CHAPTER 3

THE CDM AND KNOWLEDGE-BUILDING IN GHG EMISSIONS REDUCTION QUANTIFICATION: FROM THE INITIAL PROPOSAL TO THE PROGRAM OF ACTIVITIES

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1 CATALYZING IDEAS, INNOVATIONS, TECHNOLOGIES AND SUSTAINABILITY

The Kyoto Protocol, through its Clean Development Mechanism (CDM), has demonstrated the feasibility of an international cooperation instrument to mitigate the effects of climate change through technology transfer and sustainable development. In addition, it was a catalyst for discussions and technological innovations, which moved various segments of society, from small scale activities and large industrial projects to academia, civil society and the political sector. This innovative instrument promoted the engagement and stimulated the training and capacity-building of human resources related to the problem of climate change. In Brazil, where the CDM was widely disseminated during the initial phases of its implementation, there was certainly a popularization of the global perception of the risks associated with climate change, which contributed to a greater engagement of civil society and interest from schools and the productive sector.[3]

Beyond the tangible benefits of the CDM, the main legacy of this multilateral instrument of cooperation and innovation was its pedagogical effect. In addition, it was used to test strategies to mitigate greenhouse gas (GHG) emissions. It also had an important influence in the increase of the perception regarding the relevance of long-term strategic planning, investments in adaptation and the importance of establishing structured governance on the theme of climate change.

Under the United Nations Framework Convention on Climate Change (UNFCCC), the CDM Executive Board (EB) and panels of experts – in particular the panel of methodologies – played a crucial role in balancing over-regulation and

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3. Further information on the gradual increase of interest on CDM in Brazil from the perspective of a market agent, see Chapter 9 (note from the editors).

rigidity in monitoring and flexibility for the acceptance and dissemination of the instrument that marked the years of implementation of the CDM.

The success of the CDM was certainly relativized due to the national capacity to generate opportunities for the mitigation of GHG, as well as expertise for the development of projects. Therefore, countries with an installed industrial park with an eminently coal-based mix in the electric grid, or other fossil sources, or even with inefficiencies, were the main beneficiaries of this mechanism.

Regarding the private sector, as developers, who took on the whole process (and risk), it was an opportunity to start using new technologies, which, in addition to reducing emissions, would possibly reduce costs in the medium to long term. In this context, the CDM was seen as a new market – even in terms of income – by relevant actors, who became project developers – which had not necessarily been idealized in the building of the CDM. Creativity and innovation were framed in a structure that fostered the free thought of proposing ideas and thus the promotion of new methodologies were an extremely important component of the CDM, though particularly fruitful in the early stages of this mechanism. This characteristic certainly instigated curiosity, sharpened discussions of ideas about the effectiveness of proposed mitigation strategies in the form of new large-scale methodologies and projects.

Over the last fifteen years, up until 2017, more than 8,000 projects have been able to achieve the status of registered projects, according to EB records (UNFCCC, 2017). During this period, 1.86 billion tons of Certified Emission Reductions (CERs) were issued, thus avoiding the emission of equivalent GHGs, calculated in tons of CO_2e. In addition, afforestation and reforestation activities contributed with 11.23 million temporary Certified Emission Reductions (tCERs) in addition to 505.08 thousand tons of Certified Long-Term Emission Reductions (lCERs), equivalent to a temporary removal of 11.73 million tons of CO_2.

However, more important than all the GHG mitigation effort provided by the CDM implementation is the legacy in terms of ideas, innovations, technologies and sustainability that the CDM catalyzed in the Brazilian society. This positive influence has affected from primary schools to the highest executive positions of companies concerned to remain relevant in a changing global economy.

2 CRITICAL CHOICES FOR THE FEASIBILITY OF A NEW MODEL

With regard to the discussions on global sustainability, based on the famous report *The Limits to Growth*, of 1972, it has always been possible to identify significant uncertainty and dichotomy between theoretical fronts that defended the urgency of measures aimed to balance consumption and environmental conservation and

the group advocating orthodox economic policies, focused on economic growth by stimulating consumption, development and expansion of manufacturing industries.

Amid the turmoil, the transition between the 1980s and 1990s brought together a series of socially emblematic facts, responsible for shaping, in part or in whole, the perception and thus the will to change. In particular, this period of history was profoundly marked by Perestroika (1985-1991) and all the symbolism represented by the perception of the end of a long cycle marked by the constant and diffuse state of alert and insecurity inherent to the Cold War. This moment brought the general notion of a bright and encouraging future. However, this hope for peace and prosperity was notably modulated by the iconic nuclear accident of April 26th, 1986 in the city of Chernobyl in Ukraine.

Among the countries affected by the disastrous radiation cloud that has traveled the European continent, a deep social concern (social knowledge) was consolidated on issues related to sustainability and the model of the future that was intended to be built in the coming century. As described by Gupta (1997), there were interrelated circumstances, factors and interactions that strengthened the development of multilateral environmental arrangements. Not surprisingly, the scientific bases of all knowledge about sustainability found resonance in social concern, and, thus, enabled a historical summit, in 1992, in the city of Rio de Janeiro (the United Nations Conference on Environment and Development, Rio 92).

One result of all this political construction and the main mandate given in Berlin in 1995 at the first Conference of the Parties (COP) to the UNFCCC was the determination to achieve an arrangement capable of catalyzing efforts and synthesizing solutions for a more sustainable world, away from the consumption fossil fuels and in search of innovative, environmentally and socially appropriate technological solutions. Two years later, the CDM was legally formalized, during the 3rd Conference of Parties (COP-3) in Kyoto, which marked a memorable victory for diplomacy. This agreement represented a major focus on the political feasibility to craft a multilateral instrument based on a robust international monitoring and cooperation system.[4]

At that time, there was a perception on the symbolic importance that CDM could come to exert on various societies with the establishment of a multilateral instrument capable of coopting dissonant perception, which would converge both interests of conservationists and developmentalists.

It was due to the scale of the environmental, social and economic impact inherent to the intensive use of fossil fuels, which were pointed out in the late 1970s and early 1980s as responsible for the environmental imbalance (Carson,

4. For further information on negotiations' background and design of the CDM, see Chapter 1 (note from the editors).

1962; Lutzenberger, 1980; WCED, 1987), that the development of the Kyoto Protocol prioritized the establishment of rules and procedures specifically designed to operate in the most demanding energy sectors, particularly those dependent on fossil fuels.

Perhaps the most delicate and contentious technical aspect of the CDM negotiation process has been the concern about the environmental integrity of this mechanism. The concept of environmental integrity, forged in long diplomatic battles throughout the initial CDM negotiation process, reflected insecurities with possible leakage and/or regulatory or methodological imperfections that would allow double counting of emission reductions. Any methodological error or imperfection of this nature would open up potential gaps for distortions and would lead to the improper use of this mechanism, away from its primary objective of catalyzing reductions of GHG emissions by anthropogenic sources of emissions.

A major effort was made to structure the functions of the UNFCCC Secretariat and the EB aiming at ensuring a robust project verification cycle, which, together with the designation of operational entities, comprised of verification and auditing companies with a solid structure and proven competence, that would work together with designated national authorities to ensure the environmental integrity of this mechanism.

It was necessary to establish methodological panels with experts from various areas of interest and competences to ensure that methodologies proposed by project developers were adequate and robust enough to guarantee that emission reductions converted into CERs were translated into a real effort to reduce GHG emissions, without the occurrence of leaks or double counting.

In addition to all these concerns with the design, monitoring and verification of projects and their respective methodologies regarding the robustness to ensure the environmental integrity of the mechanism, the financial feasibility of the project and its monitoring needed to be considered in its monitoring plan. It would be of no advantage to a CDM project to predict the emission of environmentally sound CERs if the complexity and cost of monitoring made the project financially unfeasible. This crucial concern was translated during the initial CDM conception by climate negotiators, who sought a mechanism that could be implemented through ideally simple monitoring methodologies, replicable in different circumstances and regions and that would impose a low-cost and low-effort to be monitored. The need to have a well-defined and circumscribed project boundary as well as other prerogatives led to energy, industry, transport and waste treatment sectors being the focus for the design and thus to the negotiation of general frameworks that would define the core of the first phase of the Mechanism. Other sectors, such as

agriculture, bunker fuels[5] and forests, would be left for a second moment as they are considered to be more complex.

However, politically, the idea of asymmetry between losses and gains, which is inherent to climate change policies (Barrett, 1999; Barrett and Stavins, 2003) that imposes to the poorest countries the highest relative costs to deal with this global challenge, coupled with the classic prisoner's dilemma and the theory of the common good, which states that a non-collaborative stance among nations must prevail in favor of individual interests and thus this would lead to the development of more rational free-riding parasitism strategies, rather than the active engagement in solving the problem (Gupta, 1997). However, the CDM was designed to propose an alternative path that would make engaging in concrete actions seeking to reduce emissions more attractive by rewarding those capable of anticipating and developing economically viable and environmentally sustainable projects.

It is no coincidence that the Alliance of Small Island States (AOSIS) and the Least Developed Countries (LDCs) considered the negotiation of a mechanism that did not include carbon stocks in forests to be distributive, and consequently, evaluated it to be unfavorable. Despite the lack of interest, possibly due to how multilateral negotiation process are extremely demanding in terms of human resources, knowledge as well as financial resources, classically favoring the consolidation of developed countries positions (Gupta, 2000) it is possible that during the strenuous negotiation process of the Berlin Mandate, some developing countries were not able to distinguish the Brazilian proposal of a Clean Development Fund (CDF), presented only a few months before COP-3 in Kyoto, from the US proposal for a Clean Development Mechanism (Richards 2001).

According to Gupta (2000), negotiators from African countries confirmed that many of them did not understand the distinction between the CDF, which had been studied thoroughly before the meeting, and the CDM, presented only during the heat of negotiations. Mumma (2001) points out that most African countries remained hesitant about the CDM, considering that, unlike the case of emerging countries (China, India, Brazil and South Africa), which would be strategically favored, this mechanism would not be effective in prioritizing actions for the African continent.

According to Makina (2013), the historical reason for the minimization of African positions in the negotiation process is due to the condition, commonly attributed to some countries, of recipients, or victims, rather than agents capable of providing answers and solutions to the dilemmas of climate change. Given this context, the support offered by Latin American countries and AOSIS was

5. Bunker fuels are fuels used in both the aviation industry and shipping. They are composed of liquid fuels that have been fractioned and distillated from crude oil.

fundamental to enable the approval of the CDM (Agarwal, Narain and Sharma, 1999). The convergence point and the political bargain levied by Africans, Latin America and AOSIS were also evident at the end of the Kyoto negotiations. In order to approve the CDM, these countries have lobbied to reverse the Cartesian approach to CDM implementation, with a preponderant focus on sectors where monitoring could be done in a "simplified" way, calling for inclusion also of the forest sector, despite obvious complications which involved monitoring it.

The reason for this concern was obviously the lack of industrial parks or other significant sources of GHG emissions in many countries of these regions, restricting opportunities for emission reductions and effective involvement with the CDM. The general view of this group of countries was that the focus on the sectors of industry, energy and transport would not benefit them, on the contrary, it would exclude them from the CDM, reinforcing the perception that this market mechanism would primarily benefit the United States and a minority of developing countries with large industrial parks (Agarwal, Narain and Sharma, 1999).

Finally, the document generated reflected this great effort of integrative negotiation, aiming at a mutually acceptable agreement. Obviously, the conciliation of all these positions contributed to dilute ambition, as observed by Michaelowa (1998), a trend in the negotiations of multilateral environmental arrangements.

The difficulties to work on CDM projects with a focus on the agricultural and forestry sectors were notorious.[6] The monitoring of GHG emissions represent both at the time as well as today, a technological barrier, from the point of view of implementations costs as well as accuracy. These challenges basically emerge due to the large area and natural uncertainties in well defining the project boundaries. Such uncertainty creates complexities and therefore increase the costs associated to the design of monitoring plans capable to address leakage issues and the permanence of carbon stocks.[7]

3 THE CDM POLICY CONSTRUCTION PROCESS

After the initial euphoria with the ratification of the UNFCCC and approval of the Kyoto Protocol's base-text at COP-3 in 1997, the years that followed were of major concern, especially after the failure of COP-6 in The Hague in 2000. The fundamental differences between the United States and the European Union showed that the prospect of the Kyoto Protocol entering into force became more precarious as the proportional importance of large emitting countries, in particular

6. Although comparable to the agricultural sector, it is necessary to point out that the forest sector received a different treatment during the initial phase of implementation of the Kyoto Protocol.

7. For further information on forest project monitoring issues, which the author has pointed out as both a possible barrier and an important legacy for the forest sector, see Chapter 6 (note from the editors).

Russia and the United States. According to the requirements of the agreement and due to the relevance of their emissions mathematic imposed that at least one of these big emitting countries had to ratify the agreement to ensure that the Kyoto Protocol finally entered into force.

The situation got worse in the following years, with Democrat North American president Bill Clinton leaving office and the inauguration of the conservator Republican George W. Bush administration. During the new Republican administration, the feasibility for an agreement involving the United States in the effort to operationalize Kyoto was canceled. As a form of response to previous administration concerns with sustainability W. Bush policy favored the consumption of fossil fuels and opening new fronts of oil exploration, including the emblematic policy of opening oil fields in areas of environmental preservation in Alaska.

In 2001, approval of the Marrakesh Accords made room for early implementation of the CDM via the so-called prompt start rule[8] and finally represented the first major achievement in the diplomatic arena since the Kyoto Protocol was approved. It is necessary to emphasize the strategic and political relevance of this decision in the context of the impasse that was formed due to the intensification of the North American position in view of the ratification of the protocol.

4 ENTRY INTO FORCE OF THE KYOTO PROTOCOL

On the days before COP-10, a solution cautiously negotiated by the European Union and Russia Federation resulted in Russia's ratification of the Kyoto Protocol in the second half of 2004 and, consequently, its entry into force in early 2005. COP-10 in Buenos Aires was the stage for the articulation of the final preparations for the effective entry into force of the Protocol, and COP-11 in Montreal was the inaugural meeting of the Meeting of the Parties of the Kyoto Protocol (MOP), which ratified all the interim understandings reached in Marrakesh. In short, because of the delay in ratifying the Protocol, the first commitment period started only in 2008, and lasted for five years until 2012.

Subsequently, during COP-12 in Kenya, it was agreed that a negotiation process on the continuity of the Kyoto Protocol should be initiated and concluded over two years. As a result of this process, in 2007, during COP-13/MOP-3 in Indonesia, a set of understandings were agreed upon with the objective of laying the foundations of a potential future agreement, capable of articulating the United States' involvement as well as emerging economies such as China, India, Brazil

8. Mechanism that allowed for the immediate entry into force of all CDM functions, including the establishment of the United Nations Secretariat, the CDM Registry, the teams of independent consultants to review the Registry and Issuance of CER units, and the establishment and full entry into activity of the EB.

and South Africa, albeit in a differentiated way. This instrument became known as the "Bali Road Map".

5 CHARACTERIZATION OF THE DYNAMICS AND PROCESSING OF LARGE-SCALE METHODOLOGIES IN THE FOREST AND OTHER CONVENTIONAL SECTORS

In order to understand how the dynamics and procedure required for the submission of a new methodology over the years of CDM implementation took place, all the official data made available on the UNFCCC website and its records for all the large-scale methodologies for the forestry sector and other sectoral scopes were assessed. The choice to discriminate forest methodologies was due to the great difference among carbon credits generated by this sector, as a result of the transitory or temporary nature of carbon stock in afforestation and reforestation projects.

All records available in the UNFCCC database were segregated into three clusters and grouped among afforestation and reforestation project and other sectoral scopes:

- new proposed technology;
- approved methodology; and
- consolidated methodology.

These clusters also represent the natural flow of the submission process of methodologies, which initially appear as a new proposed methodology, and, when analyzed, it can either receive approval or rejection. Methodologies can undergo consecutive reviews throughout its period of validity and, eventually, be consolidated or replaced. In special cases, an approved methodology can also be suspended.

Table 1 presents a summary of the records available in the UNFCCC database which considers the clusters adopted in this analysis. In all, 403 different cases (N of cases) were analyzed, which involved the submission of new methodology, the re-sending of alternative methodologies during the proposal phase of new methodologies and the registration for an approved or consolidated methodology. We consider in the analysis all records available on the UNFCCC website until November 2017.

TABLE 1
Data available at the UNFCCC database for large-scale methodologies

Groups		N cases	N review	Sectorial scopes													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Afforestation and reforestation	Approved (AR)	14	85														14	
	Consolidated (AR)	3	13														3	
	New proposal (AR)	19	19														19	
Other sectoral scopes	Approved	118	458	50	3	11	24	16	0	5	0	0	6	9	0	17		0
	Consolidated	26	255	17	0	0	6	2	0	2	0	0	0	0	0	5		0
	New proposal	223	223	114	3	15	48	25	0	11	0	0	12	11	0	32		0

Source: UNFCCC databank. Available at: https://bit.ly/2JRf17b. Accessed on: November 2017.
Obs.: The records were subdivided into groups such as "approved", "consolidated" and "new proposal".

We also analyze the background of interactions carried out within the scope of the EB in relation to large scale methodologies. This analysis considered all the versions deliberated by the Board and recorded on the UNFCCC methodological website,[9] based all records on active methodologies and other previous records available in their data. It included, therefore, all the versions of active methodologies, whether they were old versions, others that over time were replaced or consolidated, as well as the original methodologies proposed in the submission phase.

Methodologies related to afforestation and reforestation activities (scope 14) were dealt with in an individualized manner, the other scopes were grouped up. The number of cases consists of the records related to the submission of new methodologies, the re-sending of alternative methodologies during the submission phase of a new methodology and the registration of the approved methodology, in addition to the consolidated ones, where relevant. "Number of reviews" indicates the background of interactions observed under the EB, which includes all versions of the same methodology. "Sectorial scopes" indicates how the methodologies analyzed are distributed in terms of the areas of concentration.

6 CHALLENGES IMPOSED ALONG THE CDM OPERATING PERIOD (2001-2016)

Also due to the delay in ratifying the Protocol, the COP in Montreal was responsible for initiating discussions on the second Kyoto commitment period, scheduled to be concluded in 2007 during COP13 in Bali. The lack of a firm legal framework for the continuity of the second commitment period of the Kyoto Protocol (2012 onwards) has obviously generated some strangeness and insecurity for the market.

Investors and project developers anticipated with great concern the possibility of a legal chasm, which would occur after December 31st, 2012, because of

9. Available at: https://bit.ly/2JRf17b.

the concrete possibility of uncertainties about the regulations for the second commitment period. In practical terms, negotiations on the second commitment period were completed on the days before the fateful date during COP-18 in Doha. The Doha Amendments were adopted, thus concluding the negotiation process for the second period, which entered into force in the following year, 2013, avoiding the abyss and ensuring the continuity of the Protocol by December 31st, 2012. This amendment was ratified by the Brazilian National Congress in February 2018, however, as the minimum number of countries for the instrument to enter into force has not yet been reached, the formal effectiveness of this instrument remains suspended at the international scenario.

The challenge imposed on negotiators during the Bali meeting in 2007[10] was to come up with an arrangement that could enable discussions on the second commitment period of the Kyoto Protocol to be sufficiently creative in order to allow the engagement of the United States and to deal with the lack of ambition of countries with high energy dependence on fossil fuels. A creative solution capable of effectively promoting the reduction of global GHG emissions had to be built.

This understanding would mark the beginning of the redistribution process of forces and of the geopolitical order during the following decade. In the midst of this tumultuous political moment, the EB was responsible for managing the mechanism in search for solutions and ideas that could promote an adequate balance between the dynamism and the environmental integrity of the CDM. Characterized by its proactivity, the EB adopted the management of methodologies for CDM projects as an important component of its strategy.

Large-scale projects had their methodologies submitted by project developers for the EB approval. In this context, it tried to ensure the viability of the projects, but with great attention to precepts that safeguard the environmental integrity of the CDM. Small-scale methodologies were developed by the Methodology Panel in order to meet the priorities defined by the Board. In general, small-scale methodologies have tried to prioritize the dynamism of the mechanism, stimulating less sophisticated projects with less monitoring requirements.

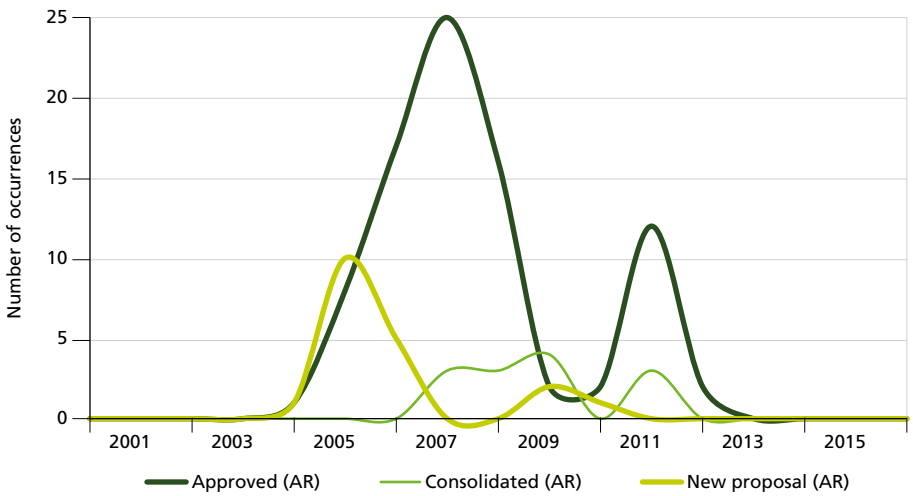
Throughout the operation of the CDM, particularly from 2001 to 2016, activity records for submission of new methodologies, referral of alternative methodologies and registration of approved methodologies, in addition to being consolidated, clearly reflected the phases and challenges faced by the EB in the management of the CDM. Graph 1 shows the dynamics of methodology reviews related to afforestation and reforestation activities (scope 14) from 2001 to 2015.

10. The Bali COP has set a historic milestone with the definition of two-way negotiation, in parallel negotiation processes related to the review of the framework agreement and the Kyoto Protocol, respectively, in order to enable a universal and binding agreement with quantifiable targets of emission reductions.

The graph consists of the distribution of 117 records, interactions observed within the EB, including all versions of the same methodology for the groups of approved methodologies (85 registers), consolidated methodologies (thirteen registers) and new proposed methodologies (nineteen registers). There are clearly two high activity moments for the records of approved methodologies.

The first peak occurs in 2008, when 25 interactions were recorded. Out of the fourteen methodologies approved for the forest area, only four did not undergo a review, while the majority underwent two reviews, and two of them (AR-AM0005 and AR-AM0007) underwent four distinct reviews of versions that year, with the period being noted as the period with the highest number of reviews and also with the greatest dispersion (variance 1.87) in this regard. The second peak occurred in 2012, with a very different nature from the first one, being more homogeneous (variance 0.28) as to the number of reviews, in which only the AR-AM0014 had more than one review and only methodologies AR-AM0003, AR-AM0001 and AR-AM0008 had no reviews.

GRAPH 1
Review dynamics in methodologies related to afforestation and reforestation activities – scope 14 (2001-2015)



Source: UNFCCC database. Available at: https://bit.ly/2JRf17b. Accessed on: November 2017.
Obs.: The records were subdivided into groups such as "approved", "consolidated" and "new proposal".

The intensity of review activity in methodologies observed between 2005 and 2009 characterizes the first phase of the CDM, in which there was great concern on the part of the EB with the environmental integrity of the Protocol. The methodologies have undergone several interactions and, in general, have become more complex in attempting to ensure the environmental integrity of the Protocol.

The peak of this activity was registered in 2008 and almost coincides with the first attempt of simplification executed by the EB, by means of the envelopment of similar methodologies in a single consolidated methodology.

The year 2012 reflects, however, another reality, with the realization that the CDM had become too complex, lacking simplifications to attract the interest of the private sector. With a view to attracting the private sector's interest in the CDM, new project modalities have been developed, including the Programmatic CDM.

However, even with all this effort, afforestation and reforestation projects (scope 14) were no longer able to attract the interest of the private sector. The last new methodology was presented in 2012 and the last methodological consolidation effort occurred in 2013. In 2014, the latest methodologies related to this sector were approved by the EB, and there has been no activity since then, a reflection of the eminent crisis, mistrust on the second commitment period and investor skepticism.

The Board's concern to ensure the Protocol's environmental integrity was also a source of constant criticism from the private sector. One of the main arguments put forward concerned the time and effort required to achieve the approval of a new methodology. Analyzing the peak and the amplitude of the dynamics of submissions of new methodological proposals and the review dynamics of approved methodologies, the timeframe between the submission of a new methodologies and the respective impact on the set of approved methodologies was approximately two years.

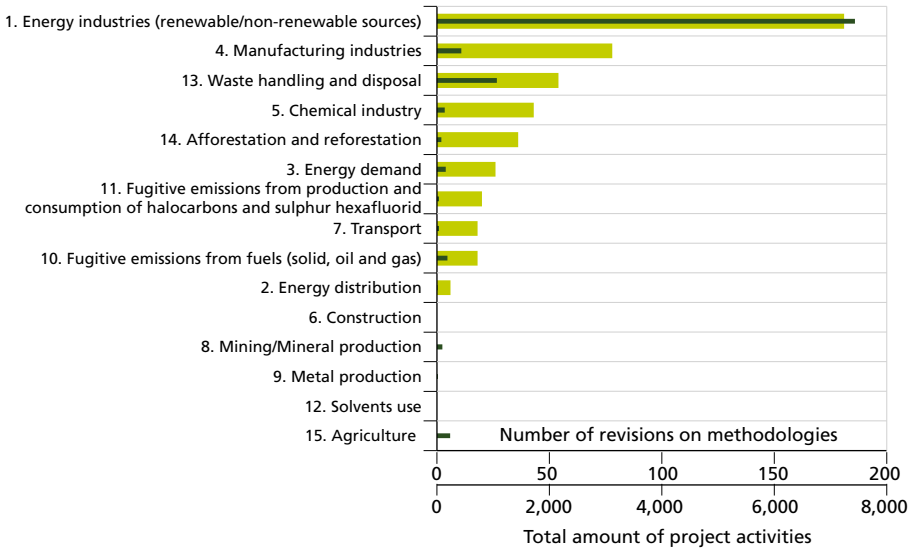
The extent of distribution of "Approved (AR)" and "New Proposal (AR)" samples is due to frequent changes in the versions of approved methodologies, which indicates that, even after approval of a methodology, project developers had to make a great deal of effort in following them up. Frequent changes of versions incurred financial costs for the readjustment of projects under development and reviews of the monitoring plans of projects already approved during the renewal phases.

The review dynamic of forest methodologies, shown in Graph 1, reflects how the work of both the EB and the methodological panels became increasingly complex throughout the early years of the CDM implementation. However, the great volume of work and the greater amount of resources invested by these institutes was directed to analyze methodologies from allother types of activities (sectorial scopes) excluding forests, due to the interest of the market, particularly in the following scopes: 1 (energy industry, renewable and non-renewable); 13 (waste management and disposal); and 4 (manufacturing industry), respectively, as shown in graph 2.

For the other sectoral scopes, as well as observed for scope 14 (afforestation and reforestation), there was great euphoria during the initial phases of the CDM implementation (2002-2008). However, interest in projects was much more significant, particularly for the energy industry sector, which accounts for 75.1% of projects registered, followed by the waste management and disposal sector (10.7%) and the manufacturing industry sector (4.4%). Activities related to afforestation and reforestation represent only 0.8% of effectively registered project activities.

GRAPH 2

Total review effort in large-scale methodologies by sectoral scope[1] and total number of registered CDM projects[2]



Source: UNFCCC database. Available at: https://bit.ly/2JRf17b. Accessed on: November 2017.
Notes: [1] Orange bar, main.
[2] Including large and small scale.
Obs.: Figure displayed in low resolution and whose layout and texts could not be formatted and proofread due to the technical characteristics of the original files (Publisher's note).

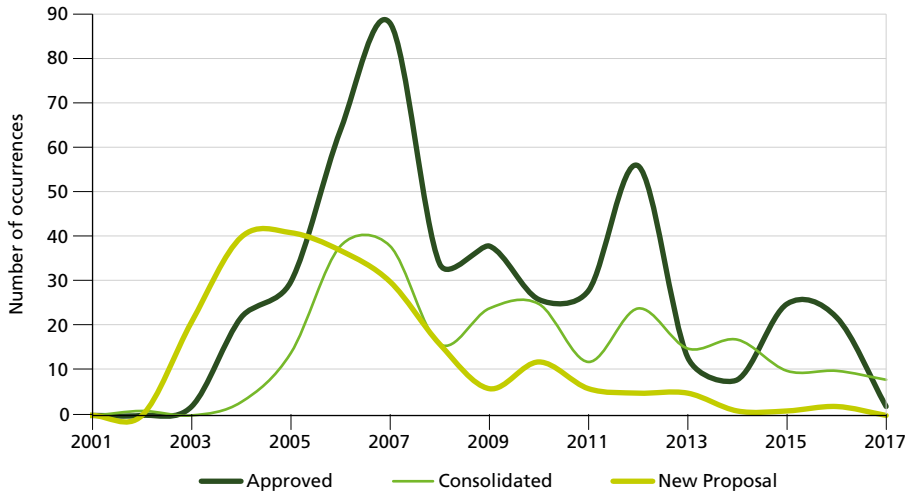
The greater interest observed for some sectorial scopes was translated into a respective greater dynamic of methodological reviews, which is reflected in graph 3. In the other scopes, a similar dynamic is observed for sectorial scope 14 (afforestation and reforestation – graph 1), by 2013, of the implementation of the CDM projects.

It is evident from the analysis of the dynamics shown in graph 3 that after 2008, the EB started to consider the potential negative impact that the entire process of methodological reviews produced and which continued to reverberate in the form of harsh criticism from the private sector, which indicated a set of

political circumstances and market skepticism. In this context, in 2009, the Board began to promote the development of a new set of consolidation of large-scale methodologies. In subsequent years, this institute proposed simplifying rules and procedures for small- or micro-scale projects, which in 2012 systematically reflected methodological reviews aimed at simplifying procedures for large-scale projects.

During this period, a major effort made by the EB to promote the advance for the universalization of the CDM, through a new type of CDM project activity model, called Program of Activities (PoA), resulted in some revitalization of the market and managed to re-attracted the interest in CDM project activities. The idea of the Board was to foster the proliferation of very small projects, called Component Project Activities (CPA), which could exist, without the need for prohibitive implementation and monitoring costs, under a large "umbrella", the PoA. Project developers reacted positively, reversing for a moment, in 2010, the saturation tendency in proposing new methodologies.

GRAPH 3
Review dynamics in methodologies for large-scale CDM project activities – except for scope 14 (2001-2017)



Source: UNFCCC database. Available at: https://bit.ly/2JRf17b. Accessed on: November 2017.
Obs.: The records were subdivided into groups such as "approved", "consolidated" and "new proposal".

Despite the good intentions of all stakeholders involved in the validation cycle of CDM projects, the wave of optimism did not last for long. The complex political scenario with respect to Annex I countries' ambition to mitigate emissions, the eminent risk of a legal vacuum of the second commitment period, and the adverse economic condition faced by the big economies, made it impossible for the carbon market to remain strong.

Despite the salutary intention of the EB in establishing the PoA as a model of universalization of the CDM and the extrinsic factors mentioned above, factors intrinsic to the mechanism also contributed to the low initial adoption of the PoA. In particular, legal caveats and uncertainties have driven away many Designated Operational Entities (DOEs), responsible for validating projects, thus creating obstacles to the initial validation of PoA projects. The reason for the concern of DOEs is that they are required to attest, as part of their validation of the PoA, that the methodologies applied and the monitoring plans would be sufficiently robust to ensure the environmental integrity of the Protocol. The pulverized nature of the Programmatic CDM has given rise to concern from many DOEs, which initially did not welcome this type of project activity, making it difficult to adopt them promptly.

The closing phase of the CDM, analyzed in the context of this document, encompasses the period from 2013 to 2017. During this period, activity in sectoral scope 14 (afforestation and reforestation) was no longer monitored. The political and economic scenario was very inflexible, resulting in lack of interest in the European Emissions Trading Scheme (ETS) for the acquisition of new CERs, which resulted in an irreversible process of slowing down the global carbon market.

In a way, the CDM was a victim of its own success, having achieved abatement levels of emissions reductions around 300 $MtCO_2$/year (Grubb, 2016), which contributed to reduce the market demand for new credits, in light of a political environment that is not friendly to the increase in ambition due to the unfavorable economic scenario (the subprime crisis in the United States), the COP-15 diplomatic fiasco in Copenhagen, the subsequent contagion of the crisis to Europe and, more recently, to emerging countries.

From December 31st, 2012, when the first commitment period of the Kyoto Protocol came to an end, and when the UNFCCC Secretariat finished accessing the Greenhouse Gas Emissions Inventories to meet the Kyoto targets, conclusion was that the overall effort by Annex I countries to reduce 2.7 $GtCO_2$/year over the five years of implementation of the Kyoto Protocol was adequately under control for almost all countries. The exceptions were the United States, which refused to ratify the agreement, and Canada, which withdrew just days before the end of the first commitment period.

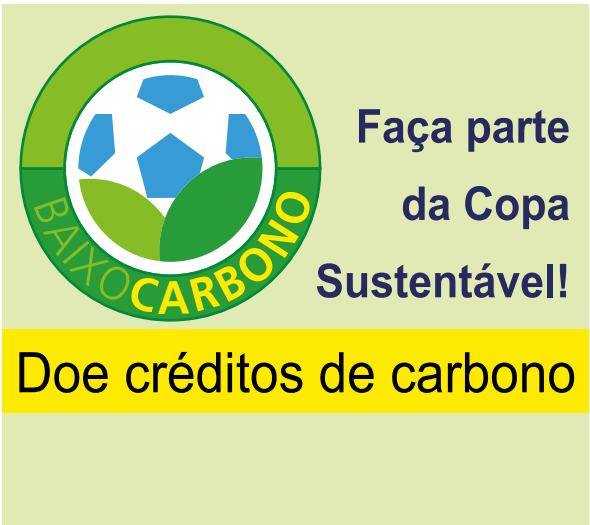
In a few words, five main factors contributed to the achievement of Kyoto Protocol targets: *i*) actions, policies and planning developed by the countries themselves; *ii*) the flexibilization mechanisms of the Kyoto Protocol, including the carbon market of the CDM; *iii*) the subprime economic crisis in the United States; *iv*) the dilutive impact arising from the accounting rule under the so-called "ETS bubble" or "EU bubble"; and *v*) the negative effect of the so-called "hot air"

inherent in the abrupt rupture of the technological production model that occurred in the countries of the former Soviet Republic after the Perestroika process, with the adoption of new and more efficient technologies.

At the same time, concerned about the negative impact on the CDM market, the Brazilian Government sought to adopt alternative measures to give some continuity to the carbon market and a political response to the companies that had invested in this initiative. The main idea was the promotion of international strategies for voluntary abatement of CERs, linked to some type of sustainability certification. In Brazil, this idea was adopted during "big events", such as Rio+20, the World Cup and the Olympic Games, when the Ministry of the Environment (MMA) granted the "Low Carbon" sustainability seal (figure 1) to companies that were willing to donate their CERs.[11]

This reassuring measure did not have great international adherence and was obviously not able to reverse the downward price trend of CERs in the market. With the negotiation of the Paris Agreement and the ongoing negotiation of the new Sustainable Development Mechanism (SDM), little energy has been dedicated by companies to expand investments during the second CDM commitment period.

FIGURE 1
"Low Carbon" sustainability seal granted to companies that were willing to donate their CERs



Source: Tolentino (2014).
Obs.: MMA Ordinance No. 70, of February 19th, 2014, provides for the "Low Carbon" sustainability seal.

11. For further information on the cancellation of CERs for their voluntary use, see Chapter 1 (note from the editors).

7 VOLUNTARY COMMITMENTS AND THEIR SYNERGY WITH THE CDM IN THE CONTEXT OF THE PARIS AGREEMENT

Considering the current scenario, and the way in which the CDM has influenced innovation and sustainability as a solution to a development paradigm shift, the Paris Accord naturally becomes the next natural step. The challenge posed to society is to plan and invest in actions and strategies that need to be adopted as soon as possible, in order to reduce the intensity of GHG emissions, and thus, in the future, stabilize the concentration of these gases, and consequently of the average global temperature, in a level that allows the adequate maintenance of the ecological processes, essential for the maintenance of the life of the planet. According to Wigley (1997), for us to succeed, this effort needs to be made on the time scale of two or at most three generations.

In addition, it is necessary to evaluate the fact that tackling climate change is considered the greatest challenge of modern society (Bolin, 1985, 2007, Kerr, 1995, Houghton, 1997 and Skodvin, 2000). Thus, current measures to mitigate GHG emissions, which are mainly related to the consumption of fossil fuels in energy production, transportation and industrial activities, do not immediately solve the problem of climate change (Lanchbery and Victor, 1995). The Paris Agreement provides that the average temperature rise of the planet should be stabilized to below 2°C. The agreement, however, stresses the urgency of the problem and indicates, in a prudent way, that the stabilization target of the average elevation of the planet's temperature should be 1.5°C. In this sense, the Paris Agreement seeks to establish an important reference framework on the acceptable limit for the balanced concentration of GHGs in the atmosphere, and, therefore, reduces the uncertainties pointed out by many authors in the 1990s about the feasibility of the climate agreement.

The Paris Agreement provides for the CDM, and opens up opportunities for future regulations and adaptations. It also establishes room for discussion of new market mechanisms, in a clear positive response to the idea of voluntary markets.[12] However, if in the past developing countries offered good opportunities for emissions mitigation projects in the context of the CDM, today they are concerned with developing nationally appropriate activities, with a focus on fulfilling their own voluntary commitments in their Nationally Determined Contributions (NDC).

It is still uncertain how the regulation of the Paris Agreement and its Sustainable Development Mechanism (SDM) will circumvent the resulting effect of the new constituted order, in which it is no longer crystal clear the segmentation between developing countries, offering opportunities for implementing mitigation, and

12. For further information on the Paris Agreement, its mechanisms, and how they relate to the CDM, see Chapter 12 (note from the editors).

developed countries with emission abatement targets and eager to acquire carbon credits at a cost lower than the investment required to offset their emissions on their own territory.

Regardless of the design of the SDM implementation, it is clear that the lessons learned from the CDM will be crucial and will form the basis upon which the new mechanism will be developed. The legacy of the CDM in fact needs to be contemplated under more angular lenses, capable of capturing all the multiple benefits and co-benefits resulting from the implementation of this mechanism.

At least three main aspects could be characterized as direct benefits of the CDM under the Paris Agreement:

- the diffusion of knowledge, legal framework and governance – involving the capacity-building to deal with the diversity and interactions of distinct areas of knowledge, encouraging academic debates in the various levels of society, serving as drivers to improve environmental legislation and the structuring of efficient governance units on climate change;
- prioritization of the environmental theme in corporate systems, stimulating the creation, adoption and innovation of renewable generation systems, diversification of the mix and adoption of energy efficiency principles, strengthening more efficient and profitable forms of business in the generation sector and use of energy, to the point of overcoming any possibility of significant use of fossil fuels, becoming the energy standard and no longer considered as "alternative energy"; and
- the improvements mentioned in the two previous paragraphs should be expressed in the form of legal and public policy frameworks that not only incorporate and stimulate social and corporate initiatives, but also create means of implementation that can be clearly assimilated as a social investment that will be largely supplanted benefits generated in the various sectors, such as logistics, health, education, transportation, industry and the environment.

These are just some of the aspects that can be objectively attributed to the CDM as part of its important legacy and which become strategic to contributing to the objectives of Paris Agreement.

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