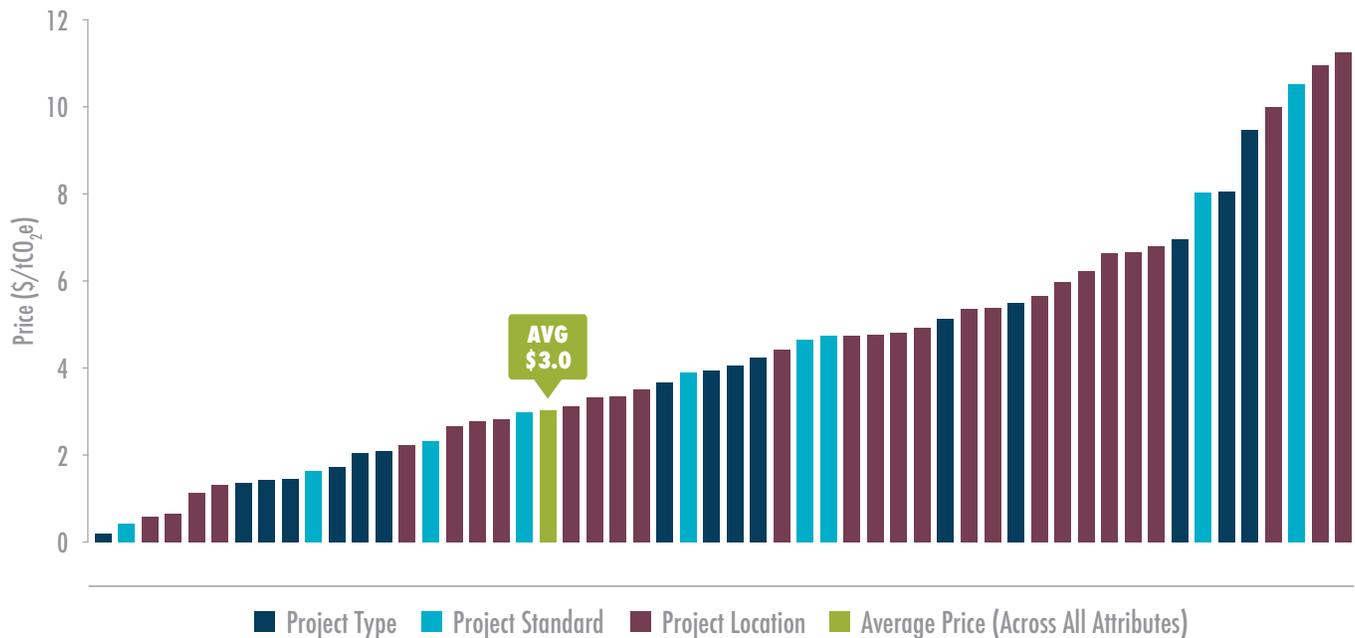
## Average Price Paid for Offsets

Scientifically speaking, one tonne reduced in one corner of the world has the same effect as a tonne reduced in another part of the world. In a compliance carbon market, one tonne of carbon dioxide equivalent is typically priced the same as any other. Yet, on the voluntary markets, buyers paid vastly different prices for voluntary carbon offsets in 2016, from less than \$0.5/tCO<sub>2</sub>e to more than \$50/tCO<sub>2</sub>e.

The reason for this is that voluntary offsets operate within a different type of market. Compliance markets are commodities markets; trading occurs to favor the lowest price and there is little differentiation between products. Voluntary markets, however, more closely resemble the real estate markets: even if two houses have an identical size and make, there are an infinite number of factors that might affect the selling price. In the voluntary markets, buyers may pay differently for the same amount of wind offsets, for example, depending on whether the offsets originate from a project close to their own business operations; on whether a project provides training or job opportunities to nearby communities; on whether a project has been verified under a particular standard body.

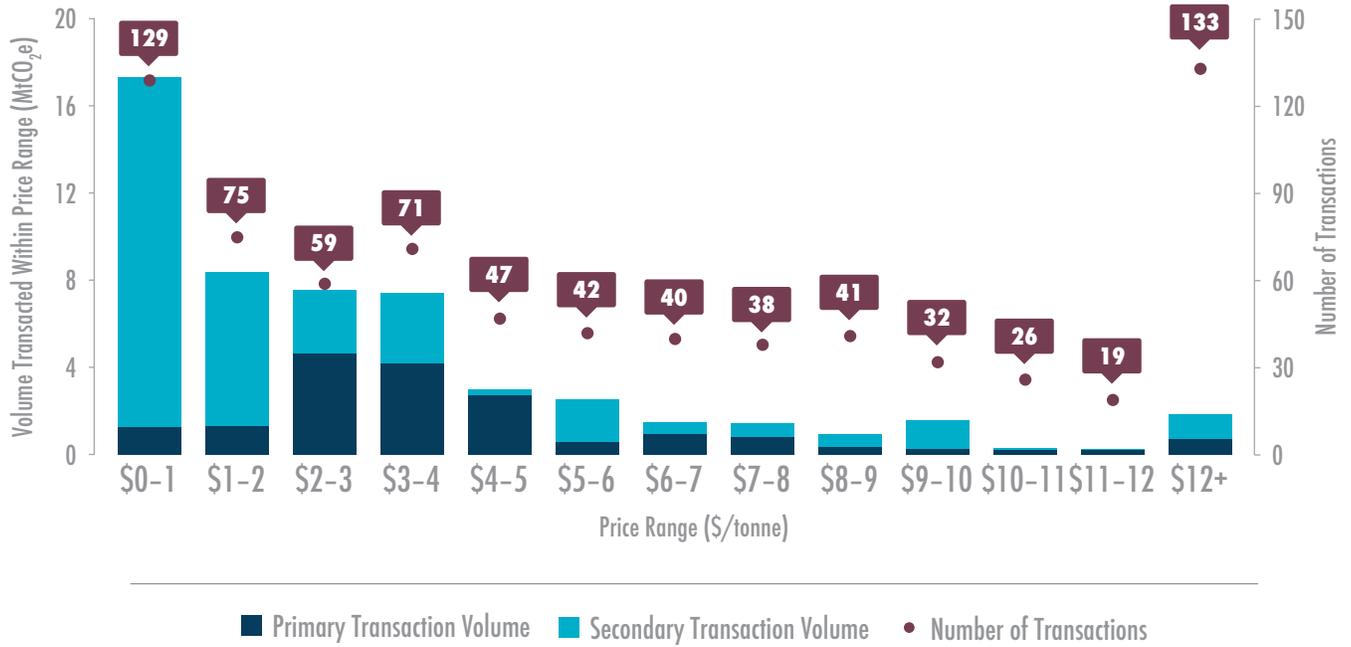
However, while we present many of these offset attributes and the accompanying average prices below (Figure 4) and in later pages (10–16), it's important to note that buyers are often influenced to value offsets by a *combination* of attributes. For example, clean cookstove offsets from Asia and Africa transacted at an average of \$2.9/tCO<sub>2</sub>e and \$5.1/tCO<sub>2</sub>e respectively (though, generally, clean cookstove offset transactions from both continents had actual prices range from below \$2/tCO<sub>2</sub>e to almost \$20/tCO<sub>2</sub>e).

Figure 4: Average Price of Offsets Transacted, Overall and by Select Project Standards, Types, and Locations



Across all offset types, age, location where produced, and standard, most offsets sell at the low end of the range (Figure 5), and this is especially pronounced for offsets sold on the secondary market. In 2016, over 17.3 MtCO<sub>2</sub>e of offsets transacted at \$1.0/tCO<sub>2</sub>e or less, and the vast majority, 93%, of these transacted on the secondary market. In contrast, only 2.4 MtCO<sub>2</sub>e were sold at \$10.0/tCO<sub>2</sub>e or more, and 47% of these transacted on the primary market. While the total volume transacted at \$12/tonne or more was much smaller than the total volume transacted at prices between \$0-1/tonne, the *number* of transactions recorded was nearly the same. This indicates that there are just as many deals at high average prices, but that those buyers purchase offsets in much smaller quantities.

Figure 5: Volume of Offsets Sold and Number of Transactions by Price, 2016



Notes: Based on 883 transactions representing 63.4 MtCO<sub>2</sub>e in 2016.

For transactions above \$12/tonne, 27% fell within the \$12–\$15/tonne range, nearly half (46%) transacted between \$15–\$16/tonne, and the remaining 27% transacted for greater than \$16/tonne.

## Project Types

The ability of voluntary offset organizations to innovate new project types is a unique feature of voluntary markets and allows them to act as incubators for compliance markets. During the project development phase, the developer must follow an approved framework, often called a **methodology** or protocol. The different standard bodies offer a number of different methodologies—and if there isn't one that fits a project, the project developer can work with a standard body to create a new one. To provide a general overview, Ecosystem Marketplace classifies projects into eight categories and 36 types (see Appendix 3 for our full list of categorization), loosely based on the methodologies and classification schemes set by different standards.

Project types can appeal to buyers in a few different ways. Some buyers want to support projects that do more than just reduce emissions and that include co-benefits like habitat protection or job creation. They might purchase offsets from a forestry project because the project not only sequesters carbon but also protects an endangered species like jaguars. Others want projects that are easy to understand. For example, most buyers intrinsically understand wind projects whereas forest carbon methodologies are much more complex to understand the biological sequestration and emission cycles. Still other buyers are simply looking for the lowest cost way to reduce emissions, and care little about the type of project they support.

Table 2: Transacted Volume, Value, and Average Price by Project Category, 2016

	VOLUME	AVERAGE PRICE	VALUE
<b>RENEWABLES</b>	<b>18.3</b> MtCO <sub>2e</sub>	<b>\$1.4</b>	<b>\$25M</b>
<b>FORESTRY AND LAND USE</b>	<b>13.1</b> MtCO <sub>2e</sub>	<b>\$5.1</b>	<b>\$67M</b>
<b>METHANE</b>	<b>5.6</b> MtCO <sub>2e</sub>	<b>\$1.8</b>	<b>\$10M</b>
<b>EFFICIENCY AND FUEL SWITCHING</b>	<b>4.5</b> MtCO <sub>2e</sub>	<b>\$2.9</b>	<b>\$13M</b>
<b>HOUSEHOLD DEVICE</b>	<b>3.4</b> MtCO <sub>2e</sub>	<b>\$5.2</b>	<b>\$18M</b>
<b>TRANSPORTATION</b>	<b>1.9</b> MtCO <sub>2e</sub>	<b>\$0.3</b>	<b>\$1M</b>
<b>GASES</b>	<b>1.4</b> MtCO <sub>2e</sub>	<b>\$5.7</b>	<b>\$8M</b>
<b>OTHER</b>	<b>0.5</b> MtCO <sub>2e</sub>	<b>\$4.0</b>	<b>\$2M</b>

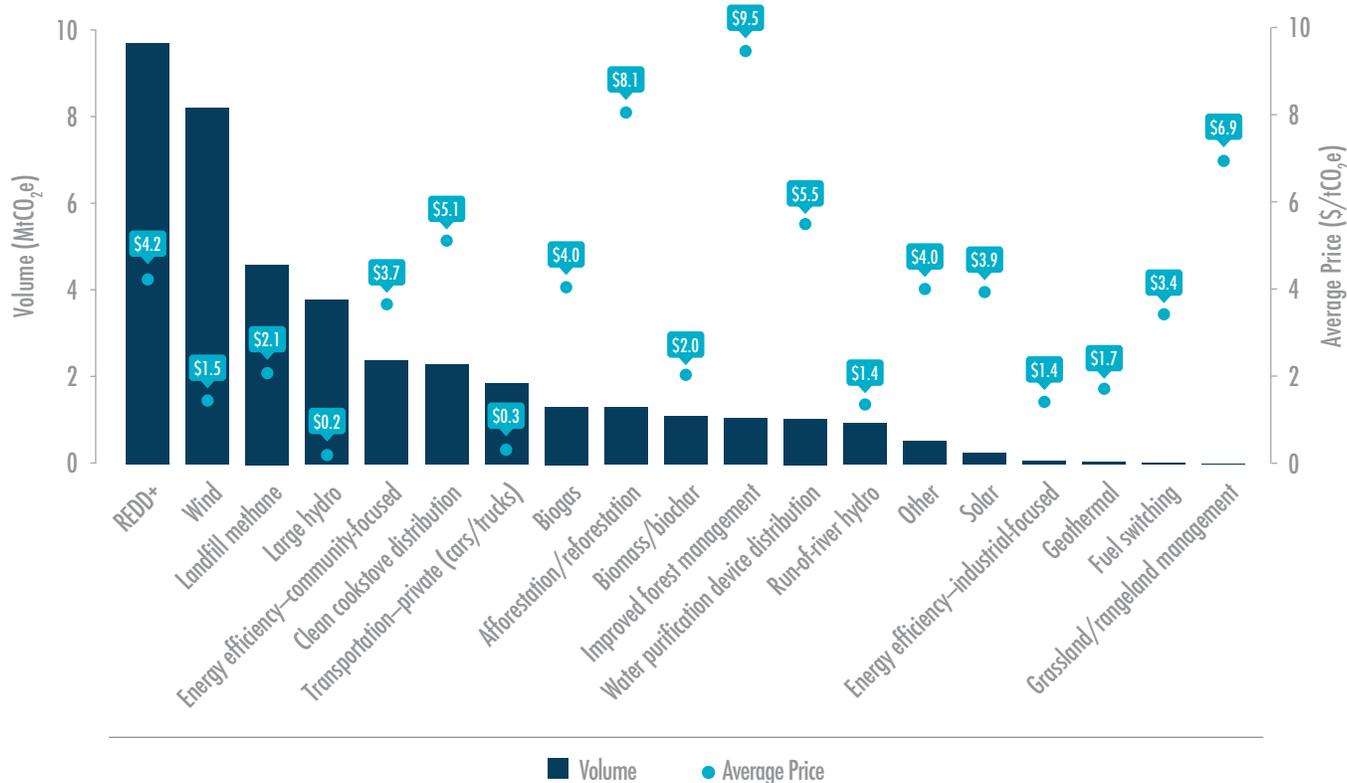
Notes: Based on 717 transactions representing 48.8 MtCO<sub>2e</sub> in 2016.

In 2016, renewables and forestry and land use were the two most traded offset categories by volume, with 18.3 and 13.1 MtCO<sub>2e</sub> traded, respectively. Renewables offsets sold at an average of \$1.4/tCO<sub>2e</sub>, while forestry and land use offsets sold at an average of \$5.1/tCO<sub>2e</sub>. As a result, the value of the forestry and land use offsets market was more than triple that of the renewables market, and comprised 46% of the total value of the voluntary carbon markets.

Aside from “other” project types—which typically represent project types that don’t fit neatly into our categories—gas and transportation projects represent the smallest component of the market. Both projects have a low volume of transactions (1.4 MtCO<sub>2</sub>e and 1.9 MtCO<sub>2</sub>e, respectively) yet vary significantly on average price (\$5.7/tCO<sub>2</sub>e versus \$0.3/tCO<sub>2</sub>e). For both categories, the few organizations that sold these offsets reported large volumes sold. The average transaction size for transportation offsets was 622.8 KtCO<sub>2</sub>e, compared with 470.1 KtCO<sub>2</sub>e for gas, which is considerably more than the average transaction size for the most-transacted offset categories, namely 398.9 KtCO<sub>2</sub>e for renewables, 156.3 KtCO<sub>2</sub>e for forestry and land use, and 229.1 KtCO<sub>2</sub>e across all categories overall.

Household devices, which include clean cookstoves, reported one of the higher average prices at \$5.2/tCO<sub>2</sub>e. However, these deals tend to be smaller, with an average transaction size of 129.7 KtCO<sub>2</sub>e and a total volume of 3.4 MtCO<sub>2</sub>e.

Figure 6: Transacted Volume, Average Price, and Price Range by Project Type, 2016



Notes: Based on 717 transactions representing 48.8 MtCO<sub>2</sub>e in 2016.

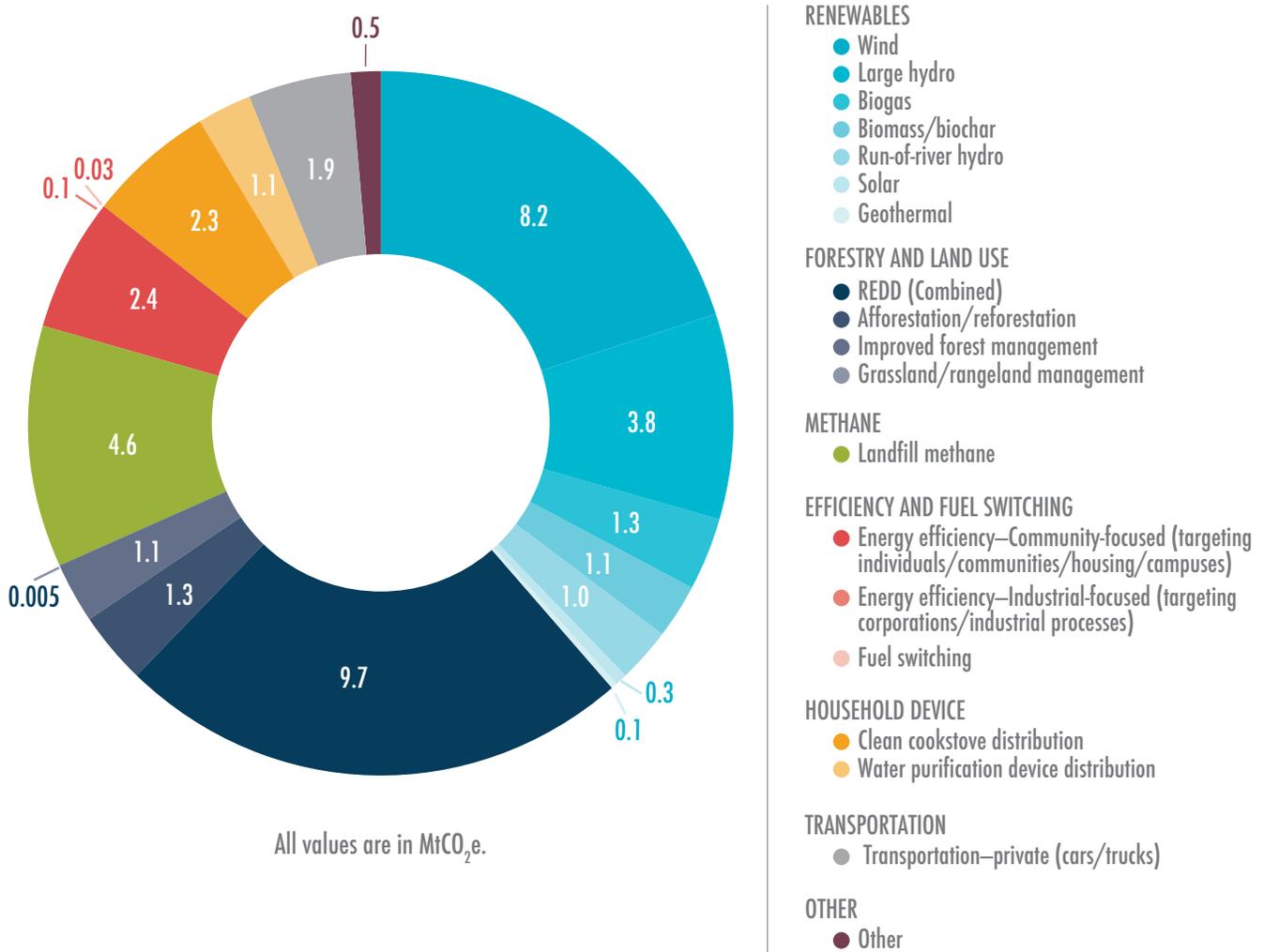
Each project category can be further broken up into several distinct project types. Of the 36 types that Ecosystem Marketplace tracks, the 20 most important ones are displayed in Figure 6 (12 had insufficient transactions to publish in this report and 4 had no reported transactions in 2016).<sup>6</sup>

The five most-transacted project types by volume in 2016 were: REDD+, wind, landfill methane, large hydropower, and community-focused energy efficiency. REDD+ and wind offsets have been the two most sought-after project types for the past several years. In 2016, REDD+ was the most transacted project type, with 9.7 MtCO<sub>2</sub>e. Wind ranked second, with 8.2 MtCO<sub>2</sub>e. Less-traded project types in 2016 were fuel switching, urban forestry, grassland/rangeland management, and wetland restoration/management.

<sup>6</sup> In order to maintain the confidentiality of respondents, Forest Trends only publishes aggregated results from at least 3 different respondents for each data point.

The two project types with the lowest average price were large hydro and transportation projects that focus specifically on private cars and trucks, which sold at an average price of \$0.2 and \$0.3/tCO<sub>2</sub>e, respectively. Improved forest management (\$9.5/tCO<sub>2</sub>e) and afforestation/reforestation (\$8.1/tCO<sub>2</sub>e) projects, in contrast, reported the highest average prices.

Figure 7: Transacted Volume by Project Type, 2016



Details of the Deals

Notes: Based on 663 transactions representing 40.8 MtCO<sub>2</sub>e in 2016.

## Offset Project Locations

The production and sale of carbon offsets is now a widespread phenomenon. However, there are some reasons why voluntary offsets projects are based in some countries, but not in others. In the case of developed countries, the main reason for a dearth of voluntary carbon projects is the fact that these countries have compliance markets (thus, there is less of a need for voluntary carbon offsetting). The European Union's Emissions Trading Scheme (EU ETS), for example, already regulates many sectors that produce carbon projects. Those sectors can't produce voluntary carbon offsets, because emissions from those sectors are already regulated—so there isn't room for voluntary emissions reductions. As such, there are fewer voluntary projects based in Europe.

In other parts of the world, voluntary carbon projects appeared *in anticipation of* compliance regulation. For example, a number of projects appeared in both Australia and the United States in the mid- to late 2000s, as developers hoped their project types would be allowed into an anticipated US federal program, the California cap-and-trade program, or the Australian cap-and-trade program. While the anticipated US federal program never materialized, the California cap-and-trade program took effect in 2012 and did allow several voluntary project types to convert into compliance projects accepted by the state's regulatory body. Meanwhile, the Australian cap-and-trade program also came to allow for some conversion of projects into those accepted in both the official cap-and-trade program and the subsequent Emissions Reduction Fund.

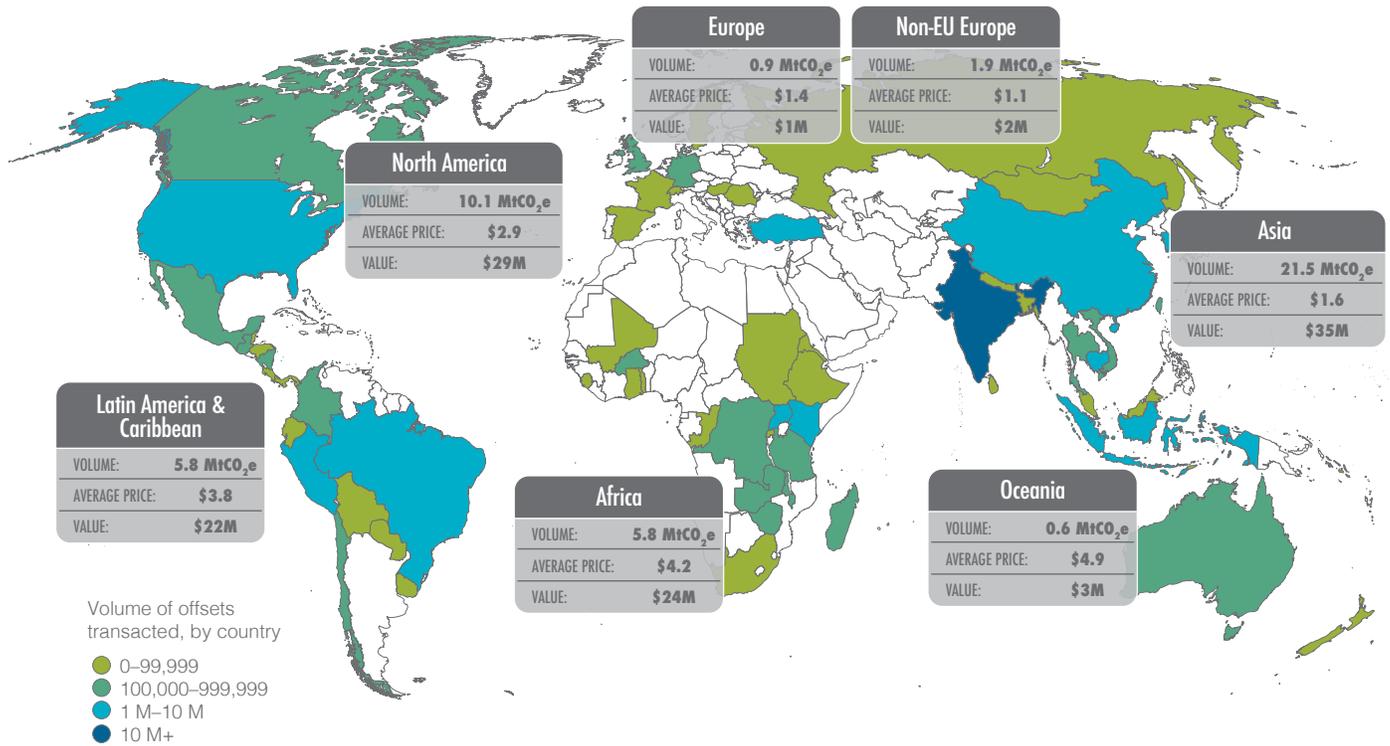
In areas lacking pre-compliance or compliance markets, voluntary projects (and their buyers) are often motivated to choose certain locations for reasons beyond the emissions reduction potential. For example, many forest carbon projects aim to protect trees and biodiversity first and foremost; revenue gained from carbon offsets is simply the means to achieve forest protection. Similarly, clean cookstoves projects are often located in rural or urban areas where households rely on smoky indoor stoves to cook, and aim to have both health and carbon benefits. The location of these projects is thus chosen at a sub-national level, and is highly specific to certain communities or ecosystems.

Buyers may also influence project location by purchasing from (and thus helping support) projects that are located near their operations or offer lower cost offsets. For example, if there is a project that is near one of their office headquarters, they may choose that project over one further away. Other buyers may prioritize the lowest cost offsets, and thus purchase from areas where the cost of labor or other project activities is cheaper.

In 2016, projects in 65 countries produced and sold carbon offsets on the voluntary market, representing every major region of the world. Asia sold the most offsets (21.5 MtCO<sub>2</sub>e), most of which came from India (10.0 MtCO<sub>2</sub>e), Korea (3.4 MtCO<sub>2</sub>e) and China (3.3 MtCO<sub>2</sub>e), while Oceania sold the fewest (557.5 KtCO<sub>2</sub>e), most of which came from Australia (535.2 KtCO<sub>2</sub>e).

Some regions favor certain project categories. Offsets from Asia and non-EU European countries (Georgia, the Russian Federation, and Turkey) were predominantly from renewable energy projects (11.8 MtCO<sub>2</sub>e and 1.3 MtCO<sub>2</sub>e), while offsets from Latin America and the Caribbean as well as Africa were mainly from forestry and land-use projects (4.1 MtCO<sub>2</sub>e and 2.9 MtCO<sub>2</sub>e, respectively). Offsets from projects in North America (Canada and the United States) were mostly from methane projects (3.7 MtCO<sub>2</sub>e). Offsets from projects in Oceania (mainly Australia and New Zealand) came in relatively equal measure from forestry and land-use projects (274 KtCO<sub>2</sub>e) and other types (283 KtCO<sub>2</sub>e). However, a host of other project categories is typically present in these regions as well.

Figure 8: Market Size by Project Region and Country, 2016



Notes: Based on 769 transactions representing 46.5 MtCO<sub>2</sub>e in 2016.

## Offset Project Standards

Voluntary offsetting first started to take off around the time countries were seriously considering and implementing compliance markets in the early 2000s. Companies, eager to prove themselves climate-friendly, started buying offsets even if they weren't required to by law. However, voluntary offset quality was a mixed bag—there were some well-planned projects and some that weren't.

After several scandals about unscrupulous carbon-offsetting organizations in the news, buyers started getting wary of purchasing voluntary carbon offsets.<sup>7</sup> Market participants reacted by starting to lay out answers to some questions that had plagued voluntary offsets, including: What was a voluntary offset? Who would vouch for it?

As an organic response to this market uncertainty, different non-profit organizations met to discuss the rules and requirements for offsets, and started to create voluntary standard bodies in the mid-2000s. The Verified Carbon Standard (VCS), for example, was created by non-profits like the International Emissions Trading Association, while the World Wildlife Fund for Nature was one of several organizations instrumental in the origin of the Gold Standard.

Standards differ by the specifics of their methodologies, and some standards focus on specific project categories or locations, and this competition and differentiation among standard bodies has helped the voluntary carbon markets serve as a space for innovation and experimentation. However, all standards verify that projects meet certain criteria to produce legitimate offsets and that they:

- Adhere to the standard's accounting methodology, including standardized recording and reporting of co-benefits.
- Ensure permanence and additionality; permanence means that the emissions are not simply being delayed. Additionality indicates that the offset would not have taken place without carbon payments.
- Prevent double-counting and leakage, meaning that the offset is not being retired more than once and that the emissions reduced by a project's activities aren't being displaced to some other geographic location.

In 2016, 99% of offsets in the voluntary carbon markets were certified by a third-party standard – continuing a trend started in 2008, when Ecosystem Marketplace first tracked nearly all offsets using a third-party standard to verify their impact (96% of all offsets at that time). Last year, respondents reported using thirteen different standards, with the Verified Carbon Standard (VCS) being the most common.

VCS certified almost 33 MtCO<sub>2</sub>e, 58% of the total offsets transacted in 2016. Of those, 7.7 MtCO<sub>2</sub>e were also certified by the Climate, Community & Biodiversity (CCB) Standards, which focuses on social and environmental co-benefits of land-based projects, but does not issue emissions reduction credits. Other common standards were the Gold Standard (17%), Clean Development Mechanism (CDM) (8%), Climate Action Reserve (8%), and American Carbon Registry (3%).

In an unusual turn of events, 4% of total market volume came from offsets approved under the ISO-14064 standard. This is not a standard often seen, and most (84%) of the ISO-14064 offsets came from a single large transaction.

The average offset price varied greatly among different standards. The average price of offsets associated with the five most common standards, which collectively made up 91% of the transaction volume, ranged between \$1.6/tCO<sub>2</sub>e (CDM) and \$4.6/tCO<sub>2</sub>e (Gold Standard). ISO-14064 was the least expensive, at \$0.4/tCO<sub>2</sub>e.

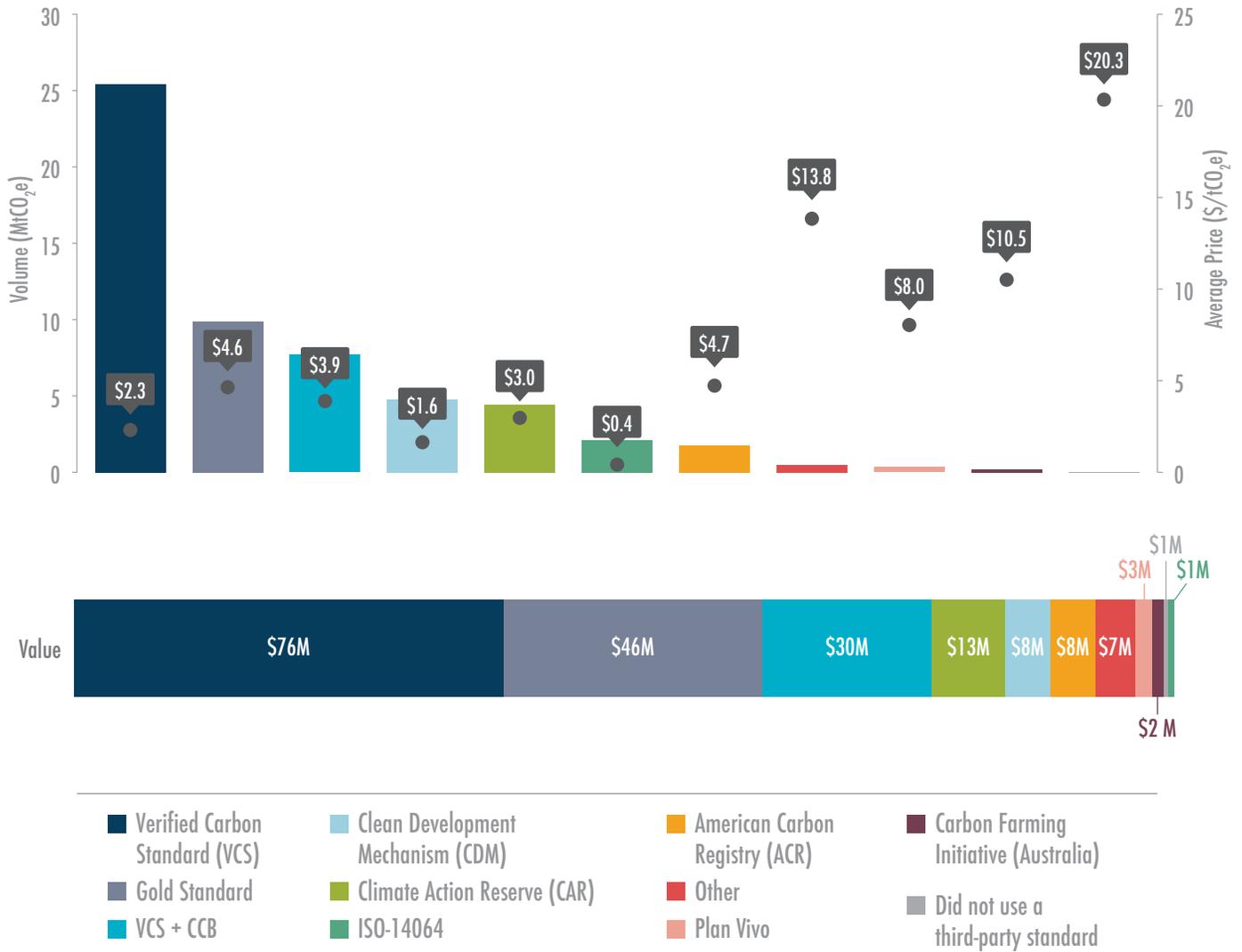
Less common standards tended to focus on a particular country, region, or project type. Plan Vivo, for instance, which certified 0.6% of offsets traded in 2016, only recognizes community land use and forestry projects. The Carbon Farming Initiative (CFI), which certified 0.3% of the market, is specifically for agro-forestry and sustainable

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<sup>7</sup> See. *Carbon Offsets: The U.S. Voluntary Market Is Growing, but Quality Assurance Poses Challenges for Market Participants*. Washington, DC: U.S. Government Accountability Office. 2008 and Hamilton, Kate, Ricardo Bayon, Guy Turner, and Douglas Higgins. 2007. *Picking Up Steam: State of the Voluntary Carbon Markets 2007*. Washington, DC: Forest Trends.

agriculture offsets in Australia. At \$8/tCO<sub>2</sub>e and \$10.5/tCO<sub>2</sub>e per offset, respectively, Plan Vivo and CFI also have higher average prices than the more mainstream standards.

Figure 9: Market Volume and Value by Standard, 2016



Notes: Based on 827 transactions representing 57.3 MtCO<sub>2</sub>e in 2016.

Details of the Deals

## Portfolio and Pipeline of Offsets

While respondents reported transacting 63.4 MtCO<sub>2</sub>e offsets last year, these organizations have nearly equal that amount—56.2 MtCO<sub>2</sub>e—still available for sale within their portfolios.<sup>8</sup>

Those offsets available for sale can be split between issued and *not* issued offsets: issued offsets are those that have received the final seal of approval by third-party verifiers and the standard body, while offsets elsewhere in the project cycle have not yet received final approval. In many cases, organizations will verify but wait to issue offsets (which can be costly) if they already have an existing supply on hand. If demand picked up, they could go through issuance to introduce this new supply to the market. Half of these unsold un-issued offsets represent renewable energy projects. Meanwhile, issued offsets that remained unsold represent a more mixed distribution of project categories, including renewables (28%), efficiency and fuel switching (19%), and gases (17%).

In terms of future offsets “in the pipeline” (those that could be brought to market in the next five years if demand warranted project development), organizations reported lower overall volume projections than they did for portfolio supply. In all categories but forestry and household devices, fewer offsets reportedly remained in the pipeline than were included as “unsold” in a portfolio already. Historically, pipeline supply exceeds unsold (both issued and not) portfolio supply; so the current situation may indicate project developers are taking a more cautious approach and waiting for more demand to appear first.

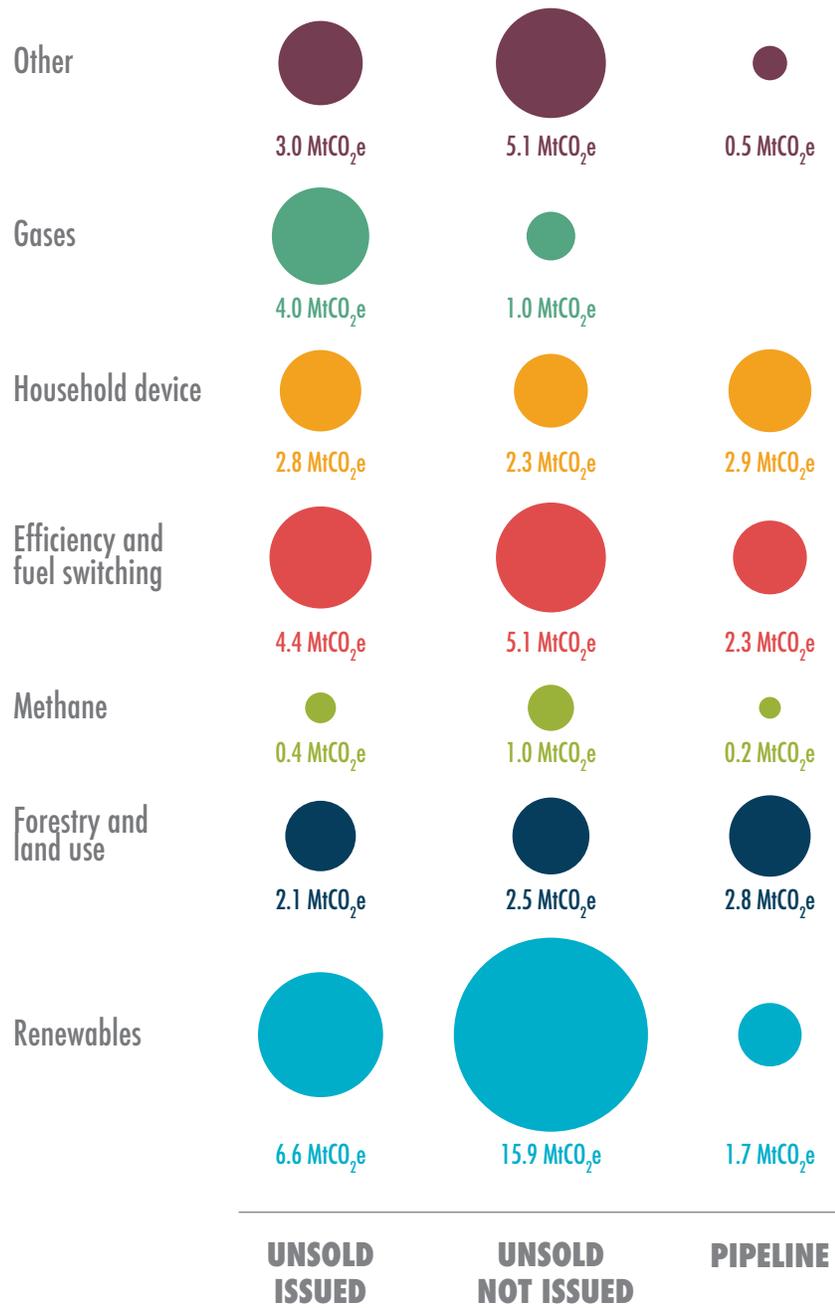
Why weren't these offsets sold? Organizations listed a number of reasons, most commonly saying that they could not find a buyer by year's end (48%). Other respondents decided to wait for better prices (36%) or for more favorable contract terms (6%). Despite these challenges, only one out of 56 organizations responding to this question said that they planned to exit the voluntary market due to insufficient demand.

Respondents to this report vary widely in how active they are in voluntary offsetting—either as a project developer, retailer, broker, or in another capacity. Some organizations' operations are completely focused on offsetting, while others view offsetting (either project development or offset resale) as one of many activities in their overall work. We also asked organizations if they planned to continue their current carbon offsetting operations in the future, or if they thought to decrease their involvement in the voluntary markets. Of the 28 organizations that responded, answers split evenly: 11 organizations plan to increase their offsetting activities in the future, 11 plan to decrease their participation, and four plan to maintain their current focus on offsetting. For those lessening their engagement in the voluntary markets, organizations reported prioritizing the following over voluntary carbon activity:

- Shifting reliance on carbon finance to other non-carbon sources (if the respondent is a project developer);
- Entering other environmental commodity markets, such as for renewable energy certificates or water benefit certificates (if the respondent is a project developer or intermediary);
- Or consulting or advising organizations on topics such as sustainable land use, forestry, biodiversity or waste management sectors (if the respondent is an intermediary).

<sup>8</sup> The actual amount of available supply is much higher than that. The 54.4 MtCO<sub>2</sub>e volume is based on responses from 72 organizations responding to this question and should be viewed as a supply minimum.

Figure 10: Remaining 2016 Portfolio and 2017 Pipeline Volumes by Project Category



Notes: Based on 23.3 MtCO<sub>2</sub>e in 2016 issued portfolio volume reported, 32.8 MtCO<sub>2</sub>e in 2016 unissued portfolio volume reported, and 10.4 MtCO<sub>2</sub>e in 2016 pipeline volume reported.

## Developments to Watch

While country representatives will continue to negotiate the rules of the Paris Agreement over the upcoming years, sub-national jurisdictions, corporations, and individuals continue to act to support low carbon solutions. We asked our survey respondents what they consider to be future opportunities and challenges for voluntary carbon markets. Several of the developments below are familiar to those listed in past years, reflecting the slow-moving nature of some market trends, while others are new in 2016.

Any one of these developments could influence voluntary markets, for better or worse: They could, for example allow for the conversion of voluntary offsets into a compliance program and unlock new demand for such offsets; or they could, through such a conversion, take away some existing voluntary demand.

**Politics may cause corporations and others to step up:** Elections in the United States this past year have left the future of US political commitment towards reducing emissions in question. Many respondents to this survey fretted about long-term implications if the US decides not to pursue low carbon commitments in the next few years, while others saw an opportunity for voluntary offsetting to help ensure interim emissions reductions occur. The lack of national climate action may galvanize private sector support for offsets.

**Aviation could open a potential new market:** All eyes are looking to the skies, as the International Civil Aviation Organization (ICAO) decides how airlines can reduce their emissions to meet an industry-wide target. Since renewable jet fuel is not yet widespread or economical, the industry association has turned to offsets as a way for airlines to meet emissions reductions goals, and ICAO is starting to craft its own offsetting scheme, known as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). However, *which* offsets (such as particular standards or project types) will be allowed in this market remains to be negotiated.

**Company commitments could stir new offset demand:** Company commitments around reducing deforestation or emissions have potential implications for offsetting. These include:

- Commitments *to reduce or eliminate deforestation from sourcing key commodities* (like soy, timber, or palm oil) are trying to protect at-risk forests. Since both forest carbon project developers and national REDD+ programs have been active in this space, this means that there is clear potential to overlap work and/or funding across REDD+ projects/programs and incorporate sustainable supply chain activities. So far, Forest Trends' Supply Change initiative has tracked 447 companies making zero deforestation commitments around their commodity sourcing.
- Meanwhile, 262 companies have committed *to science-based emissions reductions targets*, meaning that they have set targets in line with keeping a global temperature increase below 2 degrees Celsius. As these companies seek to make good on their promises, they may turn to offsetting once they have taken other measures to reduce their carbon footprint.

**Reporting differences could shift demand to renewable certificates:** In 2015, the Greenhouse Gas Protocol Corporate Standard, which is used widely by companies to quantify and report their emissions, revised their guidance. One key change regarded scope 2 emissions, which are indirect emissions generated by the purchase of electricity, heat, or steam: companies can now subtract renewable energy gained from certifications like the US-based Renewable Energy Certificates (RECs), international RECs (iRECs), Tradable Instruments for Global Renewables (TIGRs), or European Guarantees of Origin (GOs) from their total scope 2 emissions. While the guidance recognizes the purchase of renewable energy certificates, it does not allow companies to subtract renewable energy offsets from this calculation, leading market participants to believe that there could be a shift in demand from carbon offsets in favor of approved renewable energy certificates.

**Results from Paris Agreement negotiations or commitments, 2017–2020:** The Paris Agreement contains a number of decisions that could influence voluntary offsetting.

- The majority of countries have submitted their national emissions reductions plans (called Nationally Determined Contributions, "NDCs"), along with frameworks about *how* they would accomplish these changes.

Many mentioned using carbon markets as a cost-effective way to meet their reduction goals. These countries may choose to create their own carbon markets or link with countries using similar approaches (called “carbon clubs”).

- Negotiators will decide carbon market rules that would allow trading of carbon offset-like instruments (given the long-winded moniker of “internationally transferred mitigation outcomes”) across countries.
- Negotiators will also determine the role for forest carbon finance targeted towards reducing or avoiding deforestation in tropical countries at a country or jurisdictional scale.

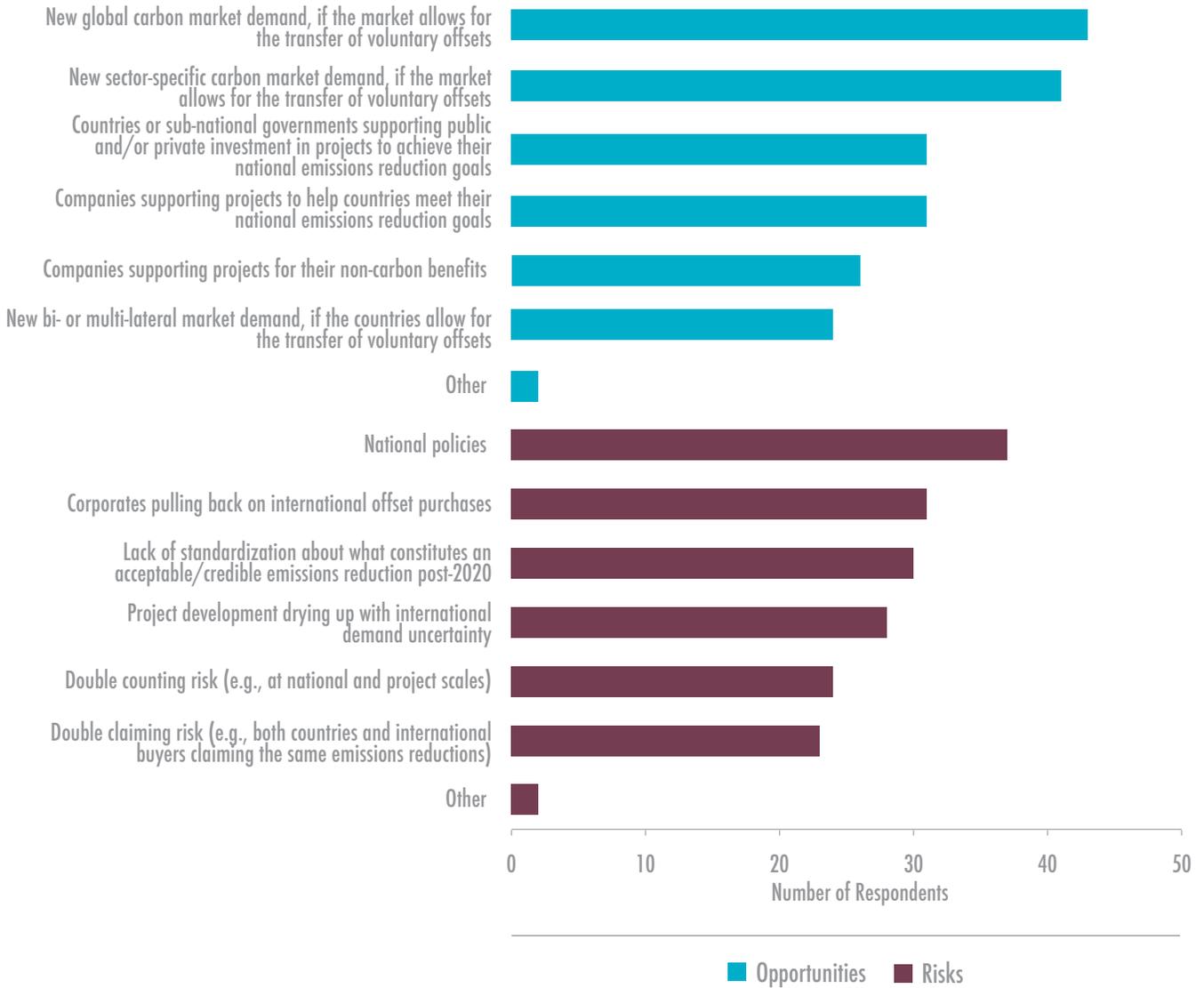
**Results from Paris Agreement negotiations or commitments, post-2020:** Since international negotiations about climate change may have the largest impact on voluntary offsetting, we asked survey respondents to look a little further in the future and list potential risks and opportunities for voluntary offsetting post-2020. They could select as many choices as they thought applicable, or write in their own responses.

The majority of respondents cited national policies around counting emissions reductions as the biggest risk towards future voluntary offsetting activity. For example, if a country counts all emissions reductions towards their own domestic emissions reduction commitment, then they would not allow voluntary market participants to sell offsets abroad (since any internationally-traded offsets should count against the foreign buyer’s emissions or meet the forest buyer country’s emissions, not the host country’s emissions). So far, Brazil has given some indication that it may take this approach and has not given any indication that it would pay for these voluntary offsets domestically.

Following their overarching concerns about national policies, respondents highlighted a few more specific risks that also revolved around national or international negotiations—either from corporations pulling back on offsetting given government action or around market uncertainty created from unclear standardization of compliance offsets. The latter has lots of politics surrounding it: when deciding how to meet their emissions reductions commitments, countries may decide to make their own compliance market, potentially link that market with other similar market structures in different countries, or participate in a global market defined by countries worldwide. In each of these, the rules around what constitutes a compliance offset could have implications for the voluntary markets; for example, as mentioned earlier in this report (page 5, 13), recent compliance markets have sometimes recognized and allowed voluntary offsets to convert for sale.

Despite these risks, respondents also saw clear avenues for selling more offsets—especially if a future global carbon market allowed for the transfer of voluntary offsets. If voluntary offsets could not find a home in a new global compliance market, there may be opportunities in sector-specific markets, like the aviation market. Furthermore, even if some countries did not allow the export of offsets, respondents thought there may be opportunities for corporations to support voluntary projects to help countries meet their emissions reduction goals, either through the purchase of emissions reductions or through project investment.

Figure 11: Perceived Opportunities and Risks for the Voluntary Markets Post-2020



Notes: Based on responses from 77 organizations. Respondents could select multiple risks and opportunities.

## Frequently Asked Questions

### Where does Ecosystem Marketplace's market data come from?

Information presented is based on data collected from offset project developers, brokers, and retailers, as well as carbon offset accounting registries and exchanges that track and facilitate the transfer of offsets between owners. The bulk of data was collected via an online survey designed for organizations supplying offsets into the voluntary carbon markets. The survey was available between February 14 and April 28, 2017 and distributed via our internal list of approximately 1,100 organizations identified as possible offset suppliers and externally through Ecosystem Marketplace's newsletters and the Climate-L and Forest-L listservs of the International Institute for Sustainable Development (IISD). To avoid double-counting volumes reported by offset suppliers and brokers (who do not take offset ownership), we asked respondents to specify the volume of offsets transacted through a broker or exchange. When we identified an overlap (for example, a project developer reported transacting offsets to a broker, and the same broker responded with transaction information), the transaction was counted only once.

### How does this report define "voluntary" offsetting?

In this report, the term "voluntary carbon markets" refers to all purchases of carbon offsets not driven by an existing regulatory compliance obligation. This includes transactions of offsets created specifically for voluntary buyers, as well as transactions of offsets by buyers preparing for future compliance obligations ("pre-compliance").

### How does this report define a transaction?

We consider "transactions" to occur at the point that offsets are contracted; or when suppliers otherwise agree to deliver offsets immediately or in the future; or when suppliers agree to retire an offset on someone's behalf based on a donation model.

### How does this report define "market" transactions?

Ecosystem Marketplace previously included two REDD Early Movers agreements in this series of reports, a 10 MtCO<sub>2</sub>e government-to-government agreement between Germany, Norway, and Ecuador in 2014 and another 8 MtCO<sub>2</sub>e bilateral deal between Germany and Acre, Brazil, in 2013. However, following a restructuring of our methodology which first began in Ecosystem Marketplace's *State of Forest Carbon Finance 2015*, such results-based payments among governments are now classified as "non-market" finance. We concluded that these commitments are distinct from previous REDD+ "readiness" finance in that they pay for achieved results quantified in terms of emissions avoided. However, they fall outside of market-based finance in that the tonnes typically do not transfer ownership and the funder does not intend to retire them against its own emissions. As such, we are no longer counting REDD Early Movers or other non-market finance within the context of the State of the Voluntary Carbon **Markets** report, though we will continue to track these agreements through the State of Forest Carbon **Finance** series. We have also removed references to REDD Early Movers data in historical data displayed in this report.

### Does this report track environmental impact?

Our analysis examines the volume of carbon offsets transacted to chart the size of the global marketplace in terms of carbon offsetting and future project investment. We do not track the individual "lives" of offsets as they pass through the value chain. For example, if a project developer sold an offset to a retailer and then the retailer sold the same offset to a final buyer, we count each transaction separately to derive the volume and value of transactions in the overall market. This methodology is consistent with most other marketplace analyses, such as the World Bank's annual reports on carbon pricing mechanisms. We do collect data on the volume of offsets retired. This volume, along with origination numbers, represents the market's minimum environmental impact—retired offsets can no longer be resold and so represent the amount of carbon emissions confirmed as being offset in each year.

## How do you protect the confidentiality of survey responses?

This report presents only aggregated data. All supplier-specific information is treated as confidential. Any supplier-specific transaction data mentioned in the text is already public information or approved by the supplier. Additionally, we do not identify prices or volumes from any country, project type, standard, or vintage for which we have data points provided by fewer than three organizations. We do not share supplier information with third parties without prior permission from the survey respondent.

## What was this report's survey response rate in 2017 (examining the 2016 offset marketplace)?

Each year, our goal is to identify and collect information from as many active offset suppliers as possible. It is critical to note that because of the fragmented nature of the market and confidentiality issues surrounding transaction data, it is impossible to capture all deals. This year, we received survey information from 231 organizations, 140 of which transacted carbon offsets in 2016.

The majority of responses came from European suppliers (48), who also supplied the most volume (30.9 MtCO<sub>2</sub>e). North American suppliers (42) respondents sold a total of 16.2 MtCO<sub>2</sub>e, while Oceania suppliers (10) trailed behind to sell 10.2 MtCO<sub>2</sub>e. Organizations headquartered Latin America (17), Asia (9), and Africa (9) reported transacting the remaining 11% of all transacted volume. Private-sector respondents (91) sold the majority (86%) of offsets, followed by non-profit organizations (42) supplying 13% of market share. Public-sector and other respondents (5) sold only 1% of the total volume.

## What estimated percentage of the voluntary carbon markets does Ecosystem Marketplace's survey capture?

We attempt to capture 100% of the voluntary offset transactions completed in 2016, but it is impossible to discern the volume of offsets sold by organizations that choose not to respond to our survey. We do know that organizations accounting for 10.5 MtCO<sub>2</sub>e in offset transactions in 2015 chose not to report to us in 2016. On the flip side, several new organizations reported transaction volumes in 2016.

## How do you calculate market share and aggregate volumes?

All of the calculations in this report are weighted by respondents' transaction volumes to determine the significance of their submissions. Market share is thus calculated based only on the transaction volume associated with each question. We do not extrapolate market share findings to all volumes reported in our survey, as the marketplace is too differentiated to make such assumptions. Notes at the bottom of most figures report the transaction volume associated with the figure.

## How does this report present prices and market value?

All offset prices reported in this series are volume-weighted to determine their significance. We prioritize pricing that was reported at the transaction level as more granular and robust than organization-wide pricing. For organizations that disclosed volume data but not price data, we used the market-wide average price as a proxy in our monetary valuation of the overall market and any variables for which we present market value. All financial figures presented are reported in US dollars unless otherwise noted. The numbers presented throughout this survey are measured in metric tonnes of carbon dioxide equivalent.

## Do Ecosystem Marketplace researchers screen the quality of offsets reported in this survey?

Because the aim of this report is to account for all voluntary payments for emissions reductions, we do not apply any quality criteria screens for offsets included in calculations. However, we do follow up with dozens of respondents to confirm or clarify survey responses that were incomplete or raised a red flag. In a few cases where we were unable to confirm that transactions occurred, these responses were omitted.

## Appendix 1: Acronyms

<b>CCB Standards</b>	Climate, Community & Biodiversity (CCB) Standards
<b>CDM</b>	Clean Development Mechanism
<b>CFI</b>	Carbon Farming Initiative
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>CORSIA</b>	Carbon Offsetting and Reduction Scheme for International Aviation
<b>EU ETS</b>	European Union Emissions Trading Scheme
<b>GHG</b>	Greenhouse gases
<b>GO</b>	Guarantees of Origin
<b>ICAO</b>	International Civil Aviation Organization
<b>iREC</b>	International Renewable Energy Certificate
<b>K</b>	Thousand
<b>M</b>	Million
<b>NDC</b>	Nationally Determined Contribution
<b>PPM</b>	Parts per million
<b>REC</b>	Renewable Energy Certificate
<b>REDD+</b>	Reduced Emissions from Deforestation and Forest Degradation
<b>tCO<sub>2</sub>e</b>	Tonne of carbon dioxide equivalent
<b>TIGR</b>	Tradable Instruments for Global Renewables
<b>VCS</b>	Verified Carbon Standard

## Appendix 2: Glossary

**Brokers:** Brokers are intermediaries who do not take ownership of offsets, but facilitate transactions for a fee between project developers and end users, between project developers and retailers, and/or between retailers. When given the opportunity, some retailers will also perform this role, but generally not at significant volumes.

**Buyers:** Buyers purchase offsets either for their own internal use (called “end-buyers”) or for re-sale to another buyer (called “intermediaries”). Intermediaries, such as retailers, purchase offsets with the intention to resell. In contrast, end-users purchase offsets to count against their emissions and typically retire any purchased offsets to signal that those offsets are no longer available for sale.

**Co-benefits:** Co-benefits are additional environmental, social, or other benefits arising from a carbon project that are quantified based on metrics or indicators defined by the project developer, a co-benefits certification program, or third-party carbon project standard that accounts for both climate and co-benefits. Some registries and standards enable co-benefits certification to be “tagged” onto issued carbon offsets, if quantification and verification of co-benefits are not already embedded in a carbon project standard.

**Compliance markets:** Compliance markets are the result of government regulation to reduce greenhouse gas emissions, and allow regulated entities to obtain and surrender emissions permits (allowances) or offsets in order to meet predetermined regulatory targets.

**End buyers:** End-buyers are buyers who purchase offsets with the intention to retire them. Offsets will no longer be sold after transferring to an end-buyer. This is in contrast to retailers, who purchase offsets with the intention to resell them. End buyers are also referred to in this report as “end-users.”

**Issuance:** Issuance is the final project stage which occurs after third-party auditors have guaranteed a project has avoided or sequestered carbon dioxide or its equivalent. Once a project has met all requirements by its voluntary standard, the developer can apply to a standards body to issue eligible offsets. Any offsets issued to the project owner come with a unique serial number and are listed in a registry that monitors any ownership transfers or offset retirement. Issuance takes place once a carbon offset project has been validated, verified, and undergone other required processes.

**Methodology:** A methodology lays out requirements for carbon offset projects for calculating emissions reductions. Project developers can either use pre-existing methodologies or develop new ones. Voluntary offset standards each have a list of approved methodologies that they accept.

**Offset:** This term refers to a quantified environmental benefit that is designed to compensate for impacts to habitat, environmental functions, or ecosystem services. Offsets may be regulatory or voluntary. Within carbon and greenhouse gas markets, offsets specifically refer to one metric tonne of carbon dioxide equivalent reduced, avoided or sequestered by an entity to compensate for emitting that tonne elsewhere.

**Permanence:** Permanence is the principle that carbon offsets must permanently remove the carbon dioxide or equivalent emissions from the atmosphere or oceans. For forest carbon, a reversal of carbon storage can happen from human activity (e.g., logging) or unforeseen natural events (e.g., forest fires, pest outbreaks).

**Primary market:** The primary market for carbon offsets is defined as the initial transaction of offsets from the project developer to the first buyer in line – this can be an offset retailer or broker (i.e., the “secondary market”) or a buyer of offsets for “end use” (i.e., end user or end buyer) in the voluntary or compliance carbon offset markets.

**Project:** A project is a site, or suite of sites, where restoration, sequestration, or other activities are implemented for the purposes of marketing the resulting ecosystem service assets or outcomes to buyers. Carbon offset projects quantify their avoided or reduced emissions to produce tradable climate reduction certificates, called offsets.

**Project developer:** A project developer is a catch-all phrase to describe organizations that create carbon offset projects, beginning with the initial Project Design Document all the way to offset issuance. Project developers

include organization's that are the project owner, partner organizations involved in project implementation, project financiers/investors, or others.

**Project Idea Note:** The Project Idea Note is the first stage in project development. The Project Idea Note is a preparatory step before creating a carbon offset project that is often required by project methodologies. A Project Idea Note may include project plans; project feasibility, impact, and risk assessments; findings from stakeholder input sessions; and other early-stage preparations.

**Project Design Document:** The Project Design Document is the project stage that follows the Project Idea Note, once a methodology is selected. A Project Design Document details project design, anticipated emissions reductions, plans for quantifying and monitoring the delivery of climate and other social and environmental benefits, demonstrates that the project activity exceeds "business-as-usual" reductions and avoids emissions leakage, and addresses other technical issues.

**Reduced Emissions from Deforestation and Forest Degradation (REDD+):** REDD+ projects are project types in areas where existing forests are at risk of land-use change or reduced carbon storage. The projects focus on conserving these forests *before* they are degraded or deforested, resulting in the avoidance of a business-as-usual scenario that would have produced higher emissions. Emissions reductions occur primarily through avoided emissions.

**Avoided Planned REDD+:** Avoided planned REDD+ projects protect forests that have been legally authorized to convert to non-forest land.

**Avoided Unplanned REDD+:** Avoided unplanned REDD+ projects protect forests from unclear or multiple threats, such as subsistence agriculture, livestock grazing, collection of fuelwood charcoal, illegal logging, and small-scale extractive activities.

**Registry:** A registry issues, holds, and transfers carbon offsets, which are given unique serial numbers to track them throughout their lifetime. Registries can also retire offsets. In compliance markets, each market has its own designated registry. In the voluntary market, independent registries exist.

**Retailers:** Retailers do not traditionally manage project development and documentation. Instead, they contract with project developers to take ownership of a portfolio of offsets that they then offer to end-buyers. Retailers typically offer other corporate carbon management services to end-buyers, such as advising on internal emissions reductions strategies.

**Retirement:** The final project development stage, retirement is the point at which an organization permanently sets aside a carbon offset in a designated registry, effectively taking the carbon offset's unique serial number out of circulation. Retiring offsets through a registry ensures that they cannot be resold. This is of particular importance if the buyer's intent is to claim the offset's emissions reductions against a carbon reduction or neutrality target.

**Secondary market:** The secondary market for offsets is comprised of sales among market intermediaries or between market intermediaries and end buyers or end users.

**Standard:** A standard is a set of project design, monitoring, and reporting criteria against which carbon offsetting activities and/or projects' environmental and social co-benefits can be certified or verified. In the voluntary markets, a number of competing standard organizations have emerged with the intent to increase credibility in the marketplace. More recently, national and sub-national regulated markets have also designed standards specific to regional needs for voluntary use.

**Supplier:** A supplier is any organization that sells carbon offsets, such as a project developer, retailer, or broker.

**Transaction:** A transaction occurs at the point that offsets are contracted by a buyer, regardless of whether suppliers agree to deliver offsets immediately or in the future.

**Validation:** The project development stage that follows the Project Design Document. Validation is the approval of carbon offset projects during planning stages. To achieve validation, projects must submit information on project

design for third-party approval. Project design information generally includes baseline scenarios, monitoring plans, and methodologies for calculating emissions reductions.

**Verification:** The project development stage that follows validation. Verification may take place up to several years after validation. It refers to the process of verifying emissions reductions generated by an offset project to a particular standard, which quantifies actual emissions reductions to ensure that the appropriate number of offsets are issued to the project.

**Vintage:** The year in which emissions reductions occur. The vintage of the offsets may not necessarily match the year in which the offsets are transacted—and the vintage year may be in the future.

**Voluntary carbon markets:** Voluntary carbon markets refer to the collective voluntary transactions tracked worldwide. There is no centralized single marketplace for voluntary transactions but rather many discrete transactions and, in some cases, country or program-related markets (such as the United Kingdom's Woodland Carbon Code).

## Appendix 3: Project Types and Associated Categories

Project Type	Project Category
Energy efficiency—community-focused (targeting individuals/communities/housing/campuses)	Efficiency and fuel switching
Energy efficiency—industrial-focused (targeting corporations/industrial processes)	Efficiency and fuel switching
Fuel switching	Efficiency and fuel switching
Waste heat recovery	Efficiency and fuel switching
Afforestation/reforestation	Forestry and land use
Agro-forestry	Forestry and land use
Grassland/rangeland management	Forestry and land use
Improved forest management	Forestry and land use
No-till/low-till agriculture	Forestry and land use
REDD+—Avoided planned deforestation	Forestry and land use
REDD+—Avoided unplanned deforestation	Forestry and land use
Rice cultivation/management	Forestry and land use
Soil carbon	Forestry and land use
Sustainable agricultural land management	Forestry and land use
Urban forestry	Forestry and land use
Wetland restoration/management	Forestry and land use
N <sub>2</sub> O	Gases
Ozone-depleting substances (Article 5)	Gases
Ozone-depleting substances (US-based)	Gases
Clean cookstove distribution	Household device
Water purification device distribution	Household device
Coal mine methane	Methane
Landfill methane	Methane
Livestock methane	Methane
Waste water methane	Methane
Transportation—private (cars/trucks)	Transportation
Transportation—bikes/public transit	Transportation
Biogas	Renewables
Biomass/biochar	Renewables
Geothermal	Renewables
Large hydro	Renewables
Run-of-river hydro	Renewables
Solar	Renewables

Wind	Renewables
Not specified	Other
Other	Other

## Appendix 4: Supplier Directory

This directory includes carbon offset suppliers that responded to Ecosystem Marketplace's survey in 2016 and chose to be listed. They are organized by region according to supplier headquarters.

**Table key:** ● Project developer ● Retailer ● Broker ● Investor ● Other

Africa			
Organization	Website	Headquarters	Market Role(s) Played in 2016
BioCarbon Partners	<a href="http://www.biocarbonpartners.com">www.biocarbonpartners.com</a>	Zambia	●
Carbon Tanzania	<a href="http://www.carbontanzania.com">www.carbontanzania.com</a>	Tanzania	●
DelAgua Health	<a href="http://www.delagua.org/projects/rwanda">www.delagua.org/projects/rwanda</a>	Rwanda	●
Environmental Conservation Trust of Uganda (ECOTRUST)	<a href="http://www.ecotrust.or.ug">www.ecotrust.or.ug</a>	Uganda	●
eThekweni Municipality	<a href="http://www.durban.gov.za">www.durban.gov.za</a>	South Africa	●
Form Ghana	<a href="http://www.formghana.com">www.formghana.com</a>	Ghana	●
GCX Africa	<a href="http://www.gcx.co.za">www.gcx.co.za</a>	South Africa	● ●
Gola Rainforest Conservation LG	<a href="http://www.golarainforest.org">www.golarainforest.org</a>	Sierra Leone	●
HIBB & CO, TOGO	<a href="http://www.hibbcotogo.com">www.hibbcotogo.com</a>	Togo	● ●
Nedbank Ltd	<a href="http://www.nedbank.co.za">www.nedbank.co.za</a>	South Africa	●
Promethium Carbon	<a href="http://www.promethium.co.za">www.promethium.co.za</a>	South Africa	● ●
Vi Agroforestry Programme	<a href="http://www.viagroforestry.org">www.viagroforestry.org</a>	Kenya	●
Viability Energy Limited	<a href="http://www.viabilityafrica.com">www.viabilityafrica.com</a>	Kenya	●

Asia			
Organization	Website	Headquarters	Market Role(s) Played in 2016
BioCarbon Group	<a href="http://www.biocarbongroup.com">www.biocarbongroup.com</a>	Singapore	●
Carbon Consulting Company	<a href="http://www.carbonconsultingcompany.com">www.carbonconsultingcompany.com</a>	Sri Lanka	●
Carbonyatra	<a href="http://www.carbonyatra.com">www.carbonyatra.com</a>	India	●
EKI Energy Services Limited	<a href="http://www.enkingint.org">www.enkingint.org</a>	India	● ●
Fair Climate Network (FCN)	<a href="http://www.fairclimate.com">www.fairclimate.com</a>	India	●
Forest Carbon	<a href="http://www.forestcarbon.com">www.forestcarbon.com</a>	Indonesia	●
Infinite Solutions	<a href="http://www.infisolutions.org">www.infisolutions.org</a>	India	● ●
InfiniteEARTH Ltd	<a href="http://www.infinite-earth.com">www.infinite-earth.com</a>	Hong Kong	●
KKI WARSI	<a href="http://www.warsi.or.id">www.warsi.or.id</a>	Indonesia	●
Nexus for Development	<a href="http://www.nexusfordevelopment.org">www.nexusfordevelopment.org</a>	Cambodia	● ●
Sindicatum Sustainable Resources	<a href="http://www.sindicatum.com">www.sindicatum.com</a>	Singapore	●

Soneva Foundation	www.sonevafoundation.org	Thailand	●
Swire Pacific Offshore	www.swire.com.sg	Singapore	●
SZ Consultancy Services Ltd	www.sz-bd.info	Bangladesh	●
Tamilnadu Spinning Mills Association (TASMA)	www.tasma.in	India	●
Tiger Standard	www.tigerstandard.com	India	● ●
Vert Conservation Pte Ltd	www.vertconservation.com	Singapore	● ●

Europe			
Organization	Website	Headquarters	Market Role(s) Played in 2016
2050 Consulting	www.2050.se	Sweden	●
Aera Group	www.aera-group.fr	France	●
Akfen Renewable Energy	www.akfenenerji.com.tr	Turkey	●
ALLCOT Group	www.allcot.com	Switzerland	● ●
ALPEREN ELEKTRIK URETIM AS	www.balsuyu.com	Turkey	●
Althelia Ecosphere	www.althelia.com	United Kingdom	●
atmosfair	www.atmosfair.de	Germany	● ●
Bischoff & Ditze Energy GmbH	www.bd-energy.com	Germany	●
BP Target Neutral	www.bptargetneutral.com/uk	United Kingdom	●
Carbon Clear	www.carbon-clear.com	United Kingdom	●
Carbon Expert	www.carbonexpert.ro	Romania	●
CarbonSinkGroup S.r.l	www.carbonsink.it	Italy	●
China Carbon	www.chinacarbonfund.com	Netherlands	● ●
Climate Neutral Group	www.climateutralgroup.com	Netherlands	●
ClimateCare Oxford Limited	www.climatecare.org	United Kingdom	● ●
ClimatePartner GmbH	www.climatepartner.com	Germany	● ●
ClimateTradeExchange	www.ctxglobal.com	United Kingdom	●
CO2balance	www.co2balance.com	United Kingdom	●
CO2Solidaire—GERES	www.co2solidaire.org	France	● ●
Die Ofenmacher e.V.	www.ofenmacher.org	Germany	●
EcoAct	www.eco-act.com	France	● ●
Ekobil Environmental Services and Consultancy Ltd.	www.ekobil.com	Turkey	●
Face the Future	www.facethefuture.com	Netherlands	● ●

Fair Recycling Foundation	<a href="http://www.fair-recycling.com">www.fair-recycling.com</a>	Switzerland	● ●
FairClimateFund	<a href="http://www.fairclimatefund.nl">www.fairclimatefund.nl</a>	Netherlands	●
Ferrero Trading Lux SA	<a href="http://www.ferrero.com">www.ferrero.com</a>	Luxembourg	●
First Climate Markets AG	<a href="http://www.firstclimate.com">www.firstclimate.com</a>	Germany	● ●
Fondation EcoFormation	<a href="http://www.ecoformation.org">www.ecoformation.org</a>	Switzerland	●
Forest Carbon Ltd	<a href="http://www.forestcarbon.co.uk">www.forestcarbon.co.uk</a>	United Kingdom	● ●
Forest Finest Consulting GmbH	<a href="http://www.co2ol.de">www.co2ol.de</a>	Germany	● ●
FutureCamp Climate GmbH	<a href="http://www.future-camp.de">www.future-camp.de</a>	Germany	● ●
Good Planet/Action Carbone Solidaire	<a href="http://www.goodplanet.org">www.goodplanet.org</a>	France	●
GREEN EVOLUTION SA	<a href="http://www.green-evolution.eu">www.green-evolution.eu</a>	Greece	● ●
Gte Carbon	<a href="http://www.gtecarbon.com">www.gtecarbon.com</a>	Turkey	● ●
Hivos Foundation	<a href="http://www.hivos.org">www.hivos.org</a>	Netherlands	●
Initiative Développement	<a href="http://www.id-ong.org">www.id-ong.org</a>	France	●
Lavola 1981, SA	<a href="http://www.lavola.com">www.lavola.com</a>	Spain	●
Livelihoods Fund	<a href="http://www.livelihoods.eu">www.livelihoods.eu</a>	France	● ●
Logicor Group Ltd.	<a href="http://www.logicor.co.uk">www.logicor.co.uk</a>	United Kingdom	●
Mavi Consultants	<a href="http://www.maviconsultants.com">www.maviconsultants.com</a>	Turkey	●
Microsol	<a href="http://www.microsol-int.com">www.microsol-int.com</a>	France	●
myclimate	<a href="http://www.myclimate.org">www.myclimate.org</a>	Switzerland	● ●
Natural Capital Partners	<a href="http://www.naturalcapitalpartners.com">www.naturalcapitalpartners.com</a>	United Kingdom	●
natureOffice GmbH	<a href="http://www.natureoffice.com">www.natureoffice.com</a>	Germany	● ●
Nordic Offset Oy	<a href="http://www.nordicoffset.com">www.nordicoffset.com</a>	Finland	●
Numerco	<a href="http://www.numerco.com">www.numerco.com</a>	United Kingdom	●
OurOffset Ltd.	<a href="http://www.ouroffset.com">www.ouroffset.com</a>	Hungary	●
SILVACONSULT AG	<a href="http://www.silvaconsult.ch">www.silvaconsult.ch</a>	Switzerland	● ●
South Pole Group	<a href="http://www.thesouthpolegroup.com">www.thesouthpolegroup.com</a>	Switzerland	● ●
UNIQUE (forestry and land use GmbH)	<a href="http://www.unique-forst.de/en">www.unique-forst.de/en</a>	Germany	●
United Purpose	<a href="http://www.united-purpose.org/carbon-up">www.united-purpose.org/carbon-up</a>	United Kingdom	●
UPM Umwelt-Projekt-Management GmbH	<a href="http://www.upm-cdm.eu">www.upm-cdm.eu</a>	Germany	●
Wind to Market, S.A.	<a href="http://www.w2m.es">www.w2m.es</a>	Spain	●
World Land Trust	<a href="http://www.worldlandtrust.org">www.worldlandtrust.org</a>	United Kingdom	●
ZeroMission	<a href="http://www.zeromission.se">www.zeromission.se</a>	Sweden	●

Latin America			
Organization	Website	Headquarters	Market Role(s) Played in 2016
ACOPAGRO	<a href="http://www.acopagro.com.pe">www.acopagro.com.pe</a>	Peru	●
BIO ASSETS ATIVOS AMBIENTAIS LTDA	<a href="http://www.bioassets.com.br/index.php">www.bioassets.com.br/index.php</a>	Brazil	●
Biofíllica Investimentos Ambientais	<a href="http://www.biofillica.com.br">www.biofillica.com.br</a>	Brazil	●
BVRio Environmental Exchange	<a href="http://www.bvrío.org">www.bvrío.org</a>	Brazil	●
CARBOSUR	<a href="http://www.carbosur.com.uy">www.carbosur.com.uy</a>	Uruguay	● ●
Cooperativa AMBIO SC de RL	<a href="http://www.ambio.org.mx">www.ambio.org.mx</a>	Mexico	●
EQAO	<a href="http://www.eqao.com.br">www.eqao.com.br</a>	Brazil	● ●
Fondo para la Acción Ambiental y la Niñez	<a href="http://www.carbosur.com.uy">www.carbosur.com.uy</a>	Colombia	●
Greenoxx	<a href="http://www.greenoxx.com">www.greenoxx.com</a>	Uruguay	●
Grupo Ecológico Sierra Gorda, IAP	<a href="http://www.sierragorda.net">www.sierragorda.net</a>	Mexico	●
Grupo Secacapp	<a href="http://www.gruposecacao.com">www.gruposecacao.com</a>	Guatemala	●
IDESAM	<a href="http://www.idesam.org.br">www.idesam.org.br</a>	Brazil	●
Pica de Hule Natural	<a href="http://www.econegocios.com.gt">www.econegocios.com.gt</a>	Guatemala	●
Plataforma Mexicana de Carbono, MÉXICO2	<a href="http://www.mexico2.com.mx">www.mexico2.com.mx</a>	Mexico	●
Pronatura México, A.C.	<a href="http://www.neutralizate.com">www.neutralizate.com</a>	Mexico	●
Proteak	<a href="http://www.proteak.com">www.proteak.com</a>	Mexico	●
Proyecto Mirador	<a href="http://www.proyectomirador.org">www.proyectomirador.org</a>	Honduras	●
Sustainable Carbon	<a href="http://www.sustainablecarbon.com">www.sustainablecarbon.com</a>	Brazil	●
WayCarbon	<a href="http://www.waycarbon.com">www.waycarbon.com</a>	Brazil	●

North America			
Organization	Website	Headquarters	Market Role(s) Played in 2016
3Degrees Group	<a href="http://www.3degreesinc.com">www.3degreesinc.com</a>	United States	●
Algoma Highlands Conservancy	<a href="http://www.algomahighlandsconservancy.org">www.algomahighlandsconservancy.org</a>	Canada	●
Bluesource, LLC	<a href="http://www.bluesource.com">www.bluesource.com</a>	United States	●
California State Parks	<a href="http://www.parks.ca.gov/?page_id=667">www.parks.ca.gov/?page_id=667</a>	United States	●
Carbon Credit Capital	<a href="http://www.carboncreditcapital.com">www.carboncreditcapital.com</a>	United States	●
Carbonfund.org Foundation	<a href="http://www.carbonfund.org">www.carbonfund.org</a>	United States	●
CERPD	<a href="http://www.cerpd.com">www.cerpd.com</a>	United States	●
City of Medicine Hat Solid Waste Utility	<a href="http://www.medicinehat.ca">www.medicinehat.ca</a>	Canada	●
Clean Air Action Corp	<a href="http://www.cleanairaction.com">www.cleanairaction.com</a>	United States	●

ClimeCo Corporation	www.climeco.com	United States	● ●
Code REDD/Stand for Trees	www.coderedd.org www.standfortrees.org	United States	●
Conservation International	www.conservation.org	United States	●
Convoy Solutions, LLC dba IdleAir	www.idleair.com	United States	●
Cool Effect	www.cooleffect.org	United States	●
C-Quest Capital	www.cquestcapital.com	United States	● ●
Diversified Pure Chem, LLC	www.divpc.com	United States	●
ecoPartners	www.epcarbon.com	United States	●
ECOTIERRA	www.ecotierra.co	Canada	●
Ecotrust Forest Management	www.ecotrustforests.com	United States	●
Element Markets	www.elementmarkets.com	United States	● ●
Envirofit International	www.envirofit.org	United States	●
Environmental Attribute Advisors	www.enviadvi.com	United States	●
EOS Climate	www.eosclimate.com	United States	●
Forterra	www.forterra.org/carbon	United States	● ●
GreenTrees	www.green-trees.com	United States	●
Hillsborough County	www.hillsboroughcounty.org	United States	●
Impact Carbon	www.impactcarbon.org	United States	●
Jadora	www.jadora.com	United States	●
L&C Carbon	LCCarbon.com	United States	● ●
Less Emissions Inc.	www.less.ca	Canada	●
Mikro-Tek Inc	www.mikro-tek.com	Canada	● ●
NativeEnergy, Inc.	www.nativeenergy.com	United States	● ●
NatureBank	naturebank.com	Canada	●
Nisqually Land Trust	nisquallylandtrust.org	United States	●
Origin Climate Inc.	www.originclimate.com	United States	● ●
Renewable Choice Energy	www.renewablechoice.com	United States	●
Second Nature	www.secondnature.org	United States	● ●
Taking Root	www.takingroot.org	Canada	●
TerraGlobal	www.terraglobalcapital.com	United States	● ●
TerraPass/Just Energy	www.terrapass.com	United States	●
The Climate Trust	www.climatetrust.org	United States	● ●
The Conservation Fund	www.conservationfund.org	United States	●
The Nature Conservancy	www.nature.org	United States	●
The Paradigm Project	www.theparadigmproject.org	United States	●
Urban Offsets	www.urbanoffsets.co	United States	● ●
Wildlife Conservation Society	www.wcs.org	United States	●

Wildlife Works Carbon LLC	www.wildlifeworks.com	United States	●
Will Solutions	www.solutionswill.com/en	Canada	●

Oceania			
Organization	Website	Headquarters	Market Role(s) Played in 2016
Australian Carbon Traders PTY LTD	www.australiancarbontraders.com	Australia	● ●
Biodiverse Carbon Conservation	www.mycarbonfarming.com.au/projects/biodiverse-carbon-conservation/	Australia	● ●
Carbon Advantage	www.carbon-advantage.com.au	Australia	●
Carbon Forest Services Limited	www.carbonforestservices.co.nz	New Zealand	●
CBL Markets	www.cblmarkets.com	Australia	●
Cool Planet	www.coolplanet.com.au	Australia	●
Ekos	www.ekos.org.nz	New Zealand	● ●
Enviro-Mark Solutions Limited	www.enviro-mark.com	New Zealand	●
GreenCollar Group	www.greencollar.com.au	Australia	● ●
Greenfleet	www.greenfleet.com.au	Australia	● ●
Sigma Global	www.sigmaglobal.com.au	Australia	● ●
WeAct Pty Ltd	www.weact.com.au	Australia	● ●
xpand Foundation	www.withoneseed.org.au	Australia	● ●

## Appendix 5: Detailed Transactional Data by Project Type

This Appendix includes detailed data by project type, including: the volume of offsets transacted in 2016, the volume-weighted average price, the spread between the minimum and maximum prices reported (to give a sense of the price range), and the total market value. We only included project types for which there were at least 100,000 tCO<sub>2</sub>e in transaction volume and for which at least three different organizations reported volume and price data (to protect confidentiality of individual respondents).

Project Type	Volume Transacted 2016	Average Price (\$/tonne)	Spread Between Min & Max Price (\$/tonne)	Value
REDD+	9.7 MtCO <sub>2</sub> e	\$4.2	\$18.7	\$41.2M
Wind	8.2 MtCO <sub>2</sub> e	\$1.5	\$18.8	\$12.0M
Landfill methane	4.6 MtCO <sub>2</sub> e	\$2.1	\$17.6	\$9.6M
Large hydro	3.8 MtCO <sub>2</sub> e	\$0.2	\$10.5	\$0.8M
Energy efficiency—community-focused	2.4 MtCO <sub>2</sub> e	\$3.7	\$11.1	\$8.8M
Clean cookstove distribution	2.3 MtCO <sub>2</sub> e	\$5.1	\$23.8	\$11.9M
Transportation—private	1.9 MtCO <sub>2</sub> e	Not enough price data to report accurate figure	Not enough price data to report accurate figure	Not enough price data to report accurate figure
Afforestation/reforestation	1.3 MtCO <sub>2</sub> e	\$8.1	\$70.5	\$10.6M
Biogas	1.3 MtCO <sub>2</sub> e	\$4.0	\$19.3	\$5.4M
Biomass/biochar	1.1 MtCO <sub>2</sub> e	\$2.0	\$28.5	\$2.3M
Improved forest management	1.1 MtCO <sub>2</sub> e	\$9.5	\$29.1	\$10.1M
Water purification device distribution	1.1 MtCO <sub>2</sub> e	\$5.5	\$13.5	\$5.8M
Run-of-river hydro	956.8 KtCO <sub>2</sub> e	\$1.4	\$8.4	\$1.3M
Other	538.1 KtCO <sub>2</sub> e	\$4.0	\$24.5	\$2.1M
Solar	256.7 KtCO <sub>2</sub> e	\$3.9	\$7.4	\$1.0M

## Appendix 6: Detailed Transactional Data by Project Location

This Appendix includes detailed data by project location, including: the volume of offsets transacted in 2016, the volume-weighted average price, and the total market value. We only included project location for which there were at least 100,000 tCO<sub>2</sub>e in transaction volume and for which at least three different organizations reported volume and price data (to protect confidentiality of individual respondents). Volumes under one million MtCO<sub>2</sub>e are rounded to the nearest 1,000.

Project Location	Volume Transacted 2016	Average Price (\$/tonne)	Value
India	10.0 MtCO <sub>2</sub> e	\$0.6	\$6M
United States	10.0 MtCO <sub>2</sub> e	\$2.8	\$28M
Korea—Republic of	3.4 MtCO <sub>2</sub> e	\$1.3	\$4M
China	3.3 MtCO <sub>2</sub> e	\$2.2	\$7M
Brazil	3.2 MtCO <sub>2</sub> e	\$2.8	\$9M
Turkey	1.9 MtCO <sub>2</sub> e	\$1.1	\$2M
Indonesia	1.8 MtCO <sub>2</sub> e	\$3.3	\$6M
Uganda	1.6 MtCO <sub>2</sub> e	\$3.1	\$5M
Peru	1.5 MtCO <sub>2</sub> e	\$4.4	\$6M
Kenya	1.3 MtCO <sub>2</sub> e	\$5.4	\$7M
Cambodia	1.0 MtCO <sub>2</sub> e	\$4.8	\$5M
Viet Nam	1.0 MtCO <sub>2</sub> e	\$3.4	\$3M
Germany	570.1 KtCO <sub>2</sub> e	\$0.6	\$0M
Australia	535.2 KtCO <sub>2</sub> e	\$4.8	\$3M
Malawi	442.7 KtCO <sub>2</sub> e	\$4.7	\$2M
Madagascar	237.3 KtCO <sub>2</sub> e	\$6.0	\$1M
Chile	203.3 KtCO <sub>2</sub> e	\$5.6	\$1M
Zambia	190.4 KtCO <sub>2</sub> e	\$4.9	\$1M
Guatemala	164.0 KtCO <sub>2</sub> e	\$6.6	\$1M
Congo—Democratic Republic of the	144.4 KtCO <sub>2</sub> e	\$2.7	\$0M
Mexico	143.5 KtCO <sub>2</sub> e	\$5.4	\$1M
Colombia	135.6 KtCO <sub>2</sub> e	\$6.2	\$1M
Tanzania—United Republic of	119.2 KtCO <sub>2</sub> e	\$6.8	\$1M
Canada	110.2 KtCO <sub>2</sub> e	\$11.0	\$1M

## Appendix 7: Detailed Transactional Data by Standard

This directory includes details on the carbon offset standards that respondents to Ecosystem Marketplace's 2017 survey list as using. They are organized by associated volume.

### Carbon Offset Third-Party Standards

Verified Carbon Standard (VCS)*			
*Overall, and used alongside the Climate, Community & Biodiversity Standards			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
33.1 MtCO <sub>2</sub> e	\$2.3/tCO <sub>2</sub> e	\$76.4M	45%
(of which 7.7 MtCO <sub>2</sub> e is CCB affiliated)	(\$3.9/tCO <sub>2</sub> e)	(\$29.9M)	(68%)
% Transactions by Top Offset Categories			% Transacted by Retailers
Renewables—47%	Forestry—38%	Efficiency and Fuel Switching—8%	55%
(Forestry—100%)			(32%)

Gold Standard			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
9.9 MtCO <sub>2</sub> e	\$4.6/tCO <sub>2</sub> e	\$45.8M	62%
% Transactions by Top Offset Categories			% Transacted by Retailers
Renewables—35%	Household Device—25%	Efficiency and Fuel Switching—21%	38%

Climate Action Reserve			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
4.4 MtCO <sub>2</sub> e	\$3.0/tCO <sub>2</sub> e	\$13.2M	33%
% Transactions by Top Offset Categories			% Transacted by Retailers
Methane—65%	Gasses—28%	Forestry—7%	67%

Clean Development Mechanism			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
4.8 MtCO <sub>2</sub> e	\$1.6/tCO <sub>2</sub> e	\$7.8M	40%
% Transactions by Top Offset Categories			% Transacted by Retailers
Renewables—76%	Efficiency and Fuel Switching—21%	Methane—2%	60%

American Carbon Registry			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
1.8 MtCO <sub>2</sub> e	\$4.7/tCO <sub>2</sub> e	\$0.9M	92%
% Transactions by Top Offset Categories			% Transacted by Retailers
Forestry—58%	Methane—38%	Transportation—4%	8%

ISO-14064			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
2.1 MtCO <sub>2</sub> e	\$0.4/tCO <sub>2</sub> e	\$883K	92%
% Transactions by Top Offset Categories			% Transacted by Retailers
Transportation—87%	Methane—8%	Efficiency and Fuel Switching—3%	8%

Plan Vivo			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
336.9 KtCO <sub>2</sub> e	\$8.0/tCO <sub>2</sub> e	\$2.7M	52%
% Transactions by Top Offset Categories			% Transacted by Retailers
Forestry—100%			48%

Carbon Farming Initiative			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
199.7 KtCO <sub>2</sub> e	\$10.5/tCO <sub>2</sub> e	\$2.1M	<i>Not enough data to report accurate figure</i>
% Transactions by Top Offset Categories			% Transacted by Retailers
Forestry—100%			<i>Not enough data to report accurate figure</i>

## Co-Benefit Third-Party Standards

Climate, Community & Biodiversity Standards			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
7.7 MtCO <sub>2</sub> e	\$3.9/tCO <sub>2</sub> e	\$30.3M	68%
% Transactions by Top Offset Categories			% Transacted by Retailers
Forestry—100%			32%

Social Carbon			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
1.2 MtCO <sub>2</sub> e	\$1.8/tCO <sub>2</sub> e	\$2.1M	71%
% Transactions by Top Offset Categories			% Transacted by Retailers
Renewables—61%	Forestry—39%		29%

### Project Area Certifications

Forest Stewardship Council			
Transacted Volume 2016	Average Price	Value	% Transacted by Project Developers
1.1 MtCO <sub>2</sub> e	\$4.3/tCO <sub>2</sub> e	\$4.7M	92%
% Transactions by Top Offset Categories			% Transacted by Retailers
Forestry—100%			8%

## Our Supporter



Good Energies Foundation (<http://www.goodenergies.org>) supports sustainable systems that can prevent poverty and disruption caused by climate change in the Global South. Good Energies Foundation was established in 2007 and founded as an integral part of Good Energies Inc., a private equity company specialised in investing in the renewable energy and energy-efficiency industries. Good Energies Foundation's historical mission is the alleviation of future poverty in the Global South by mitigating climate change. Good Energies Foundation initially leveraged its know-how in solar photo-voltaic to provide access to clean energy, especially in the area of rural electrification. At a later stage, climate-change related solutions were added to the portfolio, including sustainable reforestation models. As temperatures rise, we believe that innovative solutions are urgently needed to prevent the future displacement and impoverishment of the world's most vulnerable populations.

## Our Sponsors



BCP (BioCarbon Partners) is one of the leading African-based forest carbon offset development companies in the REDD+ (Reducing Emissions from Deforestation and Degradation) sector. BCP's mission is making forest conservation valuable to people. BCP focuses on achieving long-term conservation solutions for African dryland forests, through local presence, community empowerment and strong partnerships. Our REDD+ activities are validated and verified to the highest of international standards and include the VCS verified Lower Zambezi REDD+ Project in Zambia (CCBA triple gold Validated). BCP is also developing a large-scale REDD+ activity in Zambia's Luangwa Ecosystem through the 5 year USAID-funded Community Forests Program. BCP combines an entrepreneurial approach with a core philosophy of caring for people and environments to catalyze deforestation reduction in ecosystems of global biodiversity significance. More information about BCP can be found at [www.biocarbonpartners.com](http://www.biocarbonpartners.com).



Numerco is an award-winning independent energy and commodities company with a leading reputation in the renewable and carbon industry. Dedicated to reducing the impact of climate change, Numerco has a global reach extending beyond 30 countries, sourcing sustainable products from more than 200 partners and delivering them to organisations to meet their environmental goals. Specialising in international voluntary markets with an in-depth knowledge of regional programmes and industry-wide schemes, Numerco offers customers unparalleled access to the evolving environmental commodity markets. All products are certified to accredited standards and frameworks including CDM, VCS, Gold Standard, CAR and RECs.

Numerco provides a reliable and transparent platform to source products used to neutralise or reduce greenhouse gas emissions and present them effectively and efficiently to valued customers. The company's direct engagement throughout the process has wider social and economic benefits to communities involved in the projects and our extensive expertise and knowledge enables the development and financing of new projects. Founded in 2013 and based in London, Numerco has won awards three years consecutively from Environmental Finance Magazine. Visit <http://numerco.com> for more information.



[The BioCarbon Fund Initiative for Sustainable Forest Landscapes \(ISFL\)](#) is a multilateral fund, supported by donor governments and managed by the World Bank. Established in 2013, it promotes reducing greenhouse gas emissions from the land sector, from deforestation and forest degradation in developing countries (REDD+), and from sustainable agriculture, as well as smarter land-use planning, policies and practices. The ISFL supports programs in Colombia, Ethiopia, and Zambia. An additional program in Indonesia is under consideration.

The project-level initiative of the BioCarbon Fund was established in 2004 as a public-private sector initiative managed by the World Bank to support afforestation/reforestation as well as sustainable agricultural management projects through the purchase of emission reductions or carbon credits. Most of the projects supported by the Fund are registered with the UNFCCC's Clean Development Mechanism (CDM), while some including the first REDD+ initiative in Africa (Madagascar CAZ REDD project) and the Kenya Agricultural Carbon project are associated with Verified Carbon Standard (VCS).

BioCarbon Fund has over 20 projects located in 16 countries spread across five continents and they have been pioneers in demonstrating the generation of multiple revenue streams through a combination of financial returns from the sale of carbon credits with increased local incomes and productivity from sustainable land management practices.





# Pioneering Finance for Conservation

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## **Biodiversity Initiative**

Promoting development of sound, science-based, and economically sustainable mitigation and no net loss of biodiversity impacts

## **Coastal and Marine Initiative**

Demonstrating the value of coastal and marine ecosystem services

## **Communities Initiative**

Strengthening local communities' capacity to secure their rights, manage and conserve their forests, and improve their livelihoods

## **Ecosystem Marketplace**

A global platform for transparent information on environmental finance and markets, and payments for ecosystem services

## **Forest Policy, Trade, and Finance Initiative**

Supporting the transformation toward legal and sustainable markets for timber and agricultural commodities

## **Public-Private Finance Initiative**

Creating mechanisms that increase the amount of public and private capital for practices that reduce emissions from forests, agriculture, and other land uses

## **Supply Change**

Tracking corporate commitments, implementation policies, and progress on reducing deforestation in commodity supply chains

## **Water Initiative**

Promoting the use of incentives and market-based instruments to protect and sustainably manage watershed services

Learn more about our programs at [www.forest-trends.org](http://www.forest-trends.org)