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AGENDA

Welcome: Agenda & Introductions	Malin Emmerich (GIZ Proklima)
1. Introduction of elected Chair & Vice-Chair	Moderated by Malin Emmerich (GIZ Proklima)
2. Presentation of Result from study on: Viability of carbon markets for financing EOL management of refrigerants	Juan Mata, Consultant Moderated by Ajiniyaz Reimov (UNDP)
3. Closing remarks, next meeting	Malin Emmerich (GIZ Proklima); Ajiniyaz Reimov (UNDP)

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INTRODUCTION OF PARTICIPANTS

- Group Photo! Turn on your camera.
- Introduction round - short Poll to get to know you !
- MoM and Participation list will be distributed after meeting.
- Let us know if you agree to share your contact information with the Working Group members.
- Write any questions in the chat. Sarah will support.

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LOUIS POTOK - CHAIR 2023-2025

- CEO and founder of Recoolit (US and Indonesia).

Recoolit mitigates climate change by preventing refrigerant emissions and work with partners to safely & efficiently collect, transport and destroy harmful waste gases, and then sell carbon credits for the prevented emissions.

Top 3 priority for the TWG FM work:

1. Ensure that all member voices are included in the FM recommendations and initiatives:.
2. Represent Article 5 countries in particular:
3. Focus on real-world impact and catalyze the change we all seek.

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ADRIAN BUKMANIS – VICE-CHAIR 2023-2025

- CEO and founder of Veridien (Singapore, France)

Veridien provides advisory, training and technology for life-cycle refrigerant management. They offer services for building accurate data inventories, leak rate and emissions calculations plus leak mitigation technologies. Focus on using natural refrigerants Regular thoughts on the refrigerant and f-gas topic also at: https://fluoridated.substack.com/

Top 3 priorities for the TWG FM work:

1. Ensuring that we don't re-invent the wheel.
2. Also work with sectors that are dealing with (non-climate) waste streams or biodiversity related issues
3. Close Data Gap by improving transparency, verify impact and solve MRV problems with careful use of technology.

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NEXT STEPS

- ✓ Co-coordinators meet (online) with TWG FM Chair and Vice-chair
- ✓ Develop a proposal for a working programme for TWG FM
- ✓ Present working programme on the COPA Plenary session (June 20-21, 2023)

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Experience, methodologies and tool to estimate the viability of carbon markets for financing EOL management of refrigerants

2nd Meeting of the COPA Thematic Working Group on Financing Mechanism (TWG FM)

Juan Mata
Consultant
March 30, 2023

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Content

1. International experiences of ODS destruction projects using revenues from carbon markets;
2. Barriers and Opportunities for financing EOL ODS management projects;
3. Methodologies for quantification of GHG emission reductions from EOL ODS destruction projects;
4. Tool for Evaluating Financial Viability of ODS Destruction Projects using Revenues from the ITMO transfer of Article 6.2 of the Paris Agreement.

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International experiences of ODS destruction projects using revenues from carbon markets (1/2)

Until November 2022,approximately **30 million ODS credits** have been issued. From them nearly **4.2 million credits** belong to projects in A5 countries, the rest to non-A5, mainly **U.S.A. and Canada**.

Country	Status	Voluntary Registry	First year of project	Credits Issued (tCO_{2eq}) to date	Credits Retired
India	Completed	CAR	2009	683,087	683,087
India	Completed	CAR	2010	551,802	517,957
Mexico	Completed	CAR	2010	2,602,812	2,597,770
Mexico	Completed	CAR	2012	89,834	9
Nepal	Completed	CAR	2013	82,391	31,500
Ghana	Registered	VCS	2018	155,431	145,023
Dominican Republic	Registered	VCS	2021	23,657	3,000
Saudi Arabia	Listed	ACR	--	0	0
South Africa	Under development	VCS	--	0	0
Total				**4,189,014**	**3,978,346**

Source: Voluntary Registry Offsets Database

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International experiences of ODS destruction projects using revenues from carbon markets (2/2)

1. Although not mandated by the MP or the KP, ODS need to be recovered and properly treated to avoid their release into the atmosphere over time due to leakage or intentional venting;
2. Not being a common practice in A5 countries, ODS management and destruction have become a technical and financial challenge for governments;
3. So far, A5 countries participation in carbon markets has been limited to the selling of ODS banks to project developers for destruction mainly in U.S. facilities;
4. This activity has generated carbon credits used by U.S. firms mainly for voluntary carbon offsetting purposes;
5. However, ODS destruction projects implementation poses financial & technical challenges and risks when a country's government is directly handling it, as it is the case of A5 countries interested in evaluating possible engagement in Art. 6.2 mechanism;
6. Therefore, a new approach (different from selling ODS banks to project developers) need to be designed.

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Barriers and Opportunities for financing EOL ODS management projects; (1/2)

Main Barriers (financial, technical & managerial):

1. Upfront finance for ODS destruction is rarely available in developing countries;
2. Limited carbon finance capacity in A5 countries, specially in LDCs;
3. Projects generate carbon revenues only once the offset credits are sold;
4. High costs associated with carbon development projects;
5. Limited knowledge from A5 governments and local developers about carbon prices;
6. The opportunity cost of ODS destruction (particularly the reuse market);
7. Lack of supportive legal and regulatory frameworks in least developed A5 countries;
8. Limited knowledge from A5 governments & local developers on where accessible ODS sources exist;
9. Limited A5 governments & local project developer´s capacity (technical & human) to manage ODS destruction projects;
10. Limited knowledge from A5 governments & local developers about ODS destruction cost structure (collection, recovery, transport, destruction);
11. Carbon market eligibility of HCFC destruction projects is questionable in most A5 countries where HCFC production/consumption has not been phased-out and import banned.

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Barriers and Opportunities for financing EOL ODS management projects; (2/2)

Main Opportunities (financial, technical & managerial):

1. MDB´s and developed countries to provide upfront financing for ODS destruction investment and project finance;
2. Capacity building to A5 governments & developers on ITMOs mechanism from UNDP, WB, Switzerland, Sweden, etc;
3. Reduce ITMOs transaction costs for issuing parties through grants from MDB´s or ITMO recipient parties;
4. A5 countries to adjust legal/regulatory frameworks and market conditions to accelerate HCFC phase-out, ban ODS reuse, and promote a transformational change towards the use of ODS free refrigerants and foams;
5. MLF to continue financing technical assistance and capacity building for ODS identification, management and disposal in A5 countries;
6. Implement PPP business models for ODS destruction projects with clearly defined roles and shared responsibilities and benefits for public entities and private sector.

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Methodologies for quantification & MRV of GHG emission reductions from ODS destruction projects(1/3)

Methodology Aspect	ACR ODS from International Sources v1.0	VM0016 Recovery & Destruction of ODS v1.1	CAR Art.5 ODS Project Protocol v2.0
Applicability			
ODS	MP Group1 Annex A	MP Group1 Annexes A, B & C	MP Group1 Annex A
Use	Refrigerant	Refrigerant and Blowing Agent	Refrigerant
Source	- Bulk/Stockpiled (used &virgin) - Recovered from equipment	- Bulk/Stockpiled (only CFCs) - Recovered from equipment/foam	- Bulk/Stockpiled (not virgin) - Recovered from equipment
Location/Party	ODS source: outside U.S.A. ODS destruction: U.S.A. or outside	ODS source: All countries ODS destruction: All countries	ODS source: Art. 5 countries ODS destruction: U.S.A.
Eligibility and Additionality Criteria at Project´s Country			
CFCs are phased out	Yes	Yes	Yes
ODS destruction not req.	Yes	Yes	Yes
Must comply with local regulations.	Yes	Yes	Yes
Additionality Test	- Legal Requirement Test - Performance Std Evaluation	- Regulatory surplus & positive list in VMD0048; - CDM additionality demo tool.	- Legal Requirement Test - Performance Std Test
Destruction Facility	- TEAP stds. - DRE = 99.99%	- TEAP stds. - DRE (for BA) = 85% - DRE (conc. ODS) = 99.99% - DRE (dilute ODS) = 95%	- TEAP stds. - DRE (conc. ODS) = 99.99% - DRE (dilute ODS) = 95%

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Methodologies for quantification & MRV of GHG emission reductions from ODS destruction projects (2/3)

Methodology Aspect	ACR ODS from International Sources v1.0	VM0016 Recovery & Destruction of ODS v1.1	CAR Art.5 ODS Project Protocol v2.0
Baseline Emissions and Quantification of GHG			
ODS released at end-of-life (equipment)	Yes	Yes	Yes
ODS from leaks/servicing (equipment)	No	No	Yes
ODS released at storage (bulk/stockpiled)	Yes	Yes	Yes
Specific emissions from energy consumption at recovery (fuel/ electricity/ODS oxidation) & from transport	No	Yes	No
Aggregated emissions from ODS transport & destruction	Yes	Yes	Yes
Emissions from use of ODS substitutes (leakage)	Yes	Yes	Yes
Monitoring and Verification			
Specifies types of measured/recorded data	Yes	Yes	Yes
Specifies monitoring/testing methodologies	Yes	Yes	Yes
Specifies monitoring times/periods	Yes	Yes	Yes
Specifies roles/responsibilities for monitoring/data collection/storage	Yes	Yes	Yes
Specifies doc. required for validation & verification	Yes	Yes	Yes

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Methodologies for quantification & MRV of GHG emission reductions from ODS destruction projects (3/3)

1. VCS standard applies to all MP Group 1 ODS from Annexes A, B & C, CAR and ACR methodologies are limited to CFCs from Group 1 Annex A;
2. VCS standard applies to ODS used as refrigerants and blowing agents, CAR and ACR methodologies are specific for refrigerants;
3. The three methodologies admit ODS originated in A5 countries;
4. CAR methodology limits ODS destruction to the U.S., VCS and ACR admit destruction in any country that complies with technical specifications;
5. VCS methodology quantifies specific GHG emissions from ODS transportation from recovery/storage to destruction, CAR and ACR methodologies calculate them aggregated with ODS destruction emissions;
6. VCS methodology is the only one that quantify disaggregated GHG emissions from energy consumption at recovery facility (fuel, electricity, ODS oxidation), CAR and ACR methodologies quantify them aggregated to the ODS transportation/destruction emissions.
7. CAR methodology is the only that considers ODS from leaks/servicing (during operation of equipment), for the definition of baseline.

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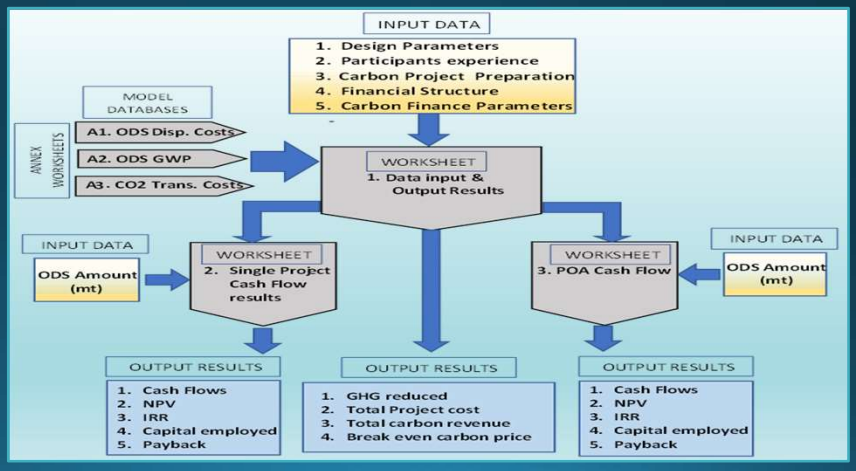
Flowchart of Tool for ODS Destruction Projects with Revenues from ITMO Transfer

- Objective: provide **governments** and **developers** of ODS destruction projects with indicative financial parameters to decide their participation in the ITMOs transfer mechanism.

Interlinkage of **input data** and **output results** among the tool worksheets.



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Worksheet 1: **Data Input** and Output Results (1/2)

Worksheet Name	Function	Requested Data Input
WS1. Data Input & Output Results	1. Centralizes input parameters for estimation of: ODS destruction project costs, carbon revenues, and financial indicators. 2. Centralizes output results: project costs, carbon revenues, "break even carbon cost", etc	1. Design parameters: ODS type, amount, use, sector, etc.; 2. Participants experience in ODS destruction project stages; 3. Definition of ITMO project preparation activities: documentation, validation, verification, registry, fees, etc.; 4. Carbon revenue parameters: carbon price, carbon revenue start year, SoP, OMG, etc.; 5. Financial structure: equity, debt, grant, cost of capital, etc.

Input Data	
Project Design Parameters	
ODS	HCFC-22
Sector/activity	Domestic refrigeration (R or BA)
Use of ODS	Refrigerant (R)
Effort Level Required	Low
Population Density	Dense
Amount of pure ODS destroyed (mt)	20
Destruction Technology	HTI
Destruction´s Site Location	International
Blend ODS 1	
GWP ODS 1	0
Amount of ODS 1 destroyed (mt)	
Blend ODS 2	
GWP ODS 2	0
Amount of ODS 2 destroyed (mt)	
Blend ODS 3	
GWP ODS 3	0
Amount of ODS 3 destroyed (mt)	
Blend ODS 4	
GWP ODS 4	0
Amount of ODS 4 destroyed (mt)	
Total Amount of blend destroyed (mt)	0

	Input data supplied by user
	Input data selected by user from a predetermined list
	Output data provided by the system

Project participants experience	
Segregation/Collection	Mid
Recovery	Mid
Transport	Mid
Destruction	High
Carbon Project Preparation (Transaction Costs)	
Documentation & supervision	N/A
Validation process	Yes
Verification process	Yes
Mitigation Action Project (MAP) application fee	Yes
Mitigation Action Identification (MID) fee	N/A
Corresponding Adjustment fee (US$/tCO2eq)	Yes
Listing fee (US$/tCO2eq)	Yes

Financial Structure	
Equity (%)	80%
Debt (%)	
Grants (%)	20%
Advance payment of MOPA´s value (%)	0%
Discount on future MOPA´s value (%)	
Loan duration (year)	
Debt cost (fixed rate) (%)	
Cost of capital (%)	5%
Annual inflation rate cost (%)	
Carbon finance parameters	
Start of Carbon credits revenue (year)	2
Carbon credit price (US$/tCO2eq)	20.23
Carbon price index (%)	
OMGE (%)	
SOP (%)	

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Worksheet 1: Data Input and **Output Results** (2/2)

Worksheet Name	Function	Data Output
WS1. Data Input & Output Results	1. Centralizes input parameters for estimation of: ODS destruction project costs, carbon revenues, and financial indicators. 2. Centralizes output results: project costs, carbon revenues, "break even carbon cost", etc	1. Project Performance (US$/tCO2, US$/mt ODS); 2. Project implementation costs per stage and total; 3. ITMO Project Transaction Costs (Total and per tCO2eq (or per ITMO); 4. Carbon revenue performance (Total revenues ($), break even cost ($/tCO2eq),

	Input data supplied by user
	Input data selected by user from a predetermined list
	Output data provided by the system
	Output results provided by the system

Output Results	
Project Performance	
ODS destroyed (mt)	20.00
ODS GWP	1810
GHG reduced (tCO2eq)	36200
GHG reduced accountable after OMGE & SOP (tCO2eq)	36200
Expenditure per ODS destroyed (US$/mtODS)	$ 42,917.00
Expenditure per GHG reduced before OMGE & SOP (US$/tCO2eq)	$ 23.71

Break even cost (US$/tCO2eq)	Total Project Cost (US$)	Total Carbon revenue (US$)
$ 23.71	$ 858,340.00	$ 732,369.44

Project Implementation Costs Budget	US$/mt (Model)	US$ (Model)	US$ (Project Developer)
Segregation & Collection	$ 8,000.00	$ 160,000.00	
Transport to recovery	$ 7,000.00	$ 140,000.00	
Recovery (processing)	$ 15,000.00	$ 300,000.00	
Transport to destruction	$ 2,700.00	$ 54,000.00	
Destruction	$ 2,400.00	$ 48,000.00	
Total Project Costs	$ 35,100.00	$ 702,000.00	$ -
Carbon Project Transactions Costs Budget	**US$/tCOeq (Model)**	**US$ (Model)**	**US$ (Project Developer)**
Documentation & supervision	$ -	$ -	
Validation process	$ 0.55	$ 20,000.00	
Verification process	$ 0.55	$ 20,000.00	
Mitigation Action Project (MAP) application fee	$ 0.01	$ 500.00	
Mitigation Action Identification (MID) fee	$ -	$ -	
Corresponding Adjustment fee (US$/tCO2eq)	$ 3.00	$ 108,600.00	
Listing fee (US$/tCO2eq)	$ 0.20	$ 7,240.00	
Total Transaction Costs	$ 4.32	$ 156,340.00	$ -

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Worksheet 2: Single Project Cash Flow (1/1)

	Input data supplied by user
	Output results provided by the system

Concept	Total		
Years of operation	1	1	2
ODS destroyed (mt)	15	15	
GHG mitigated (tCO2eq)	27150	27150	0
Project Implementation Costs	**US$**		
Segregation & Collection	(120,000)	(120,000)	$ -
Transport to recovery	(105,000)	(105,000)	$ -
Recovery (processing)	(225,000)	(225,000)	$ -
Transport to destruction	(40,500)	(40,500)	$ -
Destruction	(36,000)	(36,000)	$ -
Total Project Implementation Costs	**(526,500)**	**(526,500)**	**$ -**
Carbon Project Transactions Costs	**US$**		
Documentation & supervision	$ -	$ -	
Validation process	(20,000)	(20,000)	
Verification process	(20,000)	(20,000)	$ -
MAP application fee	(500)	(500)	
Corresponding Adjustment fee	(81,450)	(81,450)	$ -
Listing fee	(5,430)	(5,430)	$ -
Total Transaction Costs	(127,380)	(127,380)	$ -
Total Project Costs	**(653,880)**	**(653,880)**	**$ -**
Project Debt Cost	**US$**		
Project Loan	**0**	**0**	**0**
Loan Payment	**$ -**	**$ -**	**$ -**
Project Income from Carbon Revenues	**US$**		
Gross Carbon Revenue	$ 549,277.08	$ -	$ 549,277.08
Overall Mitigation in Global Emissions (OMGE)	$ -	$ -	$ -
Share of Proceedings (SOP)	$ -	$ -	$ -
Advance payment of MOPA		$ -	
Discount over Carbon Revenues			$ -
Net Carbon Revenue	**$ 549,277.08**	**$ -**	**$ 549,277.08**
Project Grant	**US$**		
Amount of Grant	$ 130,776.00	$ 130,776.00	$ -
Cash Flows	**US$**		
Cash Flows	$ 26,173.08	-$ 523,104.00	$ 549,277.08
PV of Cash Flows	$ 17.03	-$ 523,104.00	$ 523,121.03
Cumulative Cash Flows		-$ 523,104.00	$ 26,173.08
NPV of total Cash Flows	$ 17.03		
IRR (%)	5.00%		
Capital employed (US$)	(653,880)		
Profitability Index	0.000026		

Name of worksheet	Function	Requested Data Input	Data Output
WS2. Single Project Cash Flow	Delivers a Balance of Costs & Revenues for a 1 Year ODS destruction project, using Input data from WS1.	Total ODS destroyed (mt)	1. Cash Flows ($); 2. PV of Cash Flows ($); 3. Cumulative Cash Flows ($); 4. NPV ($); 5. IRR (%); 6. Capital employed ($); 7. Payback (year)

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Worksheet 3: POA Cash Flow (1/1)

	Input data supplied by user
	Output results provided by the system

Concept	Total				
Year of operation	3	1	2	3	4
ODS destroyed (mt)	15.00	5	5	5	
GHG mitigated (tCO2eq)	27150	9050	9050	9050	0
Project Implementation Costs	**US$**				
Segregation & Collection	(120,000)	(40,000)	(40,000)	(40,000)	$ -
Transport to recovery	(105,000)	(35,000)	(35,000)	(35,000)	$ -
Recovery (processing)	(225,000)	(75,000)	(75,000)	(75,000)	$ -
Transport to destruction	(40,500)	(13,500)	(13,500)	(13,500)	$ -
Destruction	(36,000)	(12,000)	(12,000)	(12,000)	$ -
Total Project Implementation Costs	**(526,500)**	**(175,500)**	**(175,500)**	**(175,500)**	**$ -**
Carbon Project Transactions Costs	**US$**				
Documentation & supervision	$ -	$ -			
Validation process	(20,000)	(20,000)			
Verification process	(60,000)	(20,000)	(20,000)	(20,000)	$ -
POA application fee	(500)	(500)			
POA MID fee	$ -	$ -	$ -	$ -	$ -
Corresponding Adjustment fee	(81,450)	(27,150)	(27,150)	(27,150)	$ -
Listing fee	(5,430)	(1,810)	(1,810)	(1,810)	$ -
Total Transaction Costs	(167,380)	(69,460)	(48,960)	(48,960)	$ -
Total Project Costs	**(693,880)**	**(244,960)**	**(224,460)**	**(224,460)**	**$ -**
Project Debt Cost	**US$**				
Project Loans	**0**	**0**	**0**	**0**	**0**
Project Income	**US$**				
Gross Carbon Revenue	$ 549,277.08	$ -	$ 183,092.36	$183,092.36	$ 183,092.36
Overall Mitigation in Global Emissions (OMGE)	$ -	$ -	$ -	$ -	$ -
Share of Proceedings (SOP)	$ -	$ -	$ -	$ -	$ -
Advance payment of MOPA		$ -	$ -	$ -	$ -
Discount over Carbon Revenues			$ -	$ -	$ -
Net Carbon Revenue	**$ 549,277.08**	**$ -**	**$ 183,092.36**	**$183,092.36**	**$ 183,092.36**
Project Grant	**US$**				
Amount of Grant	$ 138,776.00	$ 48,992.00	$ 44,892.00	$ 44,892.00	$ -
Cash Flow	**US$**				
Cash Flow	-$ 5,826.92	-$ 195,968.00	$ 3,524.36	$ 3,524.36	$ 183,092.36
PV of Cash Flows	-$ 31,252.70	-$ 195,968.00	$ 3,356.53	$ 3,196.70	$ 158,162.06
Cumulative Cash Flows		-$ 195,968.00	-$ 192,443.64	-$188,919.28	-$ 5,826.92
NPV of total Cash Flows	**-$ 31,252.70**				
IRR (%)	**-1.02%**				
Capital employed (US$)	**(693,880)**				
Profitability Index	0.045041				

Name of worksheet	Function	Requested Data Input	Data Output
WS3. POA Cash Flow	Delivers a Balance of Costs & Revenues for an ODS destruction Multiyear Program of Activities (POA), using Input data from WS1.	ODS destroyed per year (mt)	1. Cash Flows ($); 2. PV of Cash Flows ($); 3. Cumulative Cash Flows ($); 4. NPV ($); 5. IRR (%); 6. Capital employed ($); 7. Payback (year)

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Annex 1: ODS Disposal Costs (1/1)

Name of worksheet	Function	Requested Data Input	Data Output
A1. ODS Disposal Costs	Database of implementation costs for ODS project stages. Source: TEAP, 2009	N/A	Min/Max costs for ODS segregation, collection, processing, transportation & destruction, for ODS types, application sectors, domain, and country experience.

Effort Required	Sector	Population Density	ODS Type	Segregation/Collection Costs		Transport to recovery Costs		Recovery Processing Costs		Transport Costs (In country Destruction)		Transport Costs (International Destruction)		Destruction Costs (In country Destruction)		(International Destruction) (All Tech except		(International Destruction) (Plasma Arc)	
				US$/mtODS		US$/mtODS		US$/mtODS		US$/mtODS		US$/mtODS		US$/mtODS		US$/mtODS		US$/mtODS	
				min	max	min	max	min	max	min**	max**	min**	max**	min	max	min	max	min	max
Low	Domestic refrigeration	D	R	6000	10000	6000	8000	10000	20000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Domestic refrigeration	D	BA	6000	10000	6000	8000	20000	30000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Commercial refrigeration	D	R	8000	12000	8000	10000	8000	15000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Commercial refrigeration	D	BA	8000	12000	8000	10000	25000	35000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Transport refrigeration	D/S	R	N/A	N/A	N/A	N/A	15000	20000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Industrial refrigeration	D/S	R	N/A	N/A	N/A	N/A	4000	6000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Stationary A/C ^	D	R	1000	2000	N/A	N/A	4000	25000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Mobile A/C	D	R	1000	2000	N/A	N/A	4000	6000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
High	Domestic refrigeration	S	R	10000	15000	30000	40000	10000	20000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Domestic refrigeration	S	BA	10000	15000	30000	40000	20000	30000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Commercial refrigeration	S	R	15000	20000	40000	50000	8000	15000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Commercial refrigeration	S	BA	15000	20000	40000	50000	25000	35000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Stationary A/C ^	S	R	1000	2000	N/A	N/A	10000	35000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Mobile A/C	S	R	1000	2000	N/A	N/A	4000	6000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Steel forced panels	D	BA	75000	90000	5000	10000	30000	40000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Block-pipe	D	BA	10000	15000	15000	20000	30000	40000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500
	Block-Slab	D	BA	80000	100000	5000	10000	30000	40000	250	1000	1400	4000	4000	7000	2400	6000	7400	18500

Source: *Authors' own elaboration based on information from the TEAP 2009. Population density: D=dense; S=sparse. ODS Recovered: R=Refrigerant; BA=Blowing Agent** Covering shipment distances of 200–1000 km for in-country destruction; longer distances such as those incurred through exporting materials may incur higher transport costs. International transport includes import and management fees according to Basel Convention procedures.^ Assumed on-site recovery.*

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Annex 2: ODS GWP (1/1)

Substances controlled by the Montreal Protocol	Formula	GWP (100 years)
CFC-11	CCl_3F	4,750
CFC-12	CCl_2F_2	10,900
CFC-13	$CClF_3$	14,400
CFC-113	CCl_2FCClF_2	6,130
CFC-114	$CClF_2CClF_2$	10,000
CFC-115	$CClF_2CF_3$	7,370
Halon-1301	$CBrF_3$	7,140
Halon-1211	$CBrClF_2$	1,890
Halon-2402	$CBrF_2CBrF_2$	1,640
Carbon tetrachloride	CCl_4	1,400
Methyl bromide	CH_3Br	5
Methyl chloroform	CH_3CCl_3	146
HCFC-21	$CHCl_2F$	148
R-22 (HCFC-22)	$CHClF_2$	1,810
HCFC-123	$CHCl_2CF_3$	77
HCFC-124	$CHClFCF_3$	609
HCFC-141b	CH_3CCl_2F	725
HCFC-142b	CH_3CClF_2	2,310
HCFC-225ca	$CHCl_2CF_2CF_3$	122
HCFC-225cb	$CHClFCF_2CClF_2$	595

Source: *Authors' own elaboration based on information from UNEP and IPCC.*

Name of worksheet	Function	Requested Data Input	Data Output
A2. ODS GWP	Database of GWP of ODS controlled by the MP.	N/A	GWP of 19 ODS controlled by the MP.

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Annex 3: CO_2 Project Trasnsaction Costs (1/1)

Typical Transaction Costs of Mitigation Actions for ITMOs Trasnfer under Ghana´s Article 6.2 Framework			
Concept	Costs (US$) min	max	Concept Description
Project preparation	0	60000	This is typically the cost of consultant support to undertake an initial feasibility assessment, develop project documents, and support the validation and registration processes. This cost may be considerably lower than estimated if local consultants (in-country) are used or,particularly, if expertise exists in-house to undertake these tasks. In the case of the Swiss government, Klik foundation upfronts up to 200,000 USD for MADD development.
3rd party validation	15000	20000	This one-off fee is largely a fixed cost, but might be slightly reduced for particularly simple or small projects. Note that this fee is not required for CCX or CAR. Recent references from UNDP point to an avergae cost of validation of US$15,000-US$20,000, for ITMO projects.
3rd party verification (US$/year)	15000	20000	Like the cost of validation, this cost is fixed but might be slightly lower for particularly simple or small projects. For projects carried out on an ongoing or multi-year basis, this would be an annual cost. Recent references from UNDP point to an avergae cost of verification of US$15,000-US$20,000, for ITMO projects.
Mitigation activity participant (MAP) or entity application fee	500	1000	This fee is paid by an activity developer who has to create a Mitigation Action Project (MAP) account on the Ghana Carbon Registry (GCR) to obtain a Mitigation Identification Number (MID) for the first mitigation activity aiming to generate authorised ITMOs for transfer either on the GCR or registry linked to a preapproved International Credit Standard (ICS) in this framework. Fee is paid also by voluntary carbon project developer seeking formal recognition to create an account on the GCR and list carbon offset credit for recording on the GCR.The value ranges from US$500.00 for small scale projects or forestry projects to US$1000.00 for large scale commercial non forestry projects.
Mitigation activity identification (MID) fee	250	500	Fee is paid by activity developer seeking to create MID for additional mitigation activity other than the first activity created into the same MAP account. The value ranges from US$250.00 for small scale projects or forestry projects to US$500.00 for large scale commercial non forestry projects.
Corresponding Adjustment Fee (US$/ITMO)	3	10	Fees paid by an activity developer or participating acquiring Party to compensate for the opportunity cost for meeting Ghana NDC and the marginal cost for creating associated with the regular transfer and reporting of transferable mitigation outcomes. The value ranges from US$3.00 for small scale projects, US$8.00 or forestry projects, to US$10.00 for large scale commercial non forestry projects.
Listing fee (US$/ITMO)	0.1	0.2	A Fee of US$0.20/ITMO is paid on a retainer basis by an activity developer for each eligible activity aiming to create authorised ITMOs for transfer from and held on the GCR. A fee of US$0.10/ITMO is paid on a retainer basis by the VCM project developer for recording carbon offset credit on the GCR.

Source: Authors' own elaboration based on information provided by the Climate Action Reserve; VCS; ICF International; and The National framework of Ghana for market and non-market mechanisms under Article 6 of the Paris Agreement

Name of worksheet	Function	Data Output
A3. CO_2 Project Transaction Costs	Database of transaction costs of a mitigation action seeking the transfer of ITMOs under Article 6.2. Source: CAR, Gold Std, VCS, Ghana A6.2 Guideline, Klik	Average transaction costs incurred in an ITMO project development: 1. Preparation; 2. Validation; 3. Verification; 4. Fees (Application, MID, CA, listing).

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Thanks!

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Any questions?

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3. Next steps:
upcoming meetings and activities

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ACTIVITIES & NEXT MEETINGS

- **April 2023 (online distribution)**
  - ✓ Publication of Final Study on FM, link to all TWG members
- **May 2023 (online meeting)**
  - ✓ Co-coordinators meet with TWG FM Chair and Vice-chair
  - ✓ Proposal for working programme for TWG FM
  - ✓ COPA: Online election of COPA Steering Committee members
- **July 2023 – Hybrid meeting (personal + online)**
  - ✓ 20-21 June 2023: COPA first Plenary, introducing the Steering Committee – fully online!! (not with the OEWG in Bangkok)
  - ✓ TWG FM #session in the COPA Plenary: Proposal for TWG FM Working Programme

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