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## CCTC Panel

### Quebec Climate Policy Leadership : The Carbon Market and Beyond

#### **Paper 1: Institut québécois du carbone : an innovative research institute bringing together technical and policy expertise**

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#### **Abstract**

With the implementation of Quebec's cap-and-trade system and its linkage to that in California, Quebecers need a reliable source of information that will help them understand the carbon market as well as other policies, technologies and strategies to reduce greenhouse gas (GHG) emissions. Established as a non-profit organization to mobilize academic researchers, the Quebec Carbon Institute (IQCarbone) aspires bring together technical and policy expertise on climate change and mitigation of emissions. This paper will introduce IQCarbone and discuss its vision, objectives and research strategy moving forward, with a particular emphasis on Quebec's climate policy leadership and its implications for Quebec, Canada and North America. Visit: [www.iqcarbone.org](http://www.iqcarbone.org)

**Keywords:** Quebec climate policy, research, carbon market, electrification, wind energy, carbon offsets, international climate change politics

#### **Résumé**

Avec la mise en œuvre de son Système de plafonnement et d'échange de permis d'émissions (SPEDE) au Québec lié à celui de la Californie, les Québécois ont besoin d'une source d'information fiable qui leur permettra d'arriver à une meilleure compréhension du marché du carbone ainsi que des autres politiques, technologies et stratégies pour réduire les émissions de gaz à effet de serre (GES). Établi comme une organisation à but non-lucratif afin de mobiliser les chercheurs universitaires, l'Institut aspire à réunir l'expertise technique et politique sur les changements climatique et atténuation des émissions. Ce document présentera IQCarbone et discuter de ses vision, les objectifs et la stratégie de recherche d'avancer, avec un accent particulier sur le leadership de la politique climatique du Québec et de ses implications pour le Québec, le Canada et l'Amérique du Nord. Visite: [www.iqcarbone.org](http://www.iqcarbone.org)

**Mots clés :** Politique du climat du Québec, de la recherche, marché du carbone, l'électrification, l'énergie éolienne, les compensations de carbone, la politique internationale sur le changement climatique

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## 1. INTRODUCTION

With the implementation of its emissions trading system (ETS), the government of Quebec has created a real carbon market, now linked to one in California. This represents a paradigm shift that will have profound impacts on the Quebec economy and energy markets. In this context, citizens and businesses of Quebec need a reliable source of information that will help them understand the carbon market as well as other policies, technologies and strategies to reduce greenhouse gas emissions.

The academic community has the capacity to contribute to such understanding and create novel partnerships with government, business, environmentalists and the general public. Established as a non-profit organization to mobilize academic researchers, the Quebec Carbon Institute (IQCarbone) aspires to see the academic community realize its full potential in this field. IQCarbone is a new non-profit organization in Quebec whose vision is to become an important source of information and research on climate change policy in Quebec, Canada and internationally. To this end, the Institute will offer original and innovative research that will be distinguished by its quality and scientific rigor. The Institute also seeks to become one of the largest groups of specialists, experts and academics working on climate change policy in Quebec and elsewhere. To achieve our vision, we distinguish three different components of our mission: 1) To promote the greater understanding about climate change policies, including issues related to carbon markets and to support and shape public policy in this area; 2) To inform the public on policy issues related to climate change and carbon markets; 3) Encourage the development of policies and technology strategies to reduce emissions of greenhouse gases. The activities of IQCarbone are guided by a number of principles including independence and objectivity, interdisciplinary, analytical rigor, bilingualism as well as transparency, participation and cooperation. The most distinguishing feature of the Institute is its capacity to bring together policy and technical insight into matters of climate change mitigation in Quebec.

In this paper we briefly outline four major issues that we believe should be research priorities for Quebec climate policy moving forward: (i) the carbon market, (ii) technologies to reduce emissions, including electrification of the transport sector and wind energy (iii) the role of carbon offsets and REDD as well as (iv) international climate change politics. Summaries of these issues are presented below. We look forward to engaging with other researchers in order to identify additional research priorities. We also invite those interested to become a member of IQCarbone in order to keep abreast of the latest developments in Quebec climate policy, further collective research efforts and ensure the broad dissemination of research findings.

## 2. THE CARBON MARKET

A cap-and-trade system is a policy instrument to reduce emissions of greenhouse gases (GHGs) efficiently, that is to say at the lowest possible cost. Under cap-and-trade, the government sets a quota, or “cap”, for the collective emissions of firms in a particular sector of the economy. Once a cap is fixed by government, companies are obliged to obtain emission allowances for each tonne of GHG they release into the atmosphere. Each emission allowance represents a permit to emit one tonne of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e). However, unlike traditional environmental regulation, sometimes called the command-and-control approach, these allowances can be traded between companies according to the law of supply and demand.

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Thus, companies for whom the cost of reducing emissions is relatively high can buy emission allowances from companies whose costs are relatively lower. This flexibility both encourages innovation and investment in sectors that demonstrate high environmental performance. It is also through the exchange of emissions allowances on the market that the price of carbon emerges.

Since 1 January 2013, Quebec has established its own cap-and-trade system [1]. For the first phase of cap-and-trade, the cap covers emissions from the energy and industrial sectors. These targets 80 facilities emitting at least 25,000 tonnes of GHGs annually, which are respectively responsible for about 30% of total emissions in the province. The second phase, starting in January 2015, the transport sector will be added to taxable ceiling areas, which will then cover about 80% of total emissions in Quebec. The ceiling is reduced over time, between 2-4% annually. This system is implemented in conjunction with the State of California, as part of a regional partnership, the Western Climate Initiative (WCI). Transactions in a related market in benefits for California to Quebec: a State may acquire rights from less than controlled by the changes for cost reduction, while another may sell its surplus rights and reduce and its overall costs.

## 3.1 The Creation of the Carbon Market

At the initiation of the carbon market, Quebec companies can acquire emission rights in several ways. First, the government provides a number of free emission allowances to companies that are deemed sensitive to international competition, such as in the manufacturing sector. These free allowances are granted on the basis of environmental performance, measured in terms of emissions intensity. Although allowances are offered freely allow certain sectors to meet most of their needs in emission rights, they do not cover all their emissions. Therefore, they must also acquire emission rights via other means. Important to note that, overall, the number of allowances distributed freely will decrease gradually between 1% and 2% per year from 2015.

Second, companies participating in the cap-and-trade system can buy emission allowances directly through auctions regularly organized by the Quebec government. Auctions are important because they allow the government a certain degree of control over the carbon price on the market. More importantly, the government has set a floor price for emission allowances, a price that is expected to increase gradually. The first auction in Quebec was held in December 2013 and the fourth in August 2014. For the last three auctions in Quebec, the settlement price corresponded to the floor price (\$ 11.39) [2]. Companies will also have access to joint auctions organized in partnership with California. In 2014, the final selling price in California was slightly larger than its floor price (US \$ 11.50 and US \$ 11.34 respectively) [*ibid.*]. Note that, for the moment, prices are lower in Quebec than in California. Due to technical difficulties related to the trading platform, a joint auction of emission allowances on the linked Quebec-California market scheduled for November 2014 has been postponed to a later date.

Third, companies may also purchase carbon offsets that are obtained by investing in projects that reduce GHG emissions in sectors not covered by the cap, including agriculture and waste management. However, only a maximum of 8% of their emission reductions can be derived from this source. Finally, credit for early action may also be obtained by firms for GHG reductions achieved before the entry into force of the regulation creating the cap-and-trade system.

## 3.2 The Expected Effects of the Carbon Market

Several issues surround the creation of the Quebec carbon market. The establishment of this market, particularly its second phase, is likely to result in a significant increase in the price of fossil fuels in Quebec, ranging from 2.3 to 22.9 cents per liter of gasoline and 2.8 to 28.3 cents per liter of oil [3]. It is also difficult to find studies comparing the costs for California and Quebec to reduce emissions independently relative to the costs of linking their carbon markets. The few studies that do exist suggest that, as opportunities to reduce emissions amongst Quebec industries appear to be more difficult than for their peers in California, the cost of complying with the cap is higher in Quebec. One study estimated that in the absence of a linked cap-and-trade rights, the price of emission allowances for California range from US \$ 15-34 and 37- US \$ 43 in Quebec for the year 2013 [2]. Since emissions in California are almost six times higher than those in Quebec, a linked price is largely determined by the more important California market. As regards initial trading, an expected price range of US \$ 15.8 -34.5 represents only a slight increases from California's perspective [ibid.]. However, the price of emission allowances in a linked system are much lower for Quebec versus in an unrelated system.

## 3.3 More than Just a Market

The striking feature of the climate strategy of both Quebec and California is that the cap-and-trade is only part of overall climate policy. Both jurisdictions intend to achieve most of their emission reductions through complementary policies, with cap-and-trade serving as an economy-wide incentive to reduce emissions and link various components of the strategy together [1]. In Québec, important complementary policies have been the annual Green Fund levy, which is part of the 2006-2012 Action Plan but has been extended until 2015, as well as elements of the most recent Action Plan including the promotion of public transit and alternative transportation and creation of a greener car fleet.

With significant potential impact on the Quebec economy, it is imperative that citizens and economic decision-makers are aware and prepared for the possibility of major changes in energy prices in Quebec. Moreover, the establishment of a carbon market will allow the government to collect additional revenues of the order of three billion dollars [5]. The Quebec government will have the means to implement assistance programs to help citizens and businesses to make the transition towards technology and a way of life less dependent on fossil fuels and lower in carbon intensity.

## 4. TECHNOLOGIES: ELECTRIFICATION OF TRANSPORT

In Quebec, where almost all electricity is produced from renewable resources, electrification of the transport sector appears to be a cost-effective solution to greenhouse gas (GHG) emissions and dependence on oil. This is especially true as the transport sector is responsible for 44% of emissions in Quebec [4], and that Quebec imports approximately \$14 billion of oil products annually [5]. Transportation is the largest source of GHG emissions in Quebec [1] and it is necessary that the emissions from this sector be addressed in order to achieve Quebec's emission reductions target.

It is not trivial to reduce emissions in the transport sector. Indeed, significant reduction in this sector calls for a paradigm shift in the way people live. Several cities in Quebec were in fact

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built around the use of the private car, leading to urban sprawl. The ease of use of the automobile, the rate of ownership, the symbol of freedom associated with it and our everyday habits make it difficult to create a public transport system of sufficient efficiency and availability such that people will prefer it over their individual vehicles. In addition, an interesting fact to note is that the Société de transport de Montreal (STM) consumes less than 1% of the fuel sold in Montreal [6]. Though it would have a beneficial impact on urban air pollution, the electrification of STM's vehicle fleet would only lead to a relatively weak reduction in GHG emissions and imports of petroleum products into the province.

## 4.1 The Need to Change How We Move

A significant improvement in our GHG emissions balance sheet and consumption of oil in Quebec must necessarily be realized through a change in personal vehicle use. Public transport can contribute if it is sufficient competitive to make the use of the personal automobile less attractive. Several measures can be explored to encourage people to switch from their personal vehicles in favour of public transport, such as reducing the number of parking spaces and increasing costs, increasing the tax on gasoline, maintaining and increasing the levy on oil, the introduction of tolls on roads, etc. The inclusion of the transport sector in the cap-and-trade emission as of 1 January 2015 will be another source of incentives to use public transit. The government has estimated that the SPEDE will lead to an initial increase of 1.9 percent of a liter of gasoline [3].

The use of the electric car may also be considered. Interestingly fact about electric cars: one million vehicles represent nearly a quarter of Quebec fleet, and annually consume about 3TWh, which corresponds to less than 2% of electricity sales in Québec in 2009 [7]. Note also that, whereas a liter of petrol was \$1.40 and a kWh \$0.0812, it costs about 8 times less to run on electricity at oil [8]. It is easy to see the potential for Quebec to promote the use of electric cars.

## 4.2 The Challenge of Electrification

However, many challenges remain if we are to improve the technology of electric cars to meet current needs. The origin of these cars as well as the resources and materials needed to produce them must also be considered in a life-cycle analysis, as well as the cost of oil imports and their effects on the environment. In interim, to support the deployment of electric vehicles, Quebec has established a network of electric charging stations for electric and hybrid vehicles. A rebate on the purchase or lease of these two types of cars has also recently been introduced.

Incidentally, Denmark, the first country to have developed a plan to free itself of fossil fuels by 2050, based on a comprehensive analysis of the various issues involved, concludes that current technology is insufficient for making the electric car part of the short-term solution. This country considers the transport sector as one brimming with the most difficult challenges in its race to free itself of fossil fuels. The Danish plan asserts in effect that a substantial change in the automobile industry towards alternatives to fossil fuels is neither technically nor financially feasible in the short term. It argues that the challenges of this sector are unlikely to be met in the next decade, but that more time will be needed. Denmark intends to address this challenge

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beginning now and through the coming decades by investing significant effort and resources into research.

In sum, the electrification of transportation holds great potential for Quebec, but also has many challenges. Quebec has begun to make efforts to support the electrification of transport sector, but much work remains to be done. It nonetheless appears clear that the electrification of the transport sector will benefit from being examined in more detail given its potential to reduce a significant portion of Quebec's GHG budget in the near future.

## 5. TECHNOLOGIES: WIND ENERGY

In an era of climate change and the need to reduce greenhouse gas (GHG) emissions, wind energy has come to be seen as a source of clean, renewable energy that can be part of a comprehensive energy solution. Windmills have long been used to perform various tasks, including grinding grain; today wind energy is now converted into electricity on a large scale.

Currently, the "Danish" wind model, with a three-bladed rotor turning on a horizontal axis, is the most common. New concepts are also now being explored for conditions where noise constraints and visual impact are different such as, for example, offshore wind installations.

In Quebec, the 2006-2015 energy strategy anticipated the installation of 4GW of wind power by 2015, corresponding to approximately 10% of total installed power. This objective should be achieved in 2018 [9]. Wind farms in Quebec have been developed by various private developers following call for tenders issued by Hydro-Quebec, which buys wind energy and then sells it on its network. Quebec, unlike Europe, still has plenty of land for the installation of wind parks. It still offers a considerable large wind energy potential. By end of 2013 over 2GW of wind energy were installed, meeting the electricity needs of an equivalent of 600,000 households in Quebec.

As the wind does not blow at the same rate all the time, it is necessary to couple wind power with other forms of energy. Geographically dispersed wind parks also help to reduce fluctuations in the production of wind power, as the wind is not blowing in the same way everywhere. Hydro-electricity can be coupled very well with wind, putting Quebec in an advantageous position to develop it. As the annual cycle of wind is in harmony with the domestic demand for electricity, wind also offers several operational advantages for the diversification of Quebec's energy portfolio. Among others benefits, it allows for a reduction in the number of peak hours in a year, and to stabilize reservoir levels during periods when annual reservoir levels are at their lowest.

Considering the situation of wind energy in the world, it seems possible to extend its deployment in Quebec. Europe is a leader in the deployment of this energy, now closely followed by Asia [10]. As of the end of 2013, 117GW of wind power were installed in the European Union, more than 110GW onshore and almost 7 GW offshore [11]. In comparison, to date, the capacity of Hydro-Quebec's system of hydroelectric dams has reached 35 GW. In Europe, wind energy technology represented the largest amount of new installed capacity in 2013, representing 32% of new installations. Current production from wind energy corresponds to 8% of the electricity consumed in the European Union.

Denmark is an interesting example for wind energy. To date, 31% of Danish electricity consumption is generated from wind, the highest in the world. Denmark was the first country to

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install wind parks offshore, where the wind often blows in a more sustained manner and there is less turbulence. Note that production costs at sea are considerably greater than on land, ie, between 1.5 and twice as expensive. However, in Europe, offshore installations are now experiencing, in terms of percentage, greater growth than installations on land. The largest offshore wind park, with a capacity of 0.6 GW and known as the London Array, is located in the UK and meets the electricity needs of 500,000 English households. Much effort has also been invested into research to develop floating wind turbines that can be installed in places where deep water now impedes the installation of wind turbines at sea.

Wind energy offers a green alternative to energy production based on fossil fuels. In the past, the Quebec government positioned itself in favour of green energy production through the introduction of several wind parks, but the absence of plans for the period beyond 2018 makes the future of the wind energy somewhat uncertain in Quebec. The current situation of surplus electricity has also recently given rise to a debate on the relevance of developing new sources of electric power supply in Quebec, including wind power. This issue was addressed in the recent final report of the *Quebec Commission on Energy Issues* [12], which was written after a public consultation process that resulted in the submission of 460 written depositions. The Quebec government has recently said it wants to restart the process leading to a new energy policy [13]. This debate is not closed, and during the coming months we should learn more about the future of wind energy in Quebec.

### 6. CARBON OFFSETS AND REDD

The idea behind carbon offsetting is that low-cost opportunities to reduce emissions can be found in sectors and locations outside the group of entities that are obligated under a cap-and-trade system to reduce their collective emissions.

As discussed in our discussion above of the carbon market, under a cap-and-trade system the government establishes a collective emissions quota, otherwise known as a 'cap', for entities or firms in a particular sector of the economy—a quota which is gradually reduced over time. In practice, this quota is partitioned across individual firms in the form of emission allowances, each representing a permit to emit one tonne of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e). Some of these allowances are allocated to firms freely by government, others can be bought during an initial government auction or through exchange between other firms. Importantly, the price of allowances reflects the cost of reducing emissions amongst the group of firms covered by the cap.

Carbon offset credits are considered fully fungible with emission allowances and represent another, ostensibly lower-cost means by which firms can meet their emissions quota. Carbon offset credits are sought in economic sectors and locations where expert analysis indicates it is cheaper to reduce emissions—at least relative to the costs amongst firms under the cap [14, 15]. Currently, only a limited number of project types are allowed in Quebec under the offset rules currently approved by the Ministry of Sustainable Development, Environment and the Fight against Climate Change: methane reduction from improved livestock manure management, methane reduction for landfills as well as for the reduction of certain ozone-depleting substances—though there is also discussion about a forest carbon offset protocol [1].

Similar carbon offset protocols exist in California, Quebec's partner in the North American carbon market [ibid.]. Note that there are a few additional project types permitted by the Californian government under its offset system: carbon sequestration from urban forest projects

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in the US and, while not yet finalized, methane reduction from mining operations and rice cultivation. Under the linked Quebec-California carbon market, offsets from either jurisdiction will be available for purchase.

## 6.1 Carbon Offset Projects: The Basics

How do we know that a carbon offset credit is truly fungible with an emission allowance? Carbon offset projects are only to be credited when they are able to demonstrate that the project results in a measureable reduction of emissions compared to a so-called baseline emissions scenario. To do this, the project developer first measures current or historical emissions, say of the methane emissions associated with a landfill outside Montreal, and extrapolates these trends into the future [16, 17]. Note that landfills are currently not included in Quebec's emissions quota—they are outside its regulatory purview.

Next the project developer considers a scenario where a new technology or strategy, such as methane capture, is introduced to make effective use of the greenhouse gases now being seeped into the atmosphere by the landfill and thus reducing emissions [ibid.]. This new technology, it is asserted by the project developer, is currently not widely available because it is too costly. Crucial to the effectiveness of the system is the claim that the technology or strategy for this emissions reduction scenario would not have been able to proceed without the extra incentive offered through carbon finance. In other words, without carbon finance the carbon offset project would not have been implemented and the baseline scenario would prevail.

The amount of carbon finance associated with the project is largely determined by two things. First, is the amount of carbon offset credits generated (or expected to be generated) by the project. This is the difference between emissions associated with the carbon offset project and initial baseline emissions scenario. Second is the market price for carbon offset credits, which tend to be slightly lower though still reflective of the price of emissions allowances already being traded amongst firms.

The rules governing carbon offsets under the Quebec & California carbon market permit credits to be sourced from carbon offset projects anywhere in North America—including Canada, the US and Mexico. By extending the reach of offsets to areas outside of Quebec, there are opportunities to identify considerable costs savings. It may simply be cheaper to reduce emissions elsewhere in North America. However, carbon offsets from projects outside North America are currently not available for use in the Quebec & California carbon market. Carbon offsets have been popular—and controversial—under the Kyoto Protocol where they have operated through a specific instrument known as the Clean Development Mechanism (CDM) [18].

## 6.2 Concerns and Limitations on Usage

There are real concerns with carbon offsets, the most important being that the carbon credits generated do not really represent emission reductions. Carbon offsets are vulnerable to the criticism that the action they are crediting with reducing emissions, in the example here the introduction of methane capture technology, would have happened anyway—without the additional carbon finance [19]. This is exacerbated by the long term nature of the crediting period of offset projects—typically set at 10 years. For example, the price of technology to capture landfill gas might go down significantly five years after a project's start, rendering it highly affordable though for reasons that have little to do with carbon finance. There are also

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concerns that offsets present a “moral hazard”, constituting a disincentive for governments to make the more challenging structural changes to their economy to reduce emissions [20]. It should be noted that, despite such moral hazard concerns, countries holding the most CDM credits are also those countries which have taken the most steps domestically to reduce their emissions—a empirical finding suggesting another political vantage point on the use of offsets [21].

Nonetheless, such concerns have been significant enough to see the use of offsets limited to 8% of any firm’s emission reduction obligation under the rules governing Quebec & California’s carbon market [1]. No more than 8% of an entity’s total reductions in any given compliance period can be met through the use of offsets.

### **6.3 REDD**

Despite the fact that international carbon offsets such as those under the CDM are not allowed in the Quebec carbon market, there is considerable interest in another initiative that is similar to carbon offsets but has since evolved into its own stand-alone issue: Reducing Emissions from Deforestation and Forest Degradation, commonly known under its English acronym of REDD [22]. Deforestation is one of the largest source of emissions in the developing world, and where it is believed that considerable reductions could be achieved at a relatively low cost. While there are a few REDD offset projects in the so-called voluntary carbon market, there is also a big push at the United Nations and amongst international development agencies to see REDD implemented in key forested developing countries. One question is whether REDD will remain a development finance programme or will evolve into a full-fledged carbon offset system.

California however has been showing leadership on this issue. California established The Governors’ Forest and Climate Task Force in 2008, a voluntary REDD initiative of several subnational governments across the US, Brazil, Indonesia and Mexico, amongst others [23]. Additionally, California in collaboration with the state of Acre (Brazil) and Chiapas (Mexico) has established the REDD Offset Working Group. In 2013, it delivered a set of recommendations on how to design a compliance-grade jurisdictional system for REDD and link this program to California’s cap-and-trade system [24]. While Quebec is not involved with REDD yet, interest may grow as Quebec & California carbon market proceeds.

## **7. INTERNATIONAL CLIMATE CHANGE POLITICS**

As a global issue, climate change is naturally associated with international political institutions, especially the United Nations which established the UN Framework Convention on Climate Change (UNFCCC) in 1992. The original UNFCCC agreement was largely aspirational, prompting states to embolden their efforts through the 1997 Kyoto Protocol which delineated specific emission targets for industrialized countries as well as mechanism for cooperation with the developing world on climate change mitigation and adaptation. It is well known that the Kyoto Protocol has never been ratified by the United States, given opposition (particularly in the US Senate) to the fact that the Kyoto Protocol does not require major emerging economies such as China and India to reduce their emissions.

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## 7.1 Securing a Successor to the Kyoto Protocol

An attempt to establish a successor to the Kyoto Protocol that would include all major emitters was the goal of the 2009 UN Climate Change Conference in Copenhagen [25]. Note that the Kyoto Protocol is structured in terms of commitment periods, a window during which emission reduction targets are to be met. The Kyoto Protocol's first commitment period was from 2008-2012, meaning that the Copenhagen negotiations were perceived as crucial negotiations for the future of the UN climate change regime. However, the Copenhagen Accords largely failed to renew commitment to the emission reduction targets of the Kyoto Protocol and bring in the US and major developing countries, especially China which has now become the main emitter of GHGs.

The Copenhagen Accords did see all major countries pledge emission reductions or, in the case of China and India, the emission intensity of their economies. But this informal agreement was not the desired outcome. And while the Kyoto Protocol was granted a second commitment period in Copenhagen, a number of industrialized countries formally withdrew from the Kyoto Protocol upon the close of its first commitment period in 2012—including Canada. The scope of emission reductions in the second commitment period of the Kyoto Protocol is much less important—the only countries that have agreed to formal emission reduction targets under it are largely restricted to Europe.

The Kyoto Protocol has largely been superseded by parallel UN climate change negotiations on a different treaty that would include industrialized countries and major developing countries. The most recent iteration of this negotiation track is known as the Durban Platform for Enhanced Action, which was agreed at the 2011 UN Climate Change Conference in Durban South Africa [26]. As part of the Durban Platform, parties have agreed to “develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties”. This new treaty is due to be adopted at the 2015 UN Climate Change Conference in Paris.

There are various legal complexities that made two parallel negotiating processes necessary—the Kyoto Protocol and what is now known as the Durban Platform. But the real reason is likely the need for a fresh start because of the perceived failure of the Kyoto Protocol. These negotiations are complex because there are some parts of the Kyoto Protocol—such as the Clean Development Mechanism—that many see as worth keeping. But there is also much that continues to be problematic, including the distinction between developed and developing countries that fails to capture the complexity of an increasingly multipolar world [27].

## 7.2 Looking Outside the UN Climate Change Regime

Many have been discouraged with the UN negotiating process. While there are good reasons for this sentiment, it would be a mistake to restrict one's focus to the UN climate change regime. The truth is that a lot of progress has been taking place outside the UN process [28]. Most recently, in November 2014, we have seen United States and China reach a historic agreement to limit their respective emissions. The United States committed to reduce annual GHG emissions 26-28% by 2025, compared with 2005 levels. China committed to its CO2 emissions peaking no later than 2030 and to increasing the share of energy consumption from non-fossil-fuel (zero-emission) energy sources to 20%, also by 2030.

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Another pertinent example includes the Western Climate Initiative (WCI), of which Quebec is a key member [29]. The WCI is a voluntary coalition of US states and Canadian provinces that has developed a common set of guidelines to facilitate mutual cooperation in order to reduce their collective emissions to 15% below 2005 levels by 2020. Quebec is a leading member of the WCI. By setting targets and timetables on emission reductions, the WCI bears many similarities to the Kyoto Protocol. However, the key difference is that the WCI is a non-binding voluntary agreement designed by participating jurisdictions for their mutual benefit. Political authority for such cooperation remains firmly with the individual jurisdictions involved. Québec is compelled by neither the UN nor the Canadian federal government to establish a cap-and-trade system—it has done so voluntarily because of the expected advantages of cooperation while the non-binding nature of the WCI allows Québec to maintain its autonomy. The downside to the WCI is that while it initially attracted interest from a number of states and provinces, the only two jurisdictions to have followed through with cap-and-trade legislation are Quebec and California.

Finally, it is important to also note that states and international institutions are not the only meaningful actors involved in international climate change politics. The private sector has shown leadership in tackling climate change, through initiatives such as the development of voluntary carbon markets (where arguably most innovation in carbon finance is now taking place) as well as the development of comprehensive emission inventories [30]. Similarly, cities have consistently shown leadership including the adoption of city-wide emission reduction targets and specific initiatives, such as public transport, aimed at reducing emissions. Finally, environmental non-governmental organizations have continued to draw the public's attention to climate change and build political will. The key attribute of these new actors is their transnational character, making the leap from the local to global and back [31]. Overall, the UN process remains important but opportunities for progress might also be found in other venues.

## 8. CONCLUSION

Quebec has positioned itself as a leader on North American climate policy, both in terms of its domestic actions but also innovative international partnerships, such as partnering with California in the establishment of North America's largest carbon market. The above summary has highlighted a number of priority issues surrounding climate change policy in Quebec. These are not the only issues that will need to be addressed to see emissions in Quebec and North America significantly reduced, but they do comprise a firm starting point. But new research needs present themselves. For example, it is increasingly apparent that research on the effect on Canada's emissions of proposed construction of a pipeline to transport oil from Alberta east to ports in Quebec and Maritime Canada is required. But common to such climate policy issues is the complexity of technical and policy interactions. By offering an integrative approach to climate change policy, IQCarbone promises to offer important solutions that might escape research teams working in their disciplinary silos. Please join us by becoming a member of IQCarbone ([www.iqcarbone.org](http://www.iqcarbone.org)).

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