

# THE GROWING IMPORTANCE OF GHG EMISSION INVENTORY, CARBON FOOTPRINTING AND INDEPENDENT VERIFICATION

## ABSTRACT

Today climate change, greenhouses gases (GHG) and global warming are front page issues the world over. The scientific understanding of climate change is now sufficiently clear to justify taking prompt action<sup>1</sup>. As a result, and for environmental, ethical and economic reasons, governments, businesses and individuals are responding to this challenge by attempting to quantify and reduce greenhouse gas emissions globally.

In attempting to manage and reduce GHG, the first step for an organization, business or individual is to inventory and quantify GHG emissions associated with its activities, operations, services or products. This quantification—or the total set of greenhouse gas emissions caused directly and indirectly by and individual, organization, event, service, or product—is known as a carbon footprint<sup>2</sup>.

While commercial activities, GHG emission profiling, and carbon footprints vary significantly from one business to another, the method for calculating a carbon footprint need not. When quantifying a carbon footprint most businesses typically use of one of two internationally-recognized standards/protocols, both of which offer a similar approach to establishing a carbon footprint within a defined boundary.

With growing pressure from investors, customers and stakeholders at large and in an attempt to take the first steps to address climate change, businesses today are increasingly inventory their emissions and quantifying their carbon footprints. Those businesses that are quantifying their emissions are realizing that doing so provides new opportunities, reduces risk and cost, and prepares them for inevitable GHG reporting and cap-and-trade legislation.

As the metric ton of carbon becomes regulated, monetized, commoditized, valued, and increasingly bought and sold in markets around the globe, businesses are also now seeing the benefits of independent 3rd-party verification of their GHG assertions. Whether it is to generate revenue by selling verified CO<sub>2</sub> reductions; to increase the integrity of GHG reporting activities or simply to provide independent assurance that a carbon footprint is complete, consistent and without material discrepancies; forward-thinking businesses are taking concrete steps to quantify, report and verify their carbon footprints.

### GREENHOUSE GASES, GLOBAL WARMING AND CLIMATE CHANGE

Today climate change, greenhouses gases (GHG) and global warming are front page issues the world over. From the classroom to the board room, global warming is the topic of conversation, and around the globe governments, businesses and individuals are beginning to recognize climate change as the single most significant issue facing our planet.

The significance of this issue and the importance of tackling the root causes of climate change have never been clearer:

*“The issue of climate change is one that we ignore at our own peril. There may still be disputes about exactly how much we’re contributing to the warming of the earth’s atmosphere and how much is naturally occurring, but what we can be scientifically certain of is that our continued use of fossil fuels is pushing us to a point of no return. And unless we free ourselves from a dependence on these fossil fuels and chart a new course on energy in this country, we are condemning future generations to global catastrophe.”* Barack Obama, The 44th President of the United States.<sup>3</sup>

*“No one should be in any doubt that climate change is upon us. The science is clear. The effects are becoming increasingly apparent as evidenced by extreme weather patterns and a growing number of natural disasters.”*<sup>4</sup> Bjorn Stigson, President of the World Business Council for Sustainable Development.

*The overriding environmental challenge of our time is climate change.*<sup>5</sup> Statement from business leaders’ coalition—Combat Climate Change.

*“Climate Change is an issue requiring urgent and extensive action on the part of governments, business and citizens if the risk of serious damage to global prosperity and security is to be avoided”.*<sup>6</sup> Statement from the UN Global Compact.

*“The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt actions.”*<sup>7</sup> Statement from US Climate Action Partnership.

With increasing consensus about the causes, impacts and actions required to mitigate an unimaginable global climate catastrophe, the debate now is not whether climate change is happening, but what on Earth we are going to do about it.

#### Carbon footprinting: the basics

##### Why is carbon footprinting important?

As indicated above, overwhelming scientific evidence indicates that climate change is primarily an anthropogenic (caused by humans) phenomenon that will—if unabated—have devastating global consequences. These impacts will affect all countries and ‘the most vulnerable—the poorest countries and populations—will suffer earliest and most, even though they have contributed least to the causes of climate change’<sup>8</sup>.

Furthermore, there are numerous economic studies (most notably the 2007 publication *The Economics of Climate Change* also known as the ‘Stern Review’<sup>9</sup>) that clearly indicate that the global economic costs of action now to mitigate and abate climate change will be significantly less than the global economic costs later of adapting to climate change if no abatement or mitigation action were to have taken place. This review has quantified that the cost of

unabated climate change will cost between 5% and 20% of global consumption while the cost of global mitigation is 1% global gross domestic production per year, +/- 3%.<sup>10</sup>

Consequently, and for environmental, ethical and economic reasons; governments, businesses and individuals are responding to this challenge by attempting to quantify and reduce greenhouse gas emissions globally.

## What is a carbon footprint?

In attempting to manage and reduce GHG, the first step for an organization, business or individual is to quantify the GHG it emits. This quantification—also known as a carbon footprint—is the “total set of greenhouse gas emissions caused directly and indirectly by and individual, organization, event or product”<sup>11</sup>. Depending on the context, a carbon footprint can also be referred to as a GHG determination or assertion.

## How do you calculate a carbon footprint?

While commercial activities and carbon footprints will vary significantly from one business to another, the method of calculating a carbon footprint need not.

Perhaps because of the obvious differences between business activities, sectors and geographies, in recent years some standardized and internationally-recognized approaches to quantifying a carbon footprint have emerged to provide clarity and consistency for GHG quantification and reporting.

The two most prominent of which are the 2004 joint publication by the World Resources Institute and the World Business Council for Sustainable Development entitled *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*, and the 2006 ISO publication ISO 14064-1 entitled: Greenhouse Gases – Part 1: Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.

Although these standards are different, they are meant to be complementary and generally speaking follow a similar approach to quantifying a carbon footprint. This approach is as follows: <sup>12</sup>

**Step 1:** Establish the organizational boundaries for the carbon footprint. This will define which facilities, operations and GHG sources and sinks will be included in the calculation. Where a footprint is to aggregate and consolidate GHG inventories from a number of facilities, operations or business units, the organization will need to clearly state what consolidation approach will be used (i.e. equity share approach or financial or operational control approach).

**Step 2:** Establish operational boundaries for the carbon footprint. This will define the boundaries of operations and thus, emissions that will be included in the carbon footprint. This should define the GHG to be included (typically the 6 GHG included within the Kyoto Protocol) and the emissions sources and scopes to be included. The 3 scopes for the quantification of emissions are:

1. Direct emissions – emissions from sources owned by the business or within its organizational boundary;
2. Energy or electricity indirect emissions – emissions associated with the purchase of electricity/energy brought into the organization for use; and,
3. Other indirect emissions – such as emissions associated with employee travel.

**Step 3:** Identify GHG sources (and sinks) for the chosen scopes.

**Step 4:** Define the quantification methodologies/calculation approach to be used. While it is possible to directly quantify GHG emissions by monitoring actual emission concentrations and flow rates, in most cases this is not practical or financially feasible. The more common approach is through a mass balance or Stoichiometric calculation where GHG emissions are determined through the use of emissions factors. Peer-reviewed guidelines and compilations of GHG emission estimation methodologies and application of emission factors are available, for example, American Petroleum Institute in the US has developed various compendiums providing a basis for consistent and reliable GHG emission management.

**Step 5:** Collect GHG activity data and choose emissions factors to be used.

**Step 6:** Apply calculations and determine the carbon footprint.

**Step 7:** Verify independently the carbon footprint. This step is optional but as discussed below there are a number of reasons why management would seek independent 3rd-party verification of a carbon footprint.

**Step 8:** Report your carbon footprint. Again, this step is optional, but as also discussed below there are benefits for doing so.

### Why would a business voluntarily quantify its carbon footprint?

Quantifying a carbon footprint—like any thorough and meaningful corporate accounting exercise—takes time and money. Depending on the size, nature, and complexity of a business or operation, calculating a carbon footprint can take anything from a few days to many months.

It stands to reason therefore, that if a business is not bound by regulation mandating the quantification and reporting of GHG emissions, many senior managers would quite rightfully question the value of voluntarily imposing such an expense on themselves.

With hundreds of big brand corporations now publicly declaring their intention to manage their carbon footprint or even 'go carbon neutral' however, there is clearly more than meets the eye here and with a little investigation it is clear that there are a number of very powerful drivers behind this trend. Further, for many organizations, GHG emission and energy consumption are two sides of the same coin. Any reduction in carbon footprint is directly mapped to reduction in energy consumption and costs.

### Positioning for survival and prosperity in a carbon constrained world

Today our world is at the beginning of a phenomenal and unavoidable transformation the likes of which we haven't experienced since the Industrial Revolution 200 years ago. This transformation—from a fossil fuel-based economy to a low-carbon economy—will bring with it both risk and opportunity and like the Industrial Revolution, with this transformation there will be winners and losers.

Because of this—and according to James Cameron, Chairman of the Carbon Disclosure Project (a coordinating secretariat for institutional investors with a combined \$57 trillion of assets under management)<sup>13</sup>—'the business world is waking up to the fact that combating the consequences of climate change is not only a necessity, but also represents an economic opportunity—those that adapt will survive, those that anticipate will prosper'.<sup>14</sup>

Understandably, many question the true significance of the opportunities presented by this transformation. Various estimates suggest, however, that ambivalence could be costly. One estimate—based on the value of a tonne of CO<sub>2</sub> (a conservative \$20/tonne) and the amount of CO<sub>2</sub> that needs to be removed from our atmosphere by the end of 2012 to begin to mitigate the effects of climate change—calculates this transformation to be a \$1 trillion opportunity.<sup>15</sup>

A second estimate is based on the market for environmental allowances itself which is already approaching \$1 trillion in market capitalization. This is equivalent to the stock market capitalization of the Toronto Stock Exchange, the seventh largest in the world or to half of the total size of the companies traded on the London Stock Exchange.<sup>16</sup>

Clearly, both the magnitude of this transformation and the speed at which this transformation is occurring means that those that act sooner and faster stand a far better chance of seizing the opportunities presented while those that wait and wonder probably will not.

### Managing risk and meeting the demands of the investment community

Whether this transformation is valued at a \$1 trillion or even just a few hundred billion dollars, one thing is for sure—climate change and the transformation to a carbon constrained world will bring with it enormous change. And this change, regardless how well we mitigate it, prepare for it, and ultimately adapt to it will bring risk.

Because of this, “the global investment community is at an unprecedented level of awareness concerning the competitive and financial implications of climate change”<sup>17</sup> and “companies are experiencing growing pressure from stakeholders to address climate change and assess, track and report GHG emissions accurately.”<sup>18</sup>

To put the influence of the investment community in perspective, some of the more prominent investor-led climate change initiatives are as follows:

1. The Carbon Disclosure Project (CDP) is an independent not-for-profit organization that provides a coordinating secretariat for institutional investors with a combined \$57 trillion of assets under management. On their behalf it seeks information on the business risks and opportunities presented by climate change and GHG emissions data from the world’s largest companies: 3,000 in 2008. <http://www.cdproject.net/>
2. The Institutional Investors Group on Climate Change (IIGCC) is a London-based forum of 42 members with assets under management in excess of €3.7trillion. Its aim is to promote the assessment and active management of the investment risks and opportunities associated with climate change. [www.iigcc.org](http://www.iigcc.org)
3. Ceres is a Boston, Massachusetts-based coalition of institutional investors managing \$4 trillion in assets (including the \$229 billion California Public Employees’ Retirement System – CalPERS). Ceres has endorsed efforts to encourage (US) federal legislation to curb greenhouse gases.<sup>19</sup> [www.ceres.org](http://www.ceres.org)
4. The Investor Network on Climate Risk (INCR) is a London-based network of institutional investors and financial institutions dedicated to promoting better understanding of the financial risks and investment opportunities posed by climate change. INCR now includes more than 50 institutional investors that collectively manage over \$3 trillion in assets. [www.incr.com](http://www.incr.com)

Clearly, and as echoed by Bjorn Stigson, President of the World Business Council for Sustainable Development (WBCSD), the investment community is forcing companies to respond to the risks associated with climate change and “an increasing number of companies are responding to this challenge by completing GHG inventories, quantifying their emissions, reporting GHG emissions and setting GHG emissions reductions goals.”<sup>20</sup>

## Prepare for impending legislation and benefit from early action

On March 10, 2009, the US EPA proposed the first comprehensive national system for mandatory reporting emissions of carbon dioxide and other greenhouse gases produced by major sources in the United States. EPA estimates 13,000 facilities in the US—including suppliers of fossil fuel and industrial chemicals, manufacturers of motor vehicles and engines, and large direct emitters of GHG equal to or greater than 25,000 metric tons of CO<sub>2</sub> equivalent per year—would be covered under this proposed rule. This is the first regulatory step toward a national, if not a regional, GHG emission cap-and-trade system across North America. On the legislative end, a discussion draft bill co-sponsored by Reps Henry Waxman (D-CA) and Ed Markey (D-MA), The American Clean Energy and Security Act of 2009” was unveiled on March 31, 2009 which called for reducing US national GHG emissions by 20% from 2005 levels by 2020, and 83% by 2050 through a market-based cap-and-trade program. President Obama has also included revenues from a cap-and-trade system in his budget projections for 2010 and beyond.

Elsewhere in the world, GHG reporting and cap-and-trade legislation is now in effect for over 11,500 energy-intensive installations across the European Union. With the scope of EU legislation set to steadily increase and with additional and/or impending GHG legislation in the UK; Canada; Taiwan; South Korea, Australia; and New Zealand the legislative and regulatory development is evident (see also Table 1). In time, GHG reporting and emissions legislation will be a condition of doing business not only for all ‘big emitters’ but, in some jurisdictions, covering emitters of various types and scopes.

Ergo, voluntarily acting now to implement systems and processes to quantify, track and inventory GHG emissions associated with an operation will prepare a business for increasingly inevitable GHG reporting and emissions management legislations.

Furthermore, in some jurisdictions, voluntarily quantifying and reporting GHG emissions ahead of a legislated requirement to do so may make a business eligible for ‘early action credits’ and concessions.

**Table 1**

<p><b>USA:</b></p> <ul style="list-style-type: none"><li>• At the federal level, there were over a dozen draft legislations introduced in the 110th Congress. However, none of which was realized into law. The 111th Congress opened with the prospects for climate legislation dramatically improved. President Obama is the first to occupy the White House to call for a mandatory, economy-wide cap-and-trade program to reduce GHG emissions. In his address to a joint session of Congress on February 24, 2009, President Obama asked lawmakers to send him “legislation that places a market-based cap on carbon pollution,”<sup>21</sup> and has set targets for reducing US GHG emissions of 14% below 2005 levels by 2020, and approximately 83% below 2005 levels by 2050. He has also included revenues from a cap-and-trade system in his budget projections for 2010 and beyond . . .</li></ul> <p>“After enactment of the Budget, the Administration will work expeditiously with key stakeholders and the Congress to develop an economy-wide emissions reduction program to reduce greenhouse gas emissions approximately 14 percent below 2005 levels by 2020, and approximately 83 percent below 2005 levels by 2050. This program will be implemented through a cap-and-trade system, a policy approach that dramatically reduced acid rain at much lower costs than the traditional government regulations and mandates of the past . . .”<sup>22</sup></p> <ul style="list-style-type: none"><li>• The Regional Greenhouse Gas Initiative (RGGI) is the first mandatory U.S. cap-and-trade program for carbon dioxide. It was established in December 2005 by the governors of seven Northeastern and Mid-Atlantic states: Connecticut, Delaware, Maine,</li></ul>
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New Hampshire, New Jersey, New York, and Vermont. Since, Massachusetts, Rhode Island, and Maryland had enacted legislations joining RGGI. Pennsylvania and District of Columbia are observers in RGGI program. As an entity, RGGI sets a cap on emissions of CO<sub>2</sub> from power plants, and allows sources to trade emissions allowances. The program will begin by capping emissions at current levels in 2009, and then reducing emissions 10% by 2018. First series of allowance auctions completed in September 2008, December 2008 and March 2009. These three auctions had raised over US \$262 millions dollars.

- The Western Climate Initiative is a collaboration between nine Western US states and Canadian provinces (Arizona, California, New Mexico, Oregon, Washington, Utah, Montana, British Columbia and Manitoba) to reduce greenhouse gas emissions to 15% below 2005 levels by 2020 through the use of a cap-and-trade system<sup>23</sup>.
- The Mid-western Greenhouse Gas Accord is a collaboration between 6 Midwestern states (Wisconsin, Minnesota, Illinois, Iowa, Michigan, Kansas) and Manitoba that creates a regional cap-and-trade system to reduce greenhouse gas emissions in the US' manufacturing and agricultural heartland by the middle of 2010'.<sup>24</sup>
- California's sweeping climate change law (Assembly Bill 32) requires California to reduce GHG emissions to 1990 levels by 2020 and then to reach 80 percent below 1990 levels by 2050. To meet these goals, in December 2007 the California Air Resources Board approved regulation for the mandatory reporting of GHG emissions from electricity retail providers, marketers, and cogeneration facilities, oil refineries, hydrogen plants, cement plants, and combustion sources ≥ 25,000 MT CO<sub>2</sub> per year. Reporting for 2008 emissions has begun as of January 1, 2009<sup>25</sup>.

### CANADA:

In April 2007, the Canadian government announced December 2007 the California Air Resources Board industry to cut the country's annual emissions by 150 approved regulation for the mandatory reporting of million tonnes of carbon dioxide (MT CO<sub>2</sub>) by 2020. GHG emissions from electricity retail providers, These proposals, delivered under the umbrella marketers, and cogeneration facilities, oil refineries, program "Turning the Corner" include a domestic hydrogen plants, cement plants, and combustion emissions trading scheme (ETS), the use of carbon sources = 25,000 MT CO<sub>2</sub> per year. Reporting for 2008 credits from Clean Development Mechanism (CDM) will begin in 2009<sup>26</sup>.

### UK:

In June 2007, the UK Department for Environment, Food and Rural Affairs launched the Carbon Reduction Commitment. This legislation aims to reduce emissions in approximately 5,000 large business and public sector bodies including hotel chains, supermarkets, local authorities, universities and large offices. The CRC will probably include a mandatory cap-and-trade scheme by 2010 and will apply to organizations that have annual electricity consumption in excess of 6,000 megawatt-hours and whose emissions are not included in the EU Emissions Trading Scheme (ETS) or Climate Change Agreements.<sup>27</sup>

### AUSTRALIA:

In February 2008, the Australian government released a policy paper on a mandatory GHG emissions and energy use regime that would require companies to report their emissions from 2009. This is to be followed by the implementation of a cap-and-trade system in 2010. It is proposed that facilities that emit at least 25,000 tonnes of carbon dioxide equivalent (CO<sub>2</sub>e) or use more than 100 terajoules of energy in the 2008-2009 financial year, shall report their emissions by October 31, 2009.<sup>28</sup>

### NEW ZEALAND:

In September 2007, the New Zealand government announced plans for a cap-and-trade system. Forestry will be the first sector to have its emissions capped when the scheme starts in January 2008. Transport, energy and agriculture will be included at different stages over the next five years.<sup>29</sup>

### **SOUTH KOREA:**

In December 2007, South Korea's Prime Minister Han Duck-soo announced that his country is planning to keep greenhouse gas emissions at 2005 levels by introducing an emissions trading scheme and other measures aimed at reducing GHG emissions.<sup>30</sup>

### **TAIWAN:**

In December 2007, the government of Taiwan announced plans to reduce GHG emissions to 2005 levels by 2030. Under the Greenhouse Gas Reduction Act, Taiwan will impose emission reduction regulations in the power and industrial sectors no later than 2009, in the transport and agriculture sectors by 2011, and additional business sectors by 2013.<sup>31</sup>

### First mover advantage in emissions reductions and tradable emissions credits

In recent years the implementation of GHG legislation has followed an increasingly predictable pattern. In the first instance legislation is established to mandate the reporting of GHG emissions for certain and larger emitting sectors. Subsequently (and sometimes simultaneously) regulation establishes a cap-and-trade system that limits the total permissible emissions from the reporting sectors.

In such a system, regulated installations are given or are able to purchase (for example, increasingly through auctions) permits to emit CO<sub>2</sub>. Those businesses that are able to reduce emissions below their permitted levels are then allowed to sell their unused emissions allocations to other businesses that are not able to reduce emissions below their permitted allocation.

Consequently, businesses that reduce emissions through energy efficiency measures, investments in low-carbon technologies or the implementation of other emissions reductions and abatement projects, will not only become more cost effective and more resource efficient, but often will be able to sell their unused emissions allocations.

As emission trading is relatively new, many businesses however, do not realize the true significance of this opportunity or potential risk of inaction. To put this in perspective, the EU Emissions Trading Scheme (EU ETS)—the world's first and currently the largest regulated cap-and-trade scheme—traded a total of 3.091 billion carbon allowances for a total market value of US\$ 91 billions (€67 billion) in 2008<sup>32</sup>. On January 13, 2009, European Commission, albeit controversial, adopted Directive 2008/101/EC amending Directive 2003/87/EC to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community, i.e., mandatory participation in EU ETS.

In the US, in its first three auctions ending March 2009, RGGI has raised over US \$262 millions at an average price of US\$ 3.42 per metric ton CO<sub>2</sub> equivalent. The Chicago Climate Exchange (CCX)—the world's first and North America's only voluntary emissions trading scheme—has already traded nearly 23 million tones of CO<sub>2</sub> at an estimated market value of approximately USD \$50 million in its earlier establishment in the market (See also Appendix 1 for a summary of the similarities and differences between the regulated and voluntary carbon markets).

Naturally, therefore, voluntarily preparing for and establishing GHG inventory reporting, management and reduction programs will enable a business to reduce emissions ahead of their competitors and peers. This will provide competitive advantage, develop expertise and experience in carbon management and provide early emissions trading opportunities that can contribute, in some cases significantly, to top-line revenue and bottom line profit.

Clearly, businesses that act now to better understand, manage, and reduce their carbon footprint will:

- identify and mitigate business risks associated with GHG emissions;
- capitalize on climate change opportunities, especially under the changing political landscape and regulatory directions;
- ease into mandatory reporting and regulated emissions regimes;
- benefit from early action incentives and concessions where they exist; and,
- improve the likelihood of emissions reductions and profit from emissions trading.

In addition to these benefits however, there are numerous other reasons why forward-thinking businesses are beginning to improve the management of their carbon footprints.

### **Quantifying and reporting a carbon footprint will:**

1. enable a business to improve energy conservation, environmental performance, and GHG management efficiency and reduce emissions and thus overall costs over time;
2. enable a business to identify emissions reductions and abatement opportunities and facilitate the development and implementation of GHG reduction and GHG avoidance/removal projects;
3. increase internal and external awareness and transparency of GHG inventory, targets and performance, which will improve staff motivation and retention, demonstrate leadership and corporate responsibility; and,
4. determine what reductions and offsets are required to become carbon neutral, which will reduce financial, operational, and reputational risk while improving brand image and your standing with shareholders, rating agencies, customers, and employees.

While many organizations today may not see the real value in declaring themselves carbon neutral, in 2008 the global voluntary carbon market including both regulated and voluntary trading (to comply with regulations or become carbon neutral) accelerated both in terms of emission volumes and values, faster than original projections amid the economic downturn. Overall, 2008 saw 4.9 billion metric tons (gigametric tons or Gt) of CO<sub>2</sub> equivalent change hands, up 83% from 2007 reaching over US \$125 billions (€ 92 billion)<sup>33</sup>. In the US, in its first three auctions, ending March 2009, RGGI has raised over US \$262 million at an average price of US \$3.42 per tonne CO<sub>2</sub> equivalent.

### **Why would a business verify its GHG emission inventory or carbon footprint?**

Regulations and mandates aside, just as unaudited financial accounts lack the credibility of those reviewed by a reputable independent accountancy firm, emission inventory or carbon footprint assertions that have been verified by an independent 3rd party are more credible, transparent and reliable than those that are not.

### **Benefiting from verified CO<sub>2</sub> reductions**

Because of this and according to a recent report by ClimateChangeCorp.com—an independent climate change news website—stakeholders today are exerting a growing influence on companies to provide verifiable carbon emissions

data<sup>34</sup> and “as companies strive to meet the expectations of shareholders, the independent verification of emissions data is of steadily growing importance.”<sup>35</sup>

With the increasing use of cap-and-trade regulation and thus the growing importance of emissions trading, a metric ton of carbon has become monetized and commoditized. As a result, there is now an established (albeit fluctuating) price for a metric ton of CO<sub>2</sub> in various marketplaces around the world. Consequently, where a business can prove the reduction or avoidance of CO<sub>2</sub> emissions, there is the potential for financial gain. Clearly therefore, and as with any commodity, businesses are recognizing that there is financial value in quantifying and verifying carbon footprints.

In addition to the financial value (often significant) in verifying and selling emissions reductions, there are a number of other benefits from verifying a carbon footprint.

### **Verifying GHG inventory reporting or carbon footprint will:**

1. provide independent assurance that a GHG inventory or carbon footprint assertion is complete, accurate, consistent, transparent and without material discrepancies<sup>36</sup>;
2. strengthen the integrity of GHG management, quantification and reporting activities which will improve data quality;
3. increase senior management confidence in GHG data and thus improve investment and strategic decision-making;
4. reduce the risk of material data discrepancies and reduce the risk of reputational, operational and financial risk that such discrepancies can cause;
5. ensure credible and reliable participation in voluntary GHG registries or reporting initiatives such as the The Climate Registry, Climate Action Reserve, or the Carbon Disclosure Project which in turn will enhance reputation and improved access to capital;
6. provide the independent 3rd-party verification often required to receive credit for early action prior to impending regulated reporting requirements;
7. improve internal accounting practices and reporting management processes; and,
8. provide practice and experience in the verification process prior to mandatory reporting or disclosure.

## Carbon footprint verification

### **What is carbon footprint verification?**

Carbon footprint verification is the ‘systematic, independent and documented process for the evaluation of a greenhouse gas assertion against agreed verification criteria’.<sup>37</sup> As indicated above, the GHG Protocol and ISO 14064-1 are the most common frameworks used for quantifying a carbon footprint.

ISO 14064 part 3 (Specification with guidance for the validation and verification of greenhouse gas assertions) is the most commonly used framework for verifying voluntary carbon footprint assertions.

Because there are numerous reasons why an organization would verify its carbon footprint and a wide range of internal and external users of carbon footprint information, the verification process—as stipulated by ISO 14064-3<sup>38</sup>—should be defined by:

- the level of assurance required;
- the needs of the intended user(s);
- the objective of the verification; and,
- the verification criteria.

Understandably, the process of verification will vary slightly depending on the nature and size of the organization and activities involved but should generally follow a similar approach.

This approach is as follows:

### Step 1: Determine:

- **The assurance level required.** This will be defined by the intended use and users of the carbon footprint quantification itself. Quantifications often rely on human judgment, sampling, estimating and qualitative evidence, it is practically, financially, realistically impossible to expect 100% accuracy in a carbon footprint and thus, assurance about a carbon footprint assertion. Consequently, an understanding of the level of assurance required and why will define the 'relative level of confidence the verifier will require to make a conclusion' about the carbon footprint quantification. Typically, verifiers will be engaged to provide either "reasonable" or "limited" assurance.
- **The objectives of the verification and the verification criteria to be used.** The verification criteria would be standard(s), regulatory requirements or protocols against which a carbon footprint will be assessed. Verification criteria will often be defined by the end-user of the information (i.e. regulatory agency, reporting initiative, emission trading program). ISO 14064-1 and the GHG Protocol are commonly used as criteria for voluntary carbon footprint verification.
- **The scope of the verification.** This will define the boundaries of the verification activity and will typically identify organizational boundaries, the GHGs to be included, and the base years and timeframes involved in the footprint quantification.
- **The level of materiality (or material discrepancy) acceptable.** As the determination of a carbon footprint is not an exact science but one that relies on estimates, testing, sampling and judgment, there will always be a degree of error in carbon footprinting. To that end, the level of certainty, accuracy and thus assurance required of carbon footprint must be agreed and established in advance and based on the needs of those using the carbon footprint information.

### Step 2: Determination of the verification approach, plan and sampling strategy.

This should be in the form of a documented verification plan and must include the items agreed in step 1 (above) and should identify, among other things, the types of qualitative and quantitative data that will be required to assess the accuracy of the carbon footprint; the sampling methodologies that will be used and the rationale for using them; and an assessment of potential material discrepancies and their root causes. Ultimately, the verification plan should lay out

what verification activities will take place, what information will be needed, and who from the client organization will need to be involved.

### **Step 3: Assessment of the GHG information management systems and controls.**

The purpose of this assessment is to identify 'sources of potential errors, omissions or misrepresentations' in the carbon footprint itself and would typically include an assessment of:

- the organizational boundaries chosen and the justification for them;
- the base year chosen and the justification for it;
- the methodology used for the inclusion/exclusion of emission sources, sinks and reservoirs;
- the emission quantification methodologies and factors used;
- the choice of emission data and information used to determine the carbon footprint;
- the management processes used to collect, consolidate and report this information;
- the policies, procedures and controls in place to ensure data accuracy; and,
- the effectiveness of the information management systems in place.

### **Step 4: Assessment of the GHG data and information**

In accordance with the established verification and sampling plan, the verifier will then assess the actual GHG data and information used in the quantification of the carbon footprint. This will be done to ensure the information is relevant, complete, accurate, and transparent. This assessment should be based on physical, documented and testimonial evidence and would typically assess factors such as the appropriateness and consistency of emissions data collected, the quantification methodologies used, and the appropriateness of boundaries and base years chosen.

### **Step 5: Assessment against chosen criteria.**

When an organization quantifies its carbon footprint, it will do so in reference to some form of standard, regulation, protocol or requirement. Whether this is ISO 14064-1, the GHG Protocol or other, this step determines to what degree the footprinting organization understands those criteria and is estimating, quantifying, monitoring and reporting in accordance with the principles of the chosen standard or protocol.

### **Step 6: Evaluation of the carbon footprint.**

If the evidence collected and emissions information provided is sufficient to support the carbon footprint quantification made, the verifier should be able to conclude whether or not the carbon footprint is materially deficient. If, and depending on the level of assurance required, it is deemed that the carbon footprint is not materially deficient, then the verifier would issue a verification statement.

### **Step 7: Issuance of the verification statement/certificate.**

This statement from the verifier should indicate the level of assurance agreed in step 1 and for which the verification is valid. The statement should make specific reference to the actual carbon footprint quantification and describe the key parameters with which the verification is made such as: the scope of the verification; the criteria against which the assertion is made; the nature of the information used in making the assertion; and any significant conclusions made by the verifier.

### CONCLUSION

Today climate change, greenhouses gases (GHG) and global warming are front page issues the world over. The scientific understanding of climate change is now sufficiently clear to justify taking prompt action.<sup>39</sup> Global political landscape and legislative outlook gearing toward a carbon constrained economy is converging. As a result, and for environmental, ethical and economic reasons; governments, businesses and individuals are responding to this challenge by attempting to quantify and reduce greenhouse gas emissions globally.

In attempting to manage and reduce GHG, the first step for an organization, business or individual is to inventory and quantify its GHG emissions. This quantification—or the total set of greenhouse gas emissions caused directly and indirectly by and individual, organization, event, service, or product—is known as a carbon footprint.

While commercial activities, GHG emission profiling, and carbon footprints vary significantly from one business to another, the method for calculating a carbon footprint does not need to. When quantifying a carbon footprint most businesses typically use of one of two internationally-recognized standards/protocols both of which offer a similar approach to establishing a carbon footprint within a defined boundary.

With increasing mandates from regulating authorities and growing pressure from investors, customers and stakeholders at large and in an attempt to take the first steps to address climate change, businesses today are increasingly quantifying their carbon footprints. Those businesses that are quantifying their emissions are realizing that doing so creates new opportunities, reduces risk and cost, and prepares them for inevitable GHG reporting and subsequent cap-and-trade legislation. As the metric ton of carbon becomes monetized, commoditized, valued and increasingly bought and sold in markets around the globe, businesses are also now seeing the benefits of independent 3rd-party verification of their GHG assertions.

Whether it is a subject of mandatory GHG inventory reporting, or for the financial gain from selling verified CO<sub>2</sub> emission avoidance or reductions; the increased integrity of GHG reporting activities, or simply the independent assurance that a GHG inventory or carbon footprint is complete, consistent, and materially acceptable is paramount. Forward-thinking businesses are taking concrete steps to inventory, quantify, report and independently verify their carbon footprints.

## APPENDIX 1: SIMILARITIES AND DIFFERENCES BETWEEN THE REGULATED AND VOLUNTARY CARBON MARKET

Loosely speaking, efforts to quantify and reduce GHGs fall into one of two categories - often referred to as either the 'regulated' or 'voluntary' markets. The regulated market is one that is driven by regulation and occurs when a government or regulatory authority—most notably the European Union—enacts mandatory GHG reporting and/or cap-and-trade regulation for their big CO<sub>2</sub> emitting sectors. In addition to the EU, such GHG reporting and/or cap-and-trade regulation exists or is imminent in Canada, the USA, Australia, New Zealand, South Korea and Taiwan. Today the regulated market is a €40 billion (\$60 billion) market and in 2007 traded over 2.7 billion tonnes of CO<sub>2</sub>.<sup>40</sup>

The voluntary market is one where participation is—by definition—voluntary. This market is one where participants typically big business (but increasingly politicians, sporting events, movies, actors and other individuals)—seek to voluntarily quantify their carbon emissions and subsequently aim to reduce and/or offset these emissions voluntarily. Today the annual market value of carbon credits (purchased to offset a business's carbon emissions and become carbon neutral for example) is estimated to be \$100 million.

**Table 2 Similarities and difference between the regulated and voluntary markets**

Regulated Market	Voluntary Market
Participation is mandatory for sectors bound by the regulation. These are typically—as in the case with the EU—big emitter sectors such as utilities, combustion plants, oil refineries, coke ovens, iron and steel plants, and factories making cement, glass, lime, brick, ceramics, pulp and paper.	Participation is entirely voluntary and open to any participant regardless of sector, geography, size, etc.
Reporting standards set by regulators.	Reporting standards not set by regulators.
Penalties and fines for noncompliance.	No fines or penalties for non-compliance*.
Quantification of GHG emissions are often referred to as GHG emission assertions or determinations.	Quantification of GHG emissions is referred to as a carbon footprint.
3rd party verification of GHG emissions report typically required.	3rd party verification of GHG emissions report is not necessarily required.
3rd party verification is typically known as GHG Emission Verification.	3rd party verification of emissions report is typically known as CFV or Carbon Footprint Verification.
A \$40 billion market in 2007.	A \$100 million market in 2006.
Use of carbon 'offsets' is stipulated by regulation i.e. maximum % of emissions excess that can be offset by carbon reduction projects.	Use of carbon offsets is not stipulated by regulation i.e. businesses can offset 100% of their carbon emissions through offsets.
The eligibility of carbon credits is typically limited by geographical source—as with the EU ETS where carbon credits are limited to only those from developing countries that have ratified the Kyoto Protocol.	The eligibility of carbon credits is not limited by the geographic source of the carbon reduction/avoidance project.
The eligibility of carbon credits is typically limited by the nature of the carbon reduction/avoidance project. Carbon credits from forestry projects are not typically eligible for the EU ETS for example.	The eligibility of carbon credits is not typically limited by the nature of the carbon reduction/avoidance project.

\* Participation in the Chicago Climate Exchange is voluntary but the carbon reduction commitments made are legally binding.

## ABBREVIATIONS

CaLPERS	California Public Employees' Retirement System
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CDP	Carbon Disclosure Project
CFV	Carbon Footprint Verification
CO <sub>2</sub>	Carbon Dioxide
CO <sub>2</sub> e	Carbon Dioxide Equivalent
CRC	UK Carbon Reduction Commitment
EU ETS	European Union Emissions Trading System
GHG	Greenhouse Gas
IIGCC	Institutional Investors Group on Climate Change
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
Mt	Million Tonnes
Ppmv	Parts per million by volume
RGGI	Regional Greenhouse Gas Initiative
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

## ENDNOTES

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