CLEAN DEVELOPMENT MECHANISM

CDM-MP74-A14

Information note

Option to replace unit size criterion in small-scale additionality Tool21

Version 01.0

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. The Executive Board of clean development mechanism (hereafter referred as the Board) at its ninety-fourth meeting (EB 94) while considering the revision of "TOOL21: Demonstration of additionality of small-scale project activities" recommended by the fifty-third meeting of the small scale working group, requested the Methodologies Panel (MP), the Small Scale Working Group (SSC WG) and the secretariat to jointly explore options for replacing the unit size criterion in the positive list (i.e. provision in paragraph 11 (c) of Tool21) with an expanded positive list of technologies in the Tool21 that includes specific distributed unit technologies that would provide services to households/communities/small- and medium sized enterprises (SMEs).

2. EB 94 also agreed not to merge the methodological tools "TOOL19: Demonstration of additionality of microscale project activities" and "TOOL21: Demonstration of additionality of small-scale project activities" and to retain three years as the frequency for reviewing the positive list of technologies contained in TOOL21 (Para 47, EB 94).

2. Purpose

3. The purpose is to launch a call for public input on analysis and recommendations in response to EB 94 request mentioned above

3. Key issues and proposed solutions

4. The documents provide options for replacing the current 1%-unit size criterion for the positive list defined in paragraph 11 (c) of Tool21 with an expanded positive list of technologies. The technologies include specific distributed unit technologies that would provide services to households/communities/small- and medium sized enterprises.

5. Impacts

6. The positive lists facilitate the development of CDM project activities and programme of activities particularly involving distributed energy technologies that would provide services to households/communities/small- and medium sized enterprises.

7. Subsequent work and timelines

4. The MP, taking public input into account on the analyses and recommendations contained in this document, will recommend at its future meeting to revise Tool21 and relevant methodologies to reflect the above proposal for the Board’s consideration.

8. Recommendations to the Board

5. Not applicable (call for public inputs).

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1. Introduction

1. The Executive Board of clean development mechanism (hereafter referred as the Board) at its ninety-fourth meeting (EB 94) while considering the revision of "TOOL21: Demonstration of additionality of small-scale project activities" recommended by the fifty-third meeting of the small scale working group, requested the Methodologies Panel (MP), the Small Scale Working Group (SSC WG) and the secretariat to jointly explore options for replacing the unit size criterion in the positive list (i.e. provision in paragraph 11 (c) of Tool21) with an expanded positive list of technologies in the Tool21 that includes specific distributed unit technologies that would provide services to households/communities/small- and medium sized enterprises (SMEs).

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3. The MP[1], taking expert input into account agreed to launch a call for public input on analysis and propose options for recommendations, as contained in this document.

2. Key issues, analysis and proposed solutions

2.1. Methodological steps to identify distributed unit technologies (DUTs)

4. In response to EB 94 request, positive list for specific distributed unit technologies that would provide services to households/communities/SMEs are identified to replace the current 1 percent unit size criterion currently defined in paragraph 11(c) of the Tool21.The following analytical steps were carried out:

   (a) Step 1: Registered Programmes of Activities (PoA) and project activities (PA) were analysed and literature review was carried out to identify DUTs;

   (b) Step 2: Relevant large scale and small scale (SSC) CDM methodologies applicable for those technologies were reviewed. The technologies whose additionality is already addressed in specific methodologies were removed from the list;

   (c) Step 3: The remaining technologies were examined against the "Criteria for graduation and expansion of positive list of technologies under the small-scale CDM", as contained in annex 23 to SSC WG46 report and approved by the Board;

   (d) Literature review was carried out on these technologies to study the environmental integrity aspects such as end user type/nature, levelised cost of service, market penetration rate, capital cost of technology, location, etc., as applicable. Also, data available from public sources and internet were reviewed to evaluate the technologies against those criteria;

   (e) Step 4: The potential impact of the proposed change on the existing and pipeline of CDM PoAs and projects was carried out.

[1] EB 94 (Para 6) decided to merge the existing Methodologies Panel with the Small-Scale Working Group constituting a single methodology panel.

2.2. Definitions

5. For the purpose of the analysis contained in this document, the following definitions are considered:

(a) **Distributed unit technologies**[2]: Individual technology providing energy services to end users which are households or communities or the Small and Medium Enterprises (SMEs);

(b) **Communities[3]:** Groups of households, commercial facilities such as shops, public services/buildings and small, medium and micro enterprises (SMMEs);

(c) **Clean and energy efficient cook stoves**: Modern-fuel cook stoves, renewable-fuel cooking solutions like solar cookers and improved/advanced biomass cook stoves.

(d) **Biogas digesters for cooking for households**: Digesters used in biogas generation from anaerobic treatment of kitchen, vegetable, animal and other farm wastes where the resulting biogas is used for heat production for cooking purpose;

(e) **Solar water heaters**: As defined in methodology "AMS-I.J.: Solar water heating systems (SWH)". This includes residential and commercial (e.g., buildings, industrial facilities, hospitals, schools, etc.) SWH systems for hot water production using solar energy;

(f) **Micro-irrigation**: Application of discrete or tiny low pressure streams of water directly above or below the soil surface (such as drip irrigation, sprinklers), which results in saving from water losses attributed to the traditional flooded irrigation systems, and as eligible under the approved CDM methodology such as AMS-II.F;

(g) **Solar lamps:** Lighting systems with solar PV based rechargeable battery in the residential and/or non-residential applications (e.g., ambient lights, task lights, portable lights). These systems may be portable or fixed- as eligible under the approved CDM methodology such as AMS-III.AR;

(h) **Water purification devices**: As defined in methodology "AMS-III.AV.: Low greenhouse gas emitting safe drinking water production systems". It includes technologies that involve point-of use (POU) or point-of-entry (POE) treatment systems for residential or institutional applications such as systems installed at a school or a community centre.

(i) **Energy efficient pump-set for agriculture**: New or improved energy efficient pump and motor assembly together with starter and other electrical accessories/devices to deliver water for irrigation;

(j) **Special underdeveloped zone (SUZ)**: As defined under the "TOOL19: Demonstration of additionality of microscale project activities.

[2] Based on conditions defined under 11(c) of Tool21, version 11.

[3] As stated in foot 12 of tool 19, version 7.1.

2.3. Criteria to identify and analyse DUTs

6. The criteria contained in "Criteria for graduation and expansion of positive list of technologies under the small-scale CDM", as contained in annex 23 SSC WG46 and adopted by the Board (EB81, paragraph 72) are used to arrive at the positive list of technologies proposed in this document:

   (a) DUTs that frequently applied the existing unit size criterion under Tool21 based on data from the CDM pipeline/literature;

   (b) **Market penetration** and installation/deployment cost for the identified technology/measure;

   (c) DUTs who installation/deployment **cost higher by at least three times** than that of the cost of most plausible baseline technology identified;

7. The rationale that were considered earlier by the SSC WG[4] to arrive at the positive list of distributed technologies were also taken into the consideration which were as follows:

   (a) It was considered appropriate to define additionality based on a criterion that takes into account the relative size of the units. This is due to obvious barriers associated with high upfront investment cost (including transaction cost) as compared to baseline alternatives;

   (b) Distributed units do not exhibit economies of scale and a project involving such units would need aggregation of large number of units on one hand and investment risk guarantee on the other hand to reach commercial viability. Such projects often struggle to access debt markets because financers require collaterals which the distributed units in terms of assets rarely qualify.;

   (c) None of the projects or PoAs deploying distributed technologies has been rejected so far on additionality ground. Very few projects have been requested for review and when the review was done it was on account of issues related to monitoring plan.

2.4. Identification of DUTs

8. Table 1 and 2 below shows the number of registered PoAs and Pas involving DUTs:

Table 1. Number of registered PoAs involving specific distributed unit technologies[(a)]

No.	Technology/measure type	No. of PoAs	Region			
			Asia-Pacific	Africa	Latin America	Others
1	Clean and efficient cook stoves	54	11	35	7	1
2	Biogas digester	36	27	4	5	0
3	Efficient lighting	26	20	5	1	0
4	Solar lamps	11	4	7	0	0

[4] Information note on the extension of simplified modalities for the demonstration of additionality of small-scale CDM project activities (Annex 13 to the annotated agenda of EB 68).

5	Solar water heater	10	3	7	0	0
6	Water purification	10	5	4	1	0
7	Waste water treatment in SMEs	10	8	2	0	0
8	Energy efficient technologies in SMEs	8	6	1	0	1
9	Fuel switch	4	2	1	1	0
10	Efficient vehicles	4				
11	Composting	3	2	0	1	0
12	Efficient Street lighting	2	2	0	0	0
13	Energy efficient technologies in household/ residential buildings	1	0	0	1	0
14	Micro-irrigation	1	1	0	0	0
	Total[(b)]	180	91	66	17	2

(a) (a) Based on IGES CDM database July 2017).

(b) (b) Total is higher than the actual number of registered PoAs since few PoA involve promotion of multiple technologies in the table.

Table 2. Number of registered PAs involving distributed unit technologies[(a)]

No.	Technology type	No. of PAs	Region			
			Asia-Pacific	Africa	Latin America	Others
1	Clean and efficient cook-stoves	35	28	7	0	0
2	Solar lamps	4	0	4	0	0
3	Energy efficient technologies in SMEs	4	3	1	0	0
4	Efficient lighting	2	0	2	0	0
	Total	45	31	14	0	0

(c) (a) Based on IGES CDM database July 2017.

9. The table 3 provides the list of technologies and related methodologies covering DUTs with respective additionality provisions

Table 3. Distributed unit technologies, related methodologies and additionality provisions

No.	Technology	Large scale methodology	Small scale methodology	Additionality provisions
1	Biogas digester for cooking	ACM0014 ACM0022	AMS.III-D AMS.III-R AMS.I-I AMS.I-E AMS.I-C	Stated in ACM0014, ACM0022 and AMS.III-D. Others refer to Tool21
2	Clean and efficient cook-stoves	-	AMS.II-G AMS.III-B	Refers to Tool21

No.	Technology	Large scale methodology	Small scale methodology	Additionality provisions
			AMS.I-I AMS.I-C AMS-I.K.	
3	Efficient lighting	AM0046 AM0113	AMS.III-AR AMS.II-J AMS.II-C	Stated in AM0113, AMS.II-J and AMS.II-C. Others refer to Tool21
4	Solar lamps	-	AMS.III-AR	Refers to Tool21
5	Energy efficient technologies in household / residential buildings	AM0105 AM0117 AM0091	AMS.II-E AMS.II-D AMS-II.M AMS-II.N AMS-II.O AMS-II.R AMS-III.X AMS-III.AE	Stated in AM0091 and AM0117 Others refer to Tool21
6	Micro-irrigation	-	AMS.II-F	Refers to Tool21
7	Solar water heater	-	AMS.I-J	Refers to Tool21
8	Water purification	AM0086	AMS.III-AV	Stated in AM0086. But not in SSC meth.
9	Waste water treatment in SMEs	ACM0014 ACM0022	AMS.III-H	Stated in ACM0014, ACM0022 and AMS.III-H
10	Street lighting	-	AMS.II-L	Refers to Tool21
11	Efficient vehicles	-	AMS.III-AV AMS.III-AY AMS.III-S AMS.III-C	Stated in AMS.III-AY and AMS-III-C. Others refer to Tool21.
12	Energy efficient pump-set for agriculture	-	AMS-II.P.	Refers to Tool21

10. Based on table 3, it is found that the simplified additionality provisions are available in relevant methodologies covering specific DUTs such as efficient lightings, efficient vehicles, and waste water treatment. Therefore, these technologies (efficient lighting, waste water treatment and street lighting) are removed from the list for further analysis since they will not be affected by a change to the 1%-unit size criterion.

11. Some distributed unit technologies, particularly energy efficient technologies for SMEs or industries may involve a combination of distributed unit technologies such as motors, furnaces, lightings, heat generation, cooling equipment. The characteristics such as investment cost, market penetration rate and baseline scenario will be different for different technologies. Though they may be implemented together as single “energy efficiency” or “fuel switch” activity in single household or SME, for automatic additionality, the group of technologies cannot be assessed on a common platform of “energy efficiency” or “fuel switch” for addition to positive list. In such project activities, some distributed unit technologies may be automatically additional under positive list (example: efficient lightings with LED) and for others the additionality would be demonstrated using regular approach (example: room heating).

12. After the above elimination of technologies, the distributed unit technologies considered for further analysis are summarized in table below:

Table 4. List of distributed unit technologies for detailed analysis

No.	Technology	No. of applicable methodologies	End users are households, communities and SMEs?	Availability of additionality provisions in relevant methodologies?	Comment
1	Clean and efficient cook-stoves	5	Yes	No	
2	Biogas digester for cooking	7	Yes	No	Additionality provisions not available in all applicable SSC methodologies
3	Solar water heater	1	Yes	No	
4	Micro-irrigation	1	Yes	No	
5	Solar lamps	1	Yes	No	
6	Water purification devices	2	Yes	No	
7	Energy efficient pump-set for agriculture	1	Yes	No	No projects registered so far under this

2.5. Analysis of DUTs to be included in the positive list

13. This section provides evaluation of each DUTs using the criteria mentioned in section 3.3 whether to include such technologies under positive list in Tool21 or would need some additional criteria to be deemed additional.

2.5.1. Analysis for clean and efficient cook stoves

14. There are 54 PoAs and 35 project activities registered so far under this technology (refer to table 1). Though clean and efficient cook stove technologies are around for more than a decade, the uptake of technology is still low especially in South-Asian and African countries. Since the traditional stoves are generally three stone fired cook stoves or self-made mud stoves, they are considered as “low or no cost” to households and the cost of clean cook stove itself is the cost of its adoption by the households. It is to be noted that this cost does not take into account the investment needed for the market development, awareness creation, supply chain network development and the cost of CDM monitoring/reporting/data management involved. As per literature”[5], energy efficient cook stove projects for households are considered to have a high risk of discontinuation

[5] “Vulnerability of CDM Projects for Discontinuation of Mitigation Activities <https://newclimateinstitute.files.wordpress.com/2017/05/summary_vulnerability_of_cdm_projects_internet1.pdf>.

because of the inherent barriers involved (that vary from region to region) other than the investment cost itself.

15. **Cost barrier:** The significant types of clean and energy efficient cook stoves and their costs are provided in table below. Considering rocket stoves, retailing at USD 20-60 and gasifiers, forced air stoves that start at USD 50, they allow 40-70% fuel saving and 50-90% GHG emission reduction, particularly the air pollutants[6], while the cost of improved cook stove technology is 3 times more than the traditional cook stove systems.

Table 5. Different clean cook stoves and their costs[7]

No.	Stove name	Figure	Cost (USD)
1	Improved wood stoves		10-15
2	Improved charcoal stove		10-30
3	Bio-ethanol stoves		20-40
4	Gasifier stove		80-250

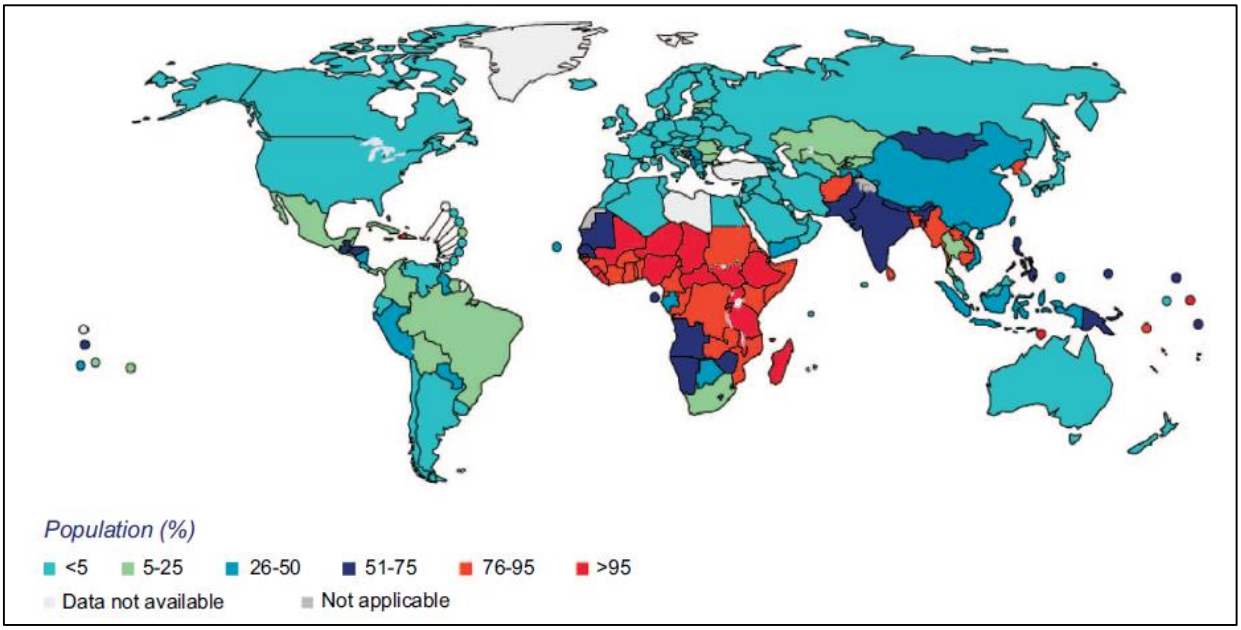
[6] "Reaching scale in access to energy, May 2017" by Hystra <https://www.gogla.org/sites/default/files/recource_docs/hystra_energy_report.pdf>.

[7] <http://catalog.cleancookstoves.org/stoves>.

No.	Stove name	Figure	Cost (USD)
5	Solar cooker		150-300

16. **Market penetration/technology barrier:** There is no direct data available on the market penetration rate of clean cook stoves in different countries.The number of people without modern cooking solutions is far higher than the number of people without access to electricity (almost 1.2 billion people) (IEA, 2016). The figure 4 shows the global scenario of population without access to clean cooking solutions.

Figure 1. Population percentage with no access to clean cooking solutions[8]



17. Based on the information presented, the analysis of cook stove technology is summarized below:

Is the investment cost of technology more than 3 times the baseline technology?	Yes
Is the market penetration rate less than 3 percentage?	Varies for different countries and regions
Does the technology qualify for addition to positive list?	Yes

18. Based on the above, the improved/energy efficient cook stove technology is considered to be included as positive list but with limitations to specific regions. The rationale and criteria to account regional limitation is discussed in the section 3.6 below.

[8] "The cost of cooking a meal. The case of Nyeri County, Kenya", Francesco Fuso Nerini, Charlotte Ray and Youssef Boulkaid <http://iopscience.iop.org/article/10.1088/1748-9326/aa6fd0>.

2.5.2. Analysis of biogas digesters for cooking

19. There are 36 PoAs registered so far under this technology (refer table 1). Though biogas plants can be of a single large power generating unit, the focus here is on the smaller units that supply fuel for cooking in households, communities and SMEs. For this reason, the biogas digester technology is promoted as one of the options under clean cooking solutions.

20. **Cost barrier:** The global biogas market growth is still hampered by high initial investment and installation costs. Various initiatives and national level programs across the developing countries have incentivized adoption of biogas for cooking[9]. Depending on the size and location, a typical brick made fixed dome biogas plant can be installed at the yard of a rural household with the investment between USD 300 to USD 500 in Asian countries and up to USD 1,500 in the African context[10]. The biogas technology is therefore several times costlier than the traditional cooking systems of basic wood or charcoal based stoves.

21. **Technology Barrier**: Biogas plants require regular supply of appropriate feedstock to produce biogas and make biogas plant operations profitable. Biogas technology also warrants significant technical skills for construction, operation and maintenance. A study conducted in Ethiopia biogas program found that around 58% of the installed biogas plants were found to be nonoperational. The reasons were due to incomplete installation, technical problems and inadequate supervision[11].

22. **Market Penetration:** There is no consolidated data on biogas installations/market penetration rates in various developing countries. SNV, which plays active role in this sector, has stated that around 700,000 biogas digesters were installed under its programs across the nations by the end of 2015[12]. It is estimated that such household cooking digesters exist in over 4.7 million households in India, over 45,610 in Bangladesh, over 247,000 in Vietnam and 366,000 in Nepal[13]. Through the Africa Biogas Partnership Programme (ABPP), around 60,000 domestic digesters have been installed in the countries of Burkina Faso, Ethiopia, Kenya, Tanzania, Uganda, etc.[14] These statistics show that the market penetration of biogas cooking technology world-wide is far below 3 percent.

23. The analysis of biogas cooking technology is summarized below:

Is the investment cost of technology more than 3 times the baseline technology?	Yes
Is the market penetration rate less than 3 percentage?	Yes
Does the technology qualify for addition to positive list?	Yes

24. Based on the above, it is considered that the biogas digesters for cooking in households can be considered for addition to positive list without any additional criteria.

[9] <http://www.prnewswire.com/news-releases/biogas-plant-market---global-industry-analysis-size-share-growth-trends-and-forecast-2016---2022-300396215.html>.

[10] Development of the biogas/biomass sector in Rwanda, Ivan TWAGIRASHEMA, Rwanda Energy Private Developers, GRAZ 2017.

[11] <http://www.tandfonline.com/doi/full/10.1080/23815639.2017.1280432>.

[12] <http://www.snv.org/sector/energy/topic/biogas>.

[13] <http://www.ren21.net/wp-content/uploads/2017/06/17-8399_GSR_2017_Full_Report_0621_Opt.pdf>.

[14] <http://www.africabiogas.org/biogas-plants-per-country/>.

2.5.3. Analysis of solar water heaters

25. **Cost Barrier**: There are 10 PoAs registered under this technology (refer table 1). Generally, residential SWH systems cost between USD 1,500 and USD 3,500, compared to USD 150 to USD 450 for the electric and gas heaters (Environment and Energy Study Institute, 2015)[15], which shows that the solar water heater technology is several times costlier than the traditional heating systems.

26. **Market penetration/technology barrier**: The vast majority of the total capacity installed (435.9 GWth) is installed in China (309.5 GWth) and Europe (49.2 GWth), which together accounted for 82.3% of the total installed capacity. It is found that the overall market penetration in African, Asian (excluding China and India) and Latin American nations contribute to only 5.3% of the world's share[16]. This implies the poor market penetration of SWHs in the developing countries excluding India and China.

27. The analysis of SWH technology is summarized below:

Is the investment cost of technology more than 3 times the baseline technology?	Yes
Is the market penetration rate less than 3 percentage?	Varies for different countries and regions
Does the technology qualify for addition to positive list?	Yes

28. Based on the above, it is considered that the SWH technology can be considered for addition to positive list with limitations to regions. The rationale and criteria to account regional limitation is discussed in the section 3.6 below.

2.5.4. Analysis of micro-irrigation systems

29. There is only one PoA and one PA registered under the micro-irrigation technology, both of which are from India.

30. **Cost barrier:** The micro irrigation system involves high initial investment for the installation than that of the conventional system. The average investment cost ranges from 650 – 800 USD/ha[17] in Indian context against the cost of simple flood irrigation pump sets (200 USD).

31. **Market penetration:** Globally, around 94% of the irrigated area is covered under the surface irrigation and only the remaining 6% of the area (including developed and developing countries) is under micro irrigation[18]. If only the developing countries are considered, then, this market penetration would be well below 3 percent.

32. The analysis of micro irrigation systems is summarized below:

Is the investment cost of technology more than 3 times the baseline technology?	Yes
Is the market penetration rate less than 3 percentage?	Yes
Does the technology qualify for addition to positive list?	Yes

[15] <http://sun-connect-news.org/fileadmin/DATEIEN/Dateien/New/SSRN-id2928814.pdf>.

[16] <http://www.iea-shc.org/solar-heat-worldwide>.

[17] PoA 9731: Energy Efficiency through Micro irrigation system – India.

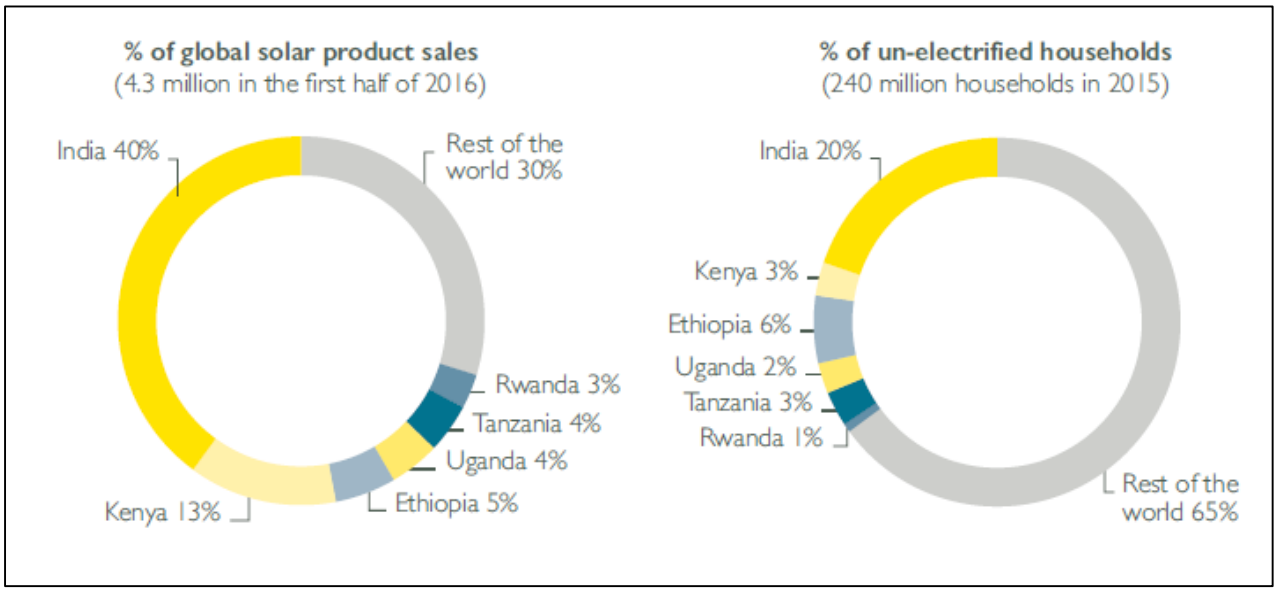
[18] "Micro Irrigation book, May 2016", Dilasa Janvikas Pratishthan <http://www.dilasango.org/downloads/publications/Micro-Irrigation%20book.pdf>.

33. Based on the above, it is considered that the micro irrigation technology shall be considered for addition to positive list without any additional criteria.

2.5.5. Analysis of solar lamps

34. There are 11 PoAs and 4 PAs registered so far under this technology (refer table 1). Around 1.1 billion people globally do not have access to electricity and the hardest hit communities are in the Sub-Saharan Africa[19]. The Global Off-grid Lighting Association (GOGLA) has stated in its impact report[20] that only 27 million solar lighting products have been sold since 2010. The global solar lamp sale pattern is provided in figure below.

Figure 2. Global sale pattern of solar lamps in comparison with un-electrified households[21]



35. **Cost Barrier:** As per the study report from Kenya solar lantern project, the prices for solar lamps have fallen by around 80% in the past 6 years[22]. The current market price of basic solar light/lantern is around USD 5 - 50 whereas the cost of kerosene lamp is around USD 5.

36. **Market Penetration/Technology Barrier:** A report by Hystra has stated that the most existing successful market regions are now starting to saturate, while the remaining

[19] <http://www.snv.org/update/launching-call-action-ignite-solar-markets-africa>.

[20] "Global Off-Grid Solar Market Report Semi-Annual Sales and Impact Data JULY-DECEMBER 2016", GOGLA <https://www.gogla.org/sites/default/files/recource_docs/final_sales-and-impact-report_h22016_full_public.pdf>.

[21] "Reaching scale in access to energy, May 2017" by Hystra <https://www.gogla.org/sites/default/files/recource_docs/hystra_energy_report.pdf>.

[22] "The Economic Impact of Solar Lighting: Results from a randomized field experiment in rural Kenya, Feb 2017", Adina Rom, Isabel Günther, Kat Harrison <https://www.ethz.ch/content/dam/ethz/special-interest/gess/nadel-dam/documents/research/Solar%20Lighting/17.02.24_ETH%20report%20on%20economic%20impact%20of%20solar_summary_FINAL.pdf)>.

regions are largely untapped. This incomplete coverage is partly due to the regulatory issues, most notably high VAT and import tariffs that price out lamps against (often subsidized) alternatives. In Tanzania, the lamps have been sold mainly in the densely populated areas around Arusha, Dar es Salaam, Highlands and Lake Zone, where the penetration is estimated to be consistently above 10% (and up to 50%). But penetration is close to zero in the rest of the country[23]. The analysis for the solar lamps technology is summarized below:

Is the investment cost of technology more than 3 times the baseline technology?	Varies for different countries and regions
Is the market penetration rate less than 3 percentage?	Varies for different countries and regions
Does the technology qualify for addition to positive list?	Yes

37. Based on the above, it is considered that the solar lamp technology shall be considered for addition to positive list but with regional limitations. The rationale and criteria to account regional limitation is discussed in the section 3.6 below.

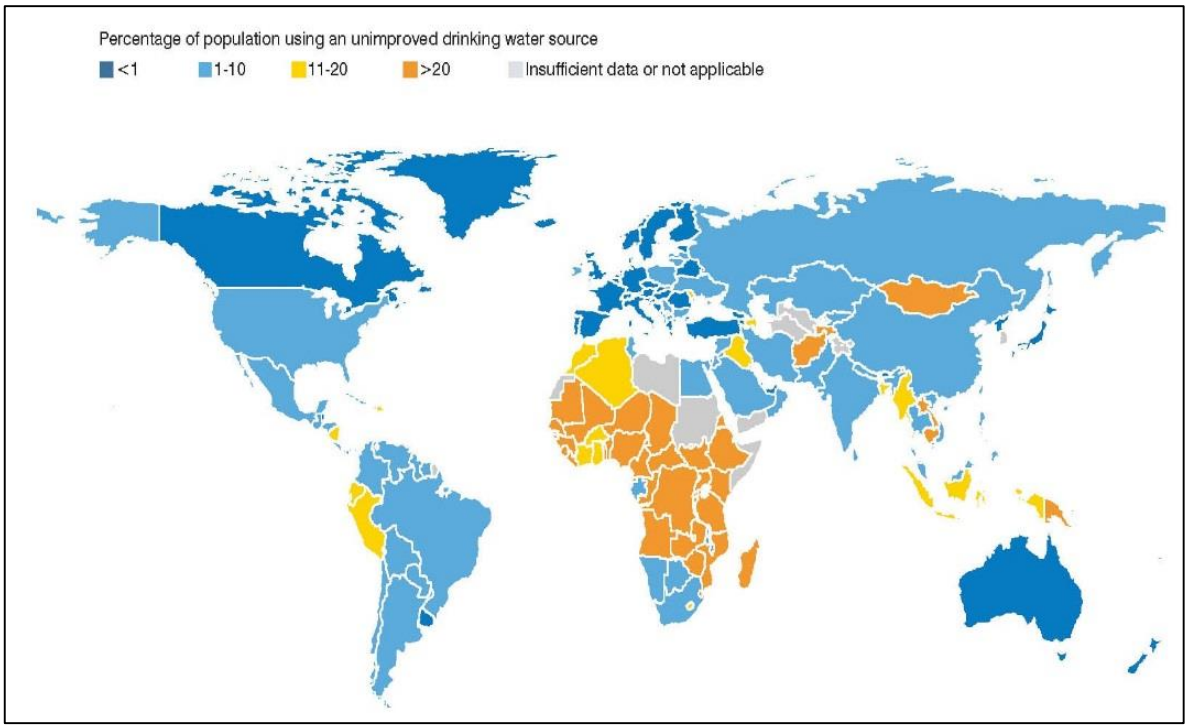
2.5.6. Analysis of water purification devices

38. There are 10 PoAs registered so far under this technology (refer table 1). As per UN-Water Global Analysis and Assessment of Sanitation and Drinking-water (GLAAS), nearly 700 million people do not receive their drinking-water from safe water sources[24]. Figure 6 shows the percentage of people depending on unsafe drinking water.

[23] "Reaching scale in access to energy, May 2017" by Hystra <https://www.gogla.org/sites/default/files/recource_docs/hystra_energy_report.pdf>.

[24] <http://www.who.int/water_sanitation_health/monitoring/investments/glaas/en/>.

Figure 3. Unsafe drinking water practices across the glob[25]



39. The water purification technologies include:

    (a) Water filters;

    (b) Solar disinfection devices;

    (c) Chemical disinfection;

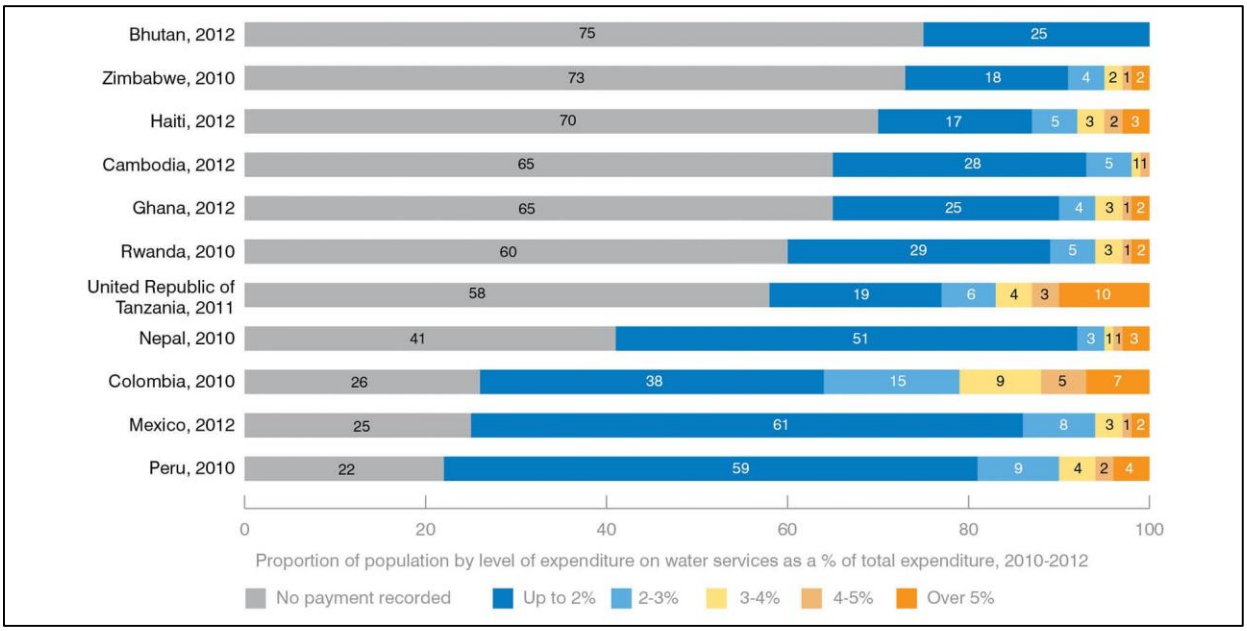
    (d) Ultrafiltration devices; and

    (e) Ultraviolet disinfection devices with renewable power.

40. **Cost/Technology Barrier:** The investment cost varies for each technology. The baseline is use of fossil fuel based or non-renewable biomass based cooking methods to boil water or no proper treatment (suppressed demand). The data on cost of technologies were not available. The tentative expenditure for safe drinking water in different countries is shown in the below figure. It shows that the households/communities spend significant percentage of their income for the practices on safe drinking water which would indicate as a proxy in terms of the high cost of these technologies.

[25] WHO/UNICEF JMP Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG baseline <https://data.unicef.org/topic/water-and-sanitation/drinking-water/# >.

Figure 4. Expenditure on safe drinking water practices[26]



41. The analysis of water purification systems is summarized below:

Is the investment cost of technology more than 3 times the baseline technology?	Yes
Is the market penetration rate less than 3 percentage?	Varies for different countries and regions
Does the technology qualify for addition to positive list?	Yes

42. Based on the above, it is considered that the water purification devices technology shall be considered for addition to positive list. The rationale and criteria to account regional limitation is discussed in the section below.

2.5.7. Energy efficient pump-set for agriculture

43. There are no projects so far have been registered under this technology in CDM. Most of the developing countries depend on agriculture as the major contributing sector for economy and growth. In the absence of grid electricity supply or due to erratic grid electricity, the farmers in the developing countries have to rely often on the diesel-driven pumps for water abstraction and conveyance. Therefore, the traditional diesel-driven pumps or old inefficient pumps are continued as common practice in the developing countries.

44. The alternatives proposed are often modern energy efficient motor pumps and submersible pumps. However, many farmers in the developing countries have poor know-how about the advantages of these energy efficient pumps. Literature shows that developing countries show that the non-technical barriers such as access to finance, service availability, etc. hinder the increased adoption of the systems.

[26] WHO/UNICEF Joint Monitoring Programme <http://newscdn.newsrep.net/h5/nrshare.html?r=3&lan=en_US&pid=17&id=6ra468931c3_us&app_lan=&mcc=&declared_lan=en_US&pubaccount=ocms_0&showall=1>.

45. There are several types of motorized pump sets available in West Africa that burn fossil fuels, mostly gasoline or diesel and sometimes kerosene. Information about the pump sets is fragmented and incomplete and often poorly matched to their applications. The purchase price in West Africa for a traditional gasoline motorized pump set is in the range of USD 110 to USD 180. These pump sets are often used in the applications for which they are seriously overpowered, resulting in unnecessary high running costs[27]. The average cost of an energy efficient pump of the comparable is around USD 1,220.[28]

46. The analysis of energy efficient irrigation systems is summarized below:

Is the investment cost of technology more than 3 times the baseline technology?	Yes
Is the market penetration rate less than 3 percentage?	Yes
Does the technology qualify for addition to positive list?	Yes

Based on the above summary, it is concluded that the energy efficient pump technology shall be considered for addition to positive list without any additional criteria.

2.5.8. Rationale/Criteria: Inclusion of regional limitation to automatic additionality through market penetration for selected technologies (Solar Water heater, Solar lamps, Efficient Cook stoves, Water purification)

47. A regional limitation to automatic additionality is proposed through inclusion of market penetration conditions for the four technologies that can be potentially considered for positive list.

48. “Information note: criteria for graduation and expansion of positive list of technologies under the small-scale CDM" (Annex 23 SSCWG 46) uses the value of less than 3% market penetration rate for a technology to be automatically additional. For the distributed unit technologies similar to this, considering market penetration rate less than 3% is not appropriate, since the host countries/regions could have reached this level of penetration through a handful of public-sector or internationally funded demonstration projects but the distributed unit technology still may not be competitive[29]. Also, for technologies such as cook stoves, percentage of sales in a year cannot be used to judge the penetration of the technology, since the alternative technology (three stone fired cook stoves or self-made mud stoves) is not sold but rather self-constructed. Therefore, it has been considered to increase the value for market penetration rate for the distributed unit technologies under discussion and consider stock of technology in place, rather than sales data.

49. It is proposed to include provision [5%] [10%] [20%] participation in the stock in use by end users for specific distributed unit technologies, applicable in the process of demonstrating additionality at the individual PA or PoA level.

50. Finally, in the case where there are wide variations in the market penetration of a DUT, it is considered that,

[27] Possible Breakthroughs Retrofitting Irrigation Pumps - World Business Council for Sustainable Development.

[28] <http://www.indianembassy.in.th/pdf/Market%20Survey%20Thailand%20Market%20for%20Agricultural%20Machinery%20Jan%202016.pdf>.

[29] Market penetration metrics: tools for additionality assessment? Sivan Kartha, Michael Lazarus & Maurice LeFranc (2005).

(a) For the LDCs/SIDS and SUZs, the distributed unit technology will be directly additional;[30]

(b) For other countries/regions, market penetration of the general DUT type (ICS, SWH, Solar Lamp, Low-greenhouse gas emitting water purification) among end users threshold value of [5%] [10%] [20%] is used, below which the specific PA or PoA involving the distributed unit technology in a particular country/region will be additional.

2.6. Impact on CDM pipeline

51. The immediate impact of the replacement of unit size criterion with the specific positive list is that any other technology (like energy efficiency in SMEs) would have to demonstrate additionality through standard procedures of demonstration of barriers as given in paragraph 10 or through micro-scale additionality tool 19, if applicable.

52. Analysis shows that 70 percent of the PoAs registered so far apply distributed technologies. About 48 percent of the PoAs in the registered PoAs cover the proposed positive list of technologies. Around 22 percent of registered PoAs which are for households/communities/SMEs would not be eligible for automatic additionality under Tool21 with this proposed changes. Remaining 30% PoA include other energy generation technologies.

53. The review of PoAs currently under validation imply that around 30% of them could benefit from addition of the technology to the positive list. The remaining 42% would not would not be eligible for automatic additionality under Tool21 with this proposed changes. Rest 28% is other energy generation technologies

54. The change in positive list may not affect already registered projects but would impact most PoAs currently under validation applying Tool21.

55. Analysis also shows that that a very limited number of projects/PoAs have so far applied the threshold criteria (i.e. 5%[31]) for automatic additionality and the technologies involved were state-of-the art and the thresholds of those technologies were well below 1% of the SSC thresholds. With the removal of the percentage SSC thresholds criterion, projects/PoAs involving DUTs where such technologies are not covered under positive list, it would have to demonstrate additionality as per standard procedures using Tool21 or explore applying micro-scale additionality tool19. Appendix provides the flow chart containing provisions of small-scale and microscale tools for automatic additionality

56. The distributed unit technologies implemented so far have unit sizes very much lower than the unit size criterion as mentioned in the current version of Tool21. So the removal of the unit size criterion neither negatively nor positively impacts the environmental integrity of the registered CDM PoAs and the CDM project activities.

[30] All distributed unit technologies still face several barriers in LDCs, SIDS and SUZs.

[31] The threshold has recently been revised to 1 percent. See para 11 (c) of the small scale additionality tool) <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v1.pdf>.

2.7. Recommendations

57. The results of the review of literature on the identified distributed unit technologies and impact study of the existing PoA database are summarized below:

    (a) Distributed unit technologies are used by households, communities and SMEs;

    (b) Unit size of most technologies in the registered PoAs are well below the limits already stated in Tool21;

    (c) Investment cost of most of the technologies are still high (> 3 times compared to baseline technology);

    (d) Market penetration of the technologies varies based on countries or regions.

58. Various aspects of the selected distributed unit technologies that are in conformation with the criteria for addition to positive list is summarized in table below.

Table 6. Conformity of distributed unit technologies with criteria for addition to positive list

No.	Technology	Are end users households, communities, SMEs?	Unit size (within 1% SSC limit)	Technology cost (3 times higher than baseline)	Market penetration (less than 3%)
1	Clean and energy efficient cook stoves	Yes	Yes	Yes	Market penetration varies depending on the location, region/country
2	Biogas digesters for cooking	Yes	Yes	Yes	Yes
3	Solar water heaters	Yes	Yes	Yes	Market penetration varies depending on the location, region/country
4	Micro-irrigation systems	Yes	Yes	Yes	Yes
5	Solar lamps	Yes	Yes	Depends on the region	Market penetration varies depending on the location, region/country
6	Water purification devices	Yes	Yes	Yes	Market penetration varies depending on the location, region/country
7	Energy efficient pump-set for agriculture	Yes	Yes	Yes	Yes

59. For some technologies, the market penetration rates highly depend upon the project location in the host county.

60. Based on the analysis and impact study, the MP agreed to recommend to add the following additionality provisions for these technologies.

Table 7. Recommendations for additionality provisions for distributed unit technologies

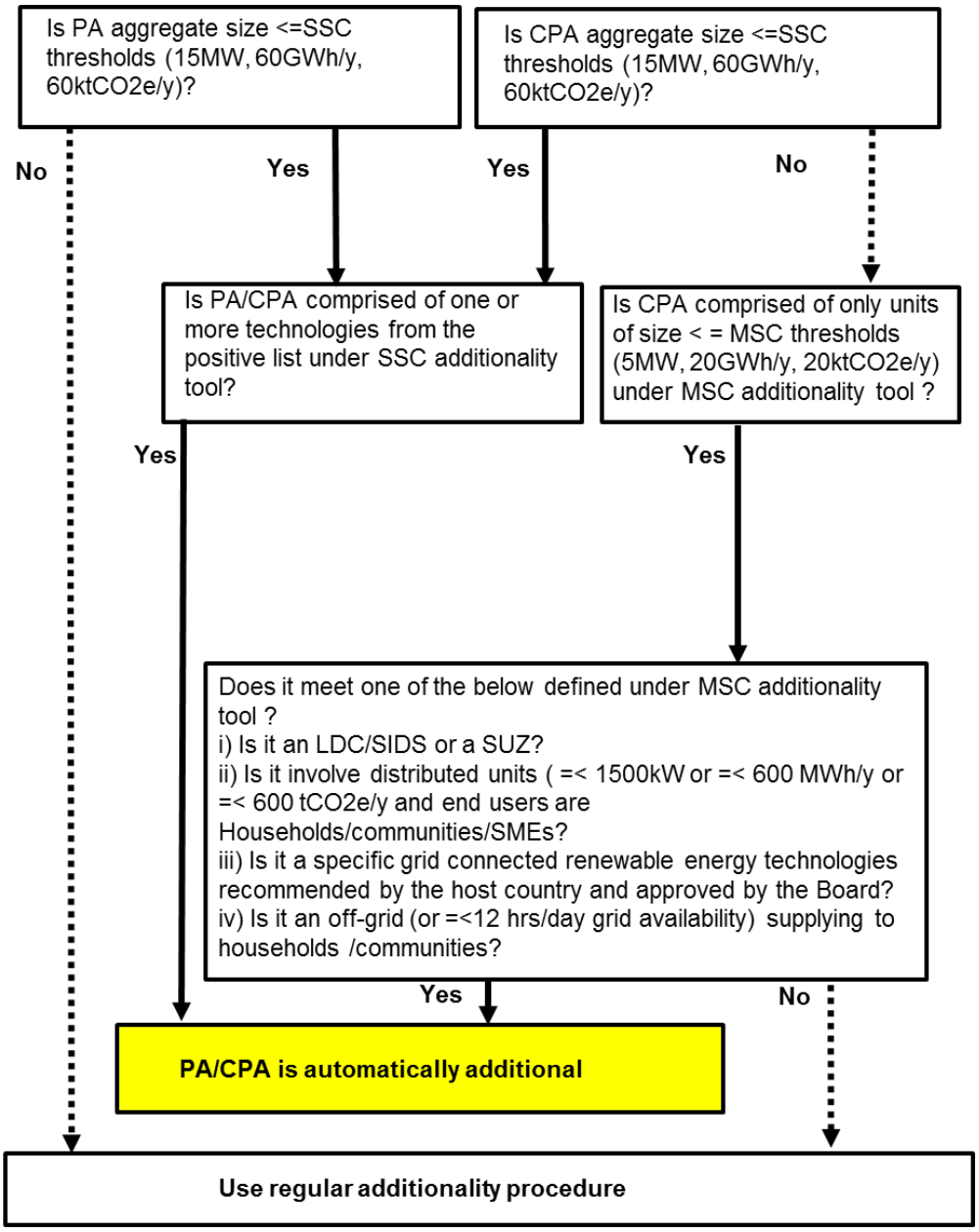
No.	Technology	Comment
For direct addition to positive list in Tool21 (without any criteria)		
2	Biogas digesters for cooking	The “biogas digesters for cooking purpose” can be added to the positive list of technologies. Biogas projects for purposes other than cooking can still use provisions in tool 19, or tool 21.
3	Micro-irrigation systems	There is only one methodology “AMS-II.F.: Energy efficiency and fuel switching measures for agricultural facilities and activities” applied for this technology. But this methodology applies to multiple technologies. "Micro irrigation systems" technology can be added to the positive list.
4	Energy efficient pump-set for agriculture	Technology can be added to positive list.
For update of additionality provision in the methodology		
1	SWHs	Provisions can be added to the methodology “AMS-I.J.: Solar water heating systems (SWH)” as “Solar water heater projects in LDCs/SIDS and SUZs are additional. Projects in other countries/regions are additional [if the market penetration is less than 20%.]” Other projects shall use regular demonstration procedure given in Tool21.
2	Solar lamps	Provisions can be added to methodology “AMS-III.AR.: Substituting fossil fuel based lighting with LED/CFL lighting systems” as “solar lamp projects in LDCs/SIDS and SUZs are additional. Projects in other countries/region are additional [if the market penetration is less than [10%] [20%.]]” Other projects shall use regular demonstration procedure given in Tool21.
3	Clean and energy efficient cook stoves	The technology can be added to positive list with regional limitations, i.e. “The clean and efficient cook stove projects where the end users are households or communities or SMEs, the projects are additional if any one of the conditions below is satisfied: The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country [If the market penetration of the project technology is less than 20% in the applicable project area]” The market penetration of technology within applicable geographical area[32] shall be demonstrated by the project proponent using official government data, third party independent surveys and research, academic research papers, pilot baseline studies by the project proponent from within 3 years prior to project implementation, and represents the percentage of total stoves employed by end users that are ICS of any kind. This will be applied to all the relevant methodologies (refer table no. 4). Projects out of the above conditions may use regular procedure of demonstration of additionality as per Tool21. A note shall be added in tool 19 that if the technology is given in the positive list and limited by regions, then they shall not use the MSC unit size criterion. They need to use other regular options to demonstrate additionality.

[32] Applicable geographical area – shall be the entire host country. If the project participants opt to limit the applicable geographical area to a specific geographical area (such as province, region, etc.) within the host country, then they shall provide justification on the essential distinction between the identified specific geographical area and rest of the host country.

No.	Technology	Comment
3	Water purification devices	Provisions can be added to methodology “AMS-III.AV.: Low greenhouse gas emitting safe drinking water production systems” as “water purification projects in LDCs/SIDS and SUZs are additional. Projects in other countries/regions are additional [if the market penetration is less than 20%.]” Other projects shall use regular demonstration procedure given in Tool21.

Appendix. Provisions of small-scale and microscale tools for automatic additionality

Figure. Criteria for automatic additionality under small-scale and micro-scale additionality



Note:

(a) SSC: Small-scale; MSC: Microscale;

(b) Microscale thresholds: = < 5MW capacity or 20 GWh energy savings per year or 20 ktCO2 emission reductions per year;

(c) Small scale thresholds i.e. equal to or less than 15MW capacity or 60 GWh energy savings per year or 60 ktCO2 emission reductions per year, for distributed units < 1500 kW or 600 MWh/yr savings or 600 tCO2/yr reductions;

(d) Positive list: It refers to list of technologies under SSC additionality tool that are deemed automatically additional.

(e) Regular additionality procedure: This includes barrier analysis as contained in Tool 21 as well as simplified additionality provisions contained in the specific methodologies.

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