

CDM Transition: CER Availability

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This paper was produced with support from the World Bank.

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Introduction

This paper reviews the potential availability of certified emission reductions (CERs) originating from the pipeline of CDM project activities and programme of activities (PoAs)¹ from the first commitment period of the Kyoto Protocol (KP1, i.e., 2008-2012), second commitment period (KP2, i.e., 2013-2020) and post 2020, across regions and methodology. These CERs could be transitioned to Article 6.4 mechanism (A64M) depending on the rules of the Paris Agreement rulebook and decisions by Host Parties and projects developers.

Approach and Methodology

There are more than 8000 projects registered under the CDM and furthermore in the pipeline. Owing to such large number of projects, instead of delving into the primary numbers provided in the respective project design documents, the following data bases were used. For the purpose of this study, the following databases were used:

- UNFCCC database for PAs and PoAs²
- UNEP DTU CDM pipeline³
- IGES CDM database⁴

The above databases vary with slightly different ways of representation and bit of lag with regards to the status of the projects⁵ but the list of projects is the same. For this exercise, the 'Database for PAs and PoAs' as available on the UNFCCC website has been used.

Categorization of projects

The following classification of the projects was used in arriving at the availability of CERs:

- Projects with CDM prior consideration – These projects have not been included as there are no ex-ante estimates available for such projects. Project participants have informed the UNFCCC Secretariat of their intention of registering these projects, but they never proceeded to register them.
- Projects under validation – There are two sets of such projects
 - Projects that have been undergoing the validation process for long (several years) and have not been able to have a positive validation opinion for various reasons and
 - Relatively new projects currently under validation.

The emission reductions from these projects have not been considered. For the former category, although the number of projects is higher, the likelihood of such projects getting

¹ Collectively referred to as projects if not explicitly stated.

² Available at: <https://cdm.unfccc.int/Statistics/Public/files/Database%20for%20PAs%20and%20PoAs.xlsx>

³ Available at: <https://www.cdmpipeline.org/>

⁴ Available at: <https://www.iges.or.jp/en/pub/iges-cdm-project-database/en>

⁵ All these databases are updated with different frequency and dates so might differ in terms of the latest projects.

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registered can be considered as lower⁶. For the latter, the number of projects is less to make much impact on overall aggregated numbers.

- Registered projects – The information for these projects is provided by the ex-ante estimates of emission reductions. These projects have been further classified into **active** and **dormant** projects with the following logic:
 - Active projects: These are projects which have had been active post- 2012 (KP2), either through the issuance of CERs from the projects, the renewal of crediting periods or recent the registration of the project (post 2015).
 - Dormant projects: These are the remaining projects which despite having been registered for a long time,
 - Have never issued CERs,
 - Issued only sparingly in pre 2012 (KP1) period,
 - And/or have a long due renewal of their crediting period.

The possibility of issuance of CERs from such registered projects is reduced due to several factors, including:

- The project is not being implemented – No CERs would originate from such projects till they are commissioned and operational.
- Delay in commissioning – With the crediting period start date getting fixed at registration with little change possible post registration, the delay in project being operational would effectively reduce the crediting period.
- Change of design – The change of design may render the methodology applied for monitoring and quantification of ERs being not relevant/not-applicable
- Lack of monitoring – Without monitoring the requisite parameters for quantification the ERs cannot be claimed. In absence of the monitored data despite the project being operational, the application of TACCC principles⁷ and conservativeness would lead to loss of ERs for the missing period.

⁶ There are about 4745 projects that entered the validation process and have not been able to get registered or receive a positive validation opinion. There had been a big rush to get projects registered by end of 2012 to be eligible under EU-ETS, however, many projects which failed to meet this deadline abandoned the validation process or received negative validation opinion. For about 3070 projects, the validation has been terminated.

⁷ Transparency, Accuracy, Consistency, Completeness, and Comparability

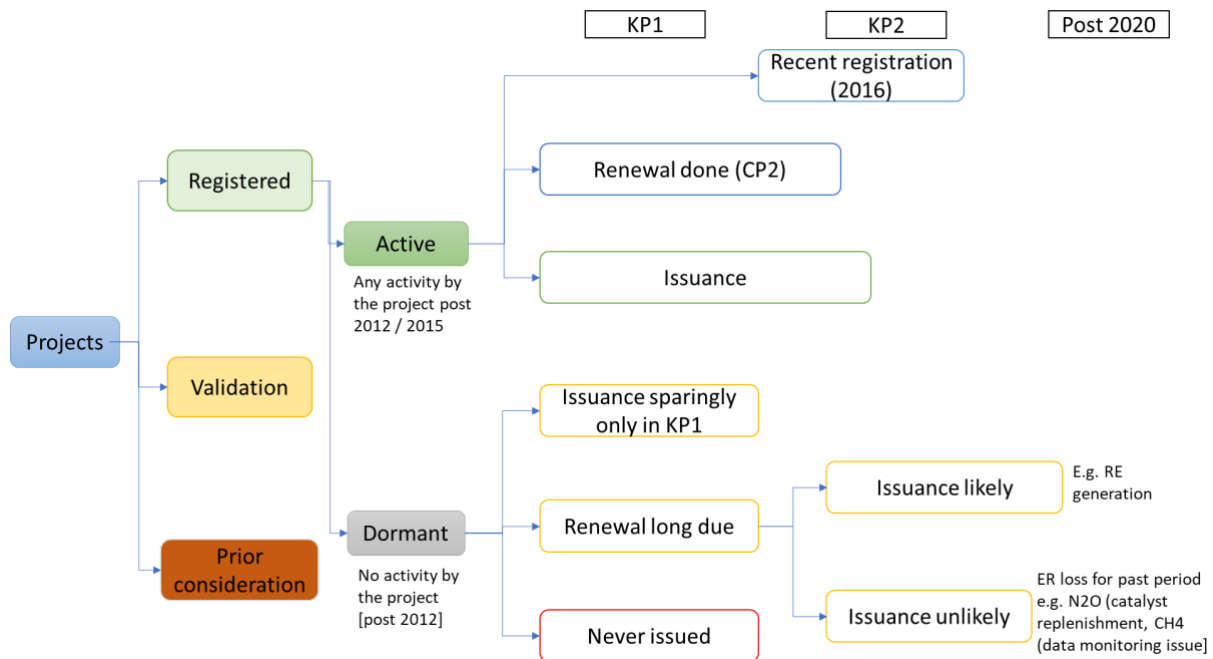


Figure 1: Categorization of CDM projects

Exclusion criteria

Certain type of projects has further been excluded in the analysis, as follows:

- Industrial gases: The industrial gases projects such as HFC23 and N2O were excluded in arriving at the ER estimates. The European Union (EU) banned HFC-23 and N2O credits from use in the EU-ETS from 1 January 2013⁸ due to their coverage under the Kigali Agreement to the Montreal Protocol. Further, for N2O destruction the emission reductions will not happen in absence of catalyst replenishment, and the others are being facilitated through Nitric Acid facility and hence their CERs are already committed.
- Large hydro: Although the definition of large hydro varies, with hydro projects above 20 MW being restricted under EU-ETS⁹, in this study a threshold of 15 MW was used to classify small and large hydro.
- Forestry: The afforestation/reforestation projects (A/R projects) have been excluded as the ERs are not permanent. The A/R projects generate the temporary CERs (tCERs) and long-term CERs (ICERs) and these cannot be exchanged for allowances in the EU ETS. Credits from Land-use, land-use change and forestry (LULUCF) projects cannot be used under EU-ETS¹⁰.

⁸ <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=OJ:L:2011:149:TOC>

⁹ Credits from hydroelectric projects exceeding 20 MW of installed capacity can only be accepted under certain conditions [https://ec.europa.eu/clima/policies/ets/credits_en]

¹⁰ https://ec.europa.eu/clima/sites/clima/files/docs/ets_handbook_en.pdf

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The database allows for the filtering of projects based on type (PA or PoA), sub-type (HFC, N2O etc.), status, crediting type (renewable/fixed), dates (registration, crediting period start date etc.) among other criteria. The ex-ante amount of CERs (PDD ex-ante) per year in CP1 is also provided.

The total ERs for the crediting period was calculated based on the type of crediting period and estimated annual average of ER. The split of the total ER estimate across the three periods (KP1, KP2 and post 2020) was done by an allocating methodology which uses the crediting period type, the start date of the project and the respective end and start dates of KP1, KP2 and post-2020. The allocation of ERs was done based on the number of overlapping days, straddling the crediting period across KP1, KP2 and post-2020.

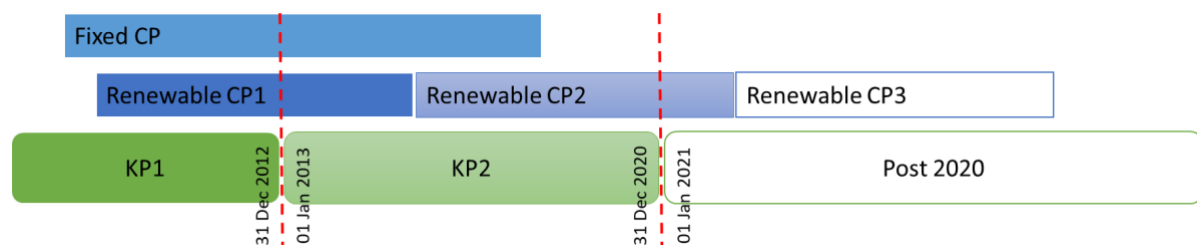


Figure 2: Straddling of crediting periods and KP periods

Despite the availability of data for the projects and their associated ex-ante estimates of emission reductions, there are uncertainties involved, owing to difference between ex-ante estimates and actual ex-post monitored and issued CER values apart from uncertainty of projects getting renewed. The ex-ante estimates in the project design documents provide some level of certainty about the expected amount of ERs the project could be deliver upon operation, however, the actual operation and issuances tend to vary.

Furthermore, for projects opting for renewable CPs, with the renewal of the crediting period comes the update of the baseline, which itself brings with it a high level of uncertainty for estimates of future ER¹¹. Also, the assessment has taken into consideration, the cut-off date for crediting period renewal been set by at EB 105 for September 30, 2020 for projects that have opted for renewable crediting period and for whom the crediting period has expired.

Certainty	Uncertainty	Exclusion
<ul style="list-style-type: none">• Ex-ante projection (CP1)	<ul style="list-style-type: none">• Issuance rate• Renewal of CP• Cut-off date for renewal	<ul style="list-style-type: none">• HFC23• N2O• Large hydro• Forestry

¹¹ For e.g., in the simpler case of grid connected RE projects, the grid emission factor would change during the renewal of crediting period. It is generally observed that the grid emission factor is going down with more RE being developed as against coal-based power plants.

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It is interesting to note that of the 5489 projects that have opted for renewable crediting period (CP) only 974 have renewed the 2nd CP and only 40 have had a 3rd CP renewal¹². There are about 4457 projects wherein the 1st CP has ended, and with the EB105 decision, about 2400 projects would not be renewed further and the crediting period has ended.

The dormant projects bring in a high amount of uncertainty for post-2020 projections due to the pending renewal (uncertain) and limited previous activity. In the absence of renewal numbers (wherein renewal is still to be carried out), an average ratio of 0.86 derived from renewed projects has been applied as a proxy to arrive at CP2 and CP3 numbers for other projects where renewal is due¹³. The ratio has been derived based on the ER estimates for CP1 and CP2 of the 974 projects that have had renewal.

Ex-ante supply of emission reductions

The ex-ante estimate of CER supply from registered projects based on numbers provided in the PDDs is about 14.4 billion tCO₂e; this includes about 4841 projects that have not had any issuances so far.

The split across the different periods is as follows:

Table 1: Ex ante estimate of potential CER supply from registered projects across regions

Region/Country/Grouping ^{14,15}	Qualifier	KP1	KP2	Post 2020	Total
AILAC	Independent Alliance of Latin America and the Caribbean ¹⁶	0.067	0.249	0.327	0.643
Arab States	22 member states ¹⁷	0.036	0.103	0.063	0.202
Brazil	-	0.143	0.331	0.429	0.903
China	-	1.301	3.532	2.557	7.390
India	-	0.265	0.760	0.580	1.605
Least Developed Countries (LDC)	48 Parties	0.007	0.222	0.695	0.924
Small Island Developing States (SIDS)	40 low-lying islands	0.007	0.078	0.135	0.220

¹² These numbers are based on the 'Database for PAs and PoAs' accessed in October 2020 from UNFCCC website with project status update from 05 October 2020.

¹³ The renewal of A/R projects has not been considered though.

¹⁴ Some of the countries are overlapping. Vanuatu and Haiti appear in the list of LDC as well as SIDS.

¹⁵ Source: <https://unfccc.int/process-and-meetings/parties-non-party-stakeholders/parties/party-groupings>

¹⁶ Chile, Colombia, Costa Rica, Guatemala, Honduras, Panama, Paraguay, Peru

¹⁷ Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Mauritania, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, Yemen

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Rest of the World (RoW)	All other remaining countries	0.364	1.101	1.038	2.502
Total		2.189	6.376	5.823	14.389

Note: The numbers under the columns KP1, KP2, Post 2020 and Total are values in billion tCO₂e

It is also interesting to note that despite the development and availability of more than 250 approved methodologies under CDM, only a handful are predominantly used. The share of application of the predominant methodologies and the quantum of potential CER supply is as follows:

Table 2: Ex ante estimate of potential CER supply from registered projects across methodologies

Methodology ¹⁸	Brief	Count of projects	KP1	KP2	Post 2020	Total	% ER share	% count share
ACM0002	Grid connected RE (no biomass)	3357	0.548	3.121	3.146	6.815	52.95%	38.54%
ACM0001	Landfill gas	245	0.596	0.361	0.166	1.123	8.73%	2.81%
AM0001	HFC23	20	0.483	0.142	0.007	0.631	4.91%	0.23%
AMS-I.D.	Grid connected RE	2061	0.090	0.250	0.151	0.491	3.81%	23.66%
AM0021	N ₂ O	4	0.163	0.252	0.240	0.655	5.09%	0.05%
ACM0025	Natural gas power plant	66	0.065	0.262	0.097	0.425	3.30%	0.76%
ACM0008	Coal mine methane	91	0.067	0.230	0.113	0.410	3.19%	1.04%
ACM0012	Waste heat recovery	293	0.115	0.250	0.039	0.404	3.14%	3.36%
AM0034	N ₂ O	52	0.047	0.068	0.029	0.143	1.11%	0.60%
ACM0006	Biomass	160	0.037	0.070	0.043	0.149	1.16%	1.84%
AM0028	N ₂ O	17	0.036	0.060	0.047	0.143	1.11%	0.20%
ACM0022	Alternative waste mgmt.	79	0.006	0.055	0.023	0.084	0.65%	0.91%

¹⁸ The methodologies listed below also include the other methodologies which have been withdrawn and consolidated in the respective stated methodologies.

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ACM0013	Less intensive fossil fuel fired power plant	11	0.005	0.066	0.018	0.089	0.69%	0.13%
AMS-I.C	RE thermal	220	0.012	0.044	0.011	0.067	0.52%	2.53%
ACM0019	N2O	26	0.001	0.039	0.035	0.075	0.58%	0.30%
ACM0010	AWMS	60	0.029	0.018	0.002	0.049	0.38%	1%
Total		6762	2.300	5.285	4.167	11.752	91%	78%

Further, the ex-ante estimates of usable potential CER supply from registered projects design documents, excluding the industrial gases (HFC23, N2O), large hydro (> 15 MW) and forestry projects, reduces the available credits by about 5 billion tCO₂e. The post 2020 projection after the exclusion of projects in the four categories is about 3.9 billion tCO₂e.

The split across the different periods across regions is as follows:

Table 3: Ex ante estimate of usable potential CER supply from registered projects across regions

Region/Country/Grouping	KP1	KP2	Post 2020	Total
AILAC	0.043	0.149	0.163	0.355
Arab States	0.029	0.083	0.049	0.160
Brazil	0.093	0.174	0.261	0.527
China	0.600	2.279	1.542	4.422
India	0.173	0.594	0.478	1.245
LDC	0.005	0.145	0.583	0.734
SIDS	0.007	0.020	0.026	0.053
RoW	0.216	0.840	0.790	1.846
Total usable credits	1.166	4.284	3.892	9.342

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Furthermore, if the criteria of registration of the projects post 2013 or 2016 is imposed, the supply of ERs drop significantly with reduced activity post 2012. The ex-ante estimate of supply of emission reductions from the registered activities after January 1, 2013 is as follows:

Table 4: Ex ante estimate of potential usable CER supply from projects registered after 2012

Description	Qualifier	KP1	KP2	Post 2020	Total
Registered projects	PA (679), PoA (586 CPAs)	0.003 (A/R projects)	0.519	1.279	1.800
Exclusion	HFC, N2O, Large hydro, A/R	(0.003)	(0.134)	(0.257)	(0.393)
Total Usable credits		0	0.385	1.022	1.407

The ex-ante estimate of supply of emission reductions from the registered activities on/after 01st Jan 2016 is as follows:

Table 5: Ex ante estimate of potential CER supply from projects registered after 2015

Description	Qualifier	KP1	KP2	Post 2020	Total
Registered projects	PA (136), PoA (162 CPAs)	0	0.090	0.525	0.615
Exclusion	HFC, N2O, Large hydro, A/R	(0)	(0.023)	(0.075)	(0.098)
Total Usable credits		0	0.067	0.450	0.516

Ex-post issuance of certified emission reductions

There has been issuance of about 2 billion tCO₂e so far and majority coming from only about a fifth of the projects from HFC23, N₂O and large hydro, with the regional split as follows:

Table 6: Ex post issuance of CERs

Region/Country/Grouping	KP1	KP2	Total
AILAC	0.040	0.030	0.070
Arab States	0.023	0.013	0.036
Brazil	0.096	0.061	0.096
China	0.874	0.233	1.107

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India	0.199	0.060	0.259
LDC	0.002	0.044	0.047
SIDS	0.000	0.001	0.001
RoW	0.245	0.160	0.406
Total	1.480	0.603	2.082

The forecast and the actual issuances across regions compare, as follows:

Table 7: Comparison of ex-ante forecast and ex-post actual CER issuances across regions

Region/Country/Grouping	KP1 + KP2 (Ex-ante estimate)	KP1 + KP2 (Ex-post issuance)	% issuance of estimate
AILAC	0.316	0.070	22%
Arab States	0.139	0.036	26%
Brazil	0.474	0.096	20%
China	4.833	1.107	23%
India	1.025	0.259	25%
LDC	0.229	0.047	20%
SIDS	0.084	0.001	1%
RoW	1.465	0.406	28%
Total	8.565	2.082	24%

Further, the forecast and the actual issuances across regions for the usable credits compare, as follows:

Table 8: Comparison of ex-ante forecast and ex-post actual CER issuances of usable projects across regions

Region/Country/Grouping	KP1 + KP2 (Ex-ante estimate)	KP1 + KP2 (Ex-post issuance)	% issuance of estimate
AILAC	0.192	0.039	20%
Arab States	0.112	0.017	15%

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Brazil	0.267	0.075	28%
China	2.880	0.423	15%
India	0.767	0.138	18%
LDC	0.151	0.001	1%
SIDS	0.027	0.000	0%
RoW	1.056	0.195	18%
Total usable credits	5.450	0.888	16%

The summary of the comparison has been presented in the adjoining table.

Table 9: Comparison of ex-ante forecast and ex-post actual CER issuances

Description	KP1 + KP2 (Ex-ante estimate)	KP1 + KP2 (Ex-post issuance)	% issuance of estimate
All projects	8.565	2.082	24%
Exclusion - HFC23 + N2O + Large hydro + A/R (Unusable)	3.116	1.194	38%
Usable credits	5.450	0.888	16%
Usable ratio	64%	43%	

It can be observed that of the forecast of 8.56 billion tCO₂e for KP1 and KP2 only 2.08 billion tCO₂e has been issued, of which only 43% pertains to usable credits.

The issuance ratio for KP1 and KP2 has been as follows:

Table 10: Issuance ratio for projects under KP1 and KP2

Description	KP1	KP2	KP1 + KP2
Registered projects	68%	9%	24%
HFC23	105%	23%	86%
N2O	103%	24%	53%
Large hydro	61%	7%	16%
Forestry	78%	23%	49%

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Due to unfavourable market conditions, with drastic drop in CER prices and demand of credits, the issuances in KP2 have been dismal and for many projects the continuity or monitoring may have been hampered. If the issuances under KP1 and KP2 were to be observed carefully, after excluding the unusable projects, the issuance ratio has only been dismal 46% and 8% respectively. If such trend were to continue and even if the issuance ratio of KP1 were to be considered the availability of usable credits getting issued under KP2 and post 2020 get reduced to 1.96 and 1.78 billion tCO₂e respectively. Further, extending the same logic, if 2013 or 2016 is set as the cut-off date for registration, the likelihood of CERs being available diminishes to 0.64 and 0.24 billion tCO₂e respectively.