



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

Montreal  
Protocol Unit



# Kigali Implementation Plan workshop

14-16 June

# KIGALI in Acti ON





## Session 4- Breakout: Practical Prioritizing sector for Stage I

| 15:30-17:00 | Group 1: French Speaking Group                                                                                                                                                                                                                                                                           | Group 2: Spanish Speaking Group                                                                                                                                                             | Group 3: Manufacturing countries                                                                                                                                                                     | Group 4: Non-LVC and LVC countries                                                                                                                                                                           | Group 5: Non-LVC and LVC countries                                                                                                                                                                                                       | Group 6: Non-LVC and LVC countries                                                                                                                                                                                                     |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | Moderator: Bassam Elassaad                                                                                                                                                                                                                                                                               | Moderator: Rodrigo SERPA                                                                                                                                                                    | Moderator: Fukuya IINO                                                                                                                                                                               | Moderator: Yunrui ZHOU                                                                                                                                                                                       | Moderator: Bettina SCHRECK                                                                                                                                                                                                               | Moderator: Adnan ATWA                                                                                                                                                                                                                  |
|             | Room: Conference Room 3                                                                                                                                                                                                                                                                                  | Room:C0727                                                                                                                                                                                  | Room:C0729                                                                                                                                                                                           | Room:C0731                                                                                                                                                                                                   | Room: C0733                                                                                                                                                                                                                              | Room: C0735                                                                                                                                                                                                                            |
|             | <u>Countries (15):</u> <ul style="list-style-type: none"> <li>Cameroon</li> <li>Cote d'Ivoire</li> <li>Morocco</li> <li>Tunisia</li> <li>Senegal</li> <li>Gabon</li> <li>Algeria</li> <li>Niger</li> <li>Benin</li> <li>Guinea</li> <li>Mauritania</li> <li>Togo</li> <li>Chad</li> <li>Congo</li> </ul> | <u>Countries (7):</u> <ul style="list-style-type: none"> <li>Mexico</li> <li>Argentina</li> <li>Venezuela</li> <li>Honduras</li> <li>Ecuador</li> <li>Guatemala</li> <li>Bolivia</li> </ul> | <u>Countries (8):</u> <ul style="list-style-type: none"> <li>China</li> <li>Brazil</li> <li>Türkiye</li> <li>Nigeria</li> <li>Egypt</li> <li>South Africa</li> <li>Iran</li> <li>Pakistan</li> </ul> | <u>Countries (9):</u> <ul style="list-style-type: none"> <li>Jordan</li> <li>Syria</li> <li>Libya</li> <li>Somalia</li> <li>Sudan</li> <li>Oman</li> <li>Botswana</li> <li>Malawi</li> <li>Zambia</li> </ul> | <u>Countries (8):</u> <ul style="list-style-type: none"> <li>Serbia</li> <li>Turkmenistan</li> <li>Albania</li> <li>North Macedonia</li> <li>Bosnia and Herzegovina</li> <li>Montenegro</li> <li>Namibia</li> <li>Saint Lucia</li> </ul> | <u>Countries (9):</u> <ul style="list-style-type: none"> <li>Philippines</li> <li>Ethiopia</li> <li>Lesotho</li> <li>Sierra Leone</li> <li>Tanzania</li> <li>Guinea-Bissau</li> <li>Gambia</li> <li>Uganda</li> <li>Eritrea</li> </ul> |



## Session 4- Breakout: Practical Prioritizing sector for Stage I

15:30-17:00

Group 1: French Speaking Group

Moderator: Mr. Bassam Elassaad

Room: Conference Room 3

Countries (15):

- Cameroon
- Cote d'Ivoire
- Morocco
- Tunisia
- Senegal
- Gabon
- Algeria
- Niger
- Benin
- Guinea
- Mauritania
- Togo
- Chad



## Session 4- Breakout: Practical Prioritizing sector for Stage I

15:30-17:00

Group 2: Spanish Speaking Group

Moderator: Mr. Rodrigo SERPA

Room:C0727

### Countries (7):

- Mexico
- Argentina
- Venezuela
- Honduras
- Ecuador
- Guatemala
- Bolivia



## Session 4- Breakout: Practical Prioritizing sector for Stage I

15:30-17:00

Group 3: Manufacturing countries

Moderator: Fukuya IINO

Room:C0729

### Countries (8):

- China
- Brazil
- Türkiye
- Nigeria
- Egypt
- South Africa
- Iran
- Pakistan



## Session 4- Breakout: Practical Prioritizing sector for Stage I

15:30-17:00

Group 4: Non-LVC and LVC countries

Moderator: Yunrui ZHOU

Room:C0731

### Countries (9):

- Jordan
- Syria
- Libya
- Somalia
- Sudan
- Oman
- Botswana
- Malawi
- Zambia



## Session 4- Breakout: Practical Prioritizing sector for Stage I

15:30-17:00

Group 5: Non-LVC and LVC countries

Moderator: Bettina SCHRECK

Room: C0733

### Countries (8):

- Serbia
- Turkmenistan
- Albania
- North Macedonia
- Bosnia and Herzegovina
- Montenegro
- Namibia
- Saint Lucia



## Session 4- Breakout: Practical Prioritizing sector for Stage I

15:30-17:00

Group 6: Non-LVC and LVC countries

Moderator: Mr. Adnan ATWA

Room: C0735

### Countries (9):

- Philippines
- Ethiopia
- Lesotho
- Sierra Leone
- Tanzania
- Guinea-Bissau
- Gambia
- Uganda
- Eritrea

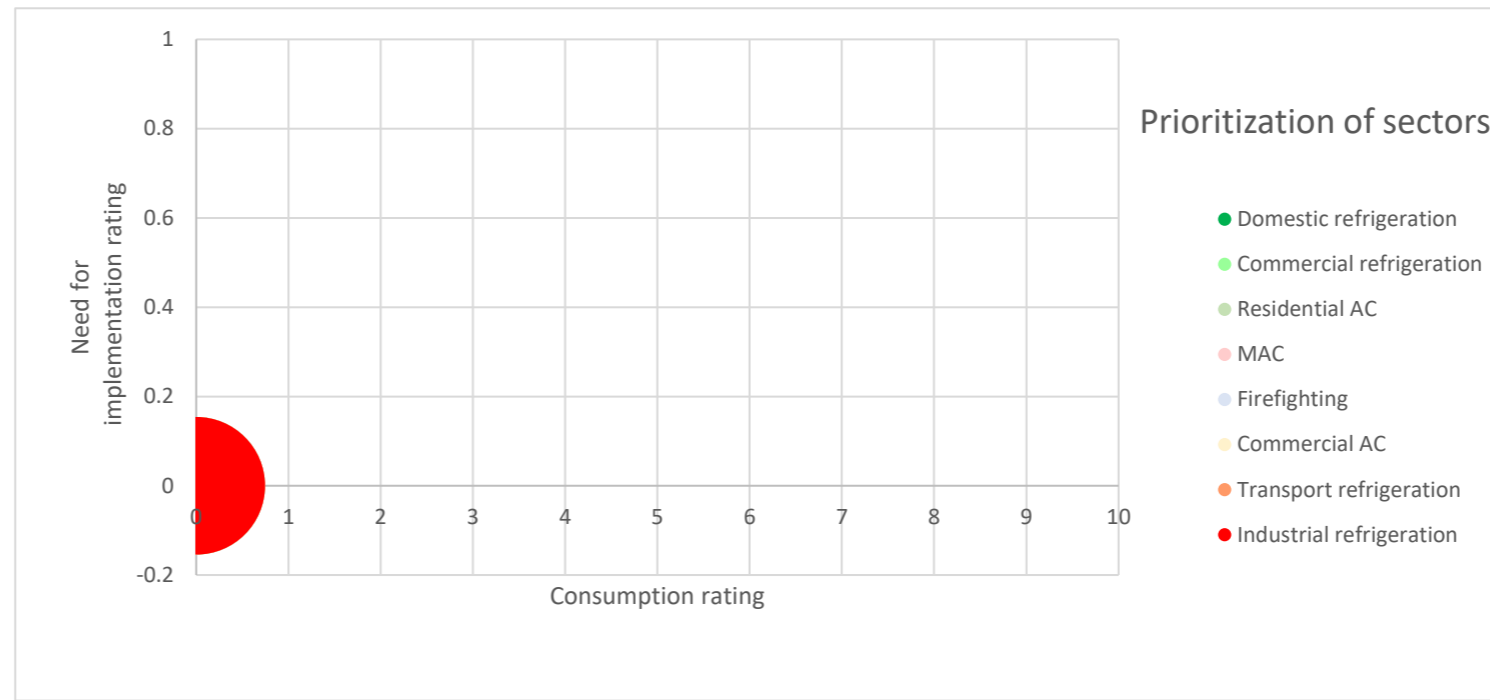


| <b>Banks in CO2e</b>     | <b>2022</b> | <b>Percentage</b> |
|--------------------------|-------------|-------------------|
| Domestic Refrigeration   | 353,000     | 4%                |
| Comercial refrigeration  | 4,500,000   | 47%               |
| Industrial refrigeration | 50,000      | 1%                |
| Transport refrigeration  | 125,000     | 1%                |
| Residential AC           | 1,500,000   | 16%               |
| Other AC                 | 2,100,000   | 22%               |
| MAC                      | 600,000     | 6%                |
| Firefighting             | 400,000     | 4%                |
| Total                    | 9,628,000   | 100%              |

|                          | Market readiness                   |                                                   |                                  | Market conditions                                                                              |                   |                  |                                                   | Investment needed                       | Total score | HFC consumption in 2021 (tons) | Consumption rating |
|--------------------------|------------------------------------|---------------------------------------------------|----------------------------------|------------------------------------------------------------------------------------------------|-------------------|------------------|---------------------------------------------------|-----------------------------------------|-------------|--------------------------------|--------------------|
|                          | Availability of low-GWP technology | Energy efficiency (EE) standards (local/regional) | Availability of training courses | Banks of refrigerants inside existing equipment as percentage of total (in CO <sub>2</sub> eq) | Geographic spread | Age of equipment | Ease of installation and service for alternatives | Equipment imported or locally assembled |             |                                |                    |
| Weight (scale 1 to 10)   | 10                                 | 4                                                 | 6                                | 6                                                                                              | 5                 | 4                | 3                                                 | 8                                       | 6           |                                |                    |
| Domestic refrigeration   |                                    |                                                   |                                  |                                                                                                |                   |                  |                                                   |                                         |             | 0                              |                    |
| Commercial refrigeration |                                    |                                                   |                                  |                                                                                                |                   |                  |                                                   |                                         |             | 0                              |                    |
| Residential AC           |                                    |                                                   |                                  |                                                                                                |                   |                  |                                                   |                                         |             | 0                              |                    |
| MAC                      |                                    |                                                   |                                  |                                                                                                |                   |                  |                                                   |                                         |             | 0                              |                    |
| Firefighting             |                                    |                                                   |                                  |                                                                                                |                   |                  |                                                   |                                         |             | 0                              |                    |
| Commercial AC            |                                    |                                                   |                                  |                                                                                                |                   |                  |                                                   |                                         |             | 0                              |                    |
| Transport refrigeration  |                                    |                                                   |                                  |                                                                                                |                   |                  |                                                   |                                         |             | 0                              |                    |
| Industrial refrigeration |                                    |                                                   |                                  |                                                                                                |                   |                  |                                                   |                                         |             | 0                              |                    |

| Ratings | Low-GWP technology           | Local/regional EE standards     | Training courses      | Banks of refrigerants in CO <sub>2</sub> | Geographic spread                      | Age of equipment       | Installation and service of alternatives | Equipment imported or locally assembled | Investment needed for stage I of the KIP      | HFC consumption in 2021  |
|---------|------------------------------|---------------------------------|-----------------------|------------------------------------------|----------------------------------------|------------------------|------------------------------------------|-----------------------------------------|-----------------------------------------------|--------------------------|
| 0       | Not available                | Not used                        | Available and planned | Not used                                 | Not used                               | Less than 2 years      | All technicians are skilled              | Not used                                | Cannot be covered by stage I                  | Less than 1 ton          |
| 1       | Available but not accessible | Not planned at regional level   | Available             | Less than 10 %                           | Used in one region                     | Between 2 and 5 years  | 20 % skilled technicians                 | Totally imported                        | Requires more than 10 % of stage I funds      | Between 1 and 100 tons   |
| 3       | Limited availability         | Planned within next 5 years     | Early development     | Between 10 and 20 %                      | Used in more than one regional capital | Between 5 and 10 years | 10 % skilled technicians                 | Imported and locally assembled          | Requires between 5% and 10 % of stage I funds | Between 100 and 300 tons |
| 9       | Easily available             | Available or planned in 3 years | Not Available         | More than 20 %                           | Used in all regions                    | More than 10 years     | No to low level of expertise             | Mostly locally assembled                | Requires less than 5 % of stage I funds       | More than 300 tons       |

|                          | Total score | Consumption rating |
|--------------------------|-------------|--------------------|
| Domestic refrigeration   | 0           | 0                  |
| Commercial refrigeration | 0           | 0                  |
| Residential AC           | 0           | 0                  |
| MAC                      | 0           | 0                  |
| Firefighting             | 0           | 0                  |
| Commercial AC            | 0           | 0                  |
| Transport refrigeration  | 0           | 0                  |
| Industrial refrigeration | 0           | 0                  |



The prioritization of the sub-sectors is a measure of the consumption of the sub-sector versus the need for implementation. The need for implementation is measured by the following factors:

- Availability and accessibility to low-GWP alternatives;
- Readiness of the market to adopt the alternative refrigerants in terms of codes, standards, and training;
- Market conditions in terms of geographic spread of equipment base, age of equipment, and ease of installation or retrofitting;
- Source of the equipment (if locally assembled or completely imported)
- Investment needed to phase-down high-GWP HFCs.

Stakeholders are asked to rate the above factors using the 0,1,3,9 rating system which forces them to choose among a set criteria of rates which is different from an open continuous scale of one to ten where they tend to flock towards a middle point.

The idea behind the factors and the rating is to give priority to the sectors with old equipment that consume a lot of refrigerants and where the alternative technology **and standards are available but where the market is not ready to receive the technology due to lack of training courses**, or expertise or because most of the equipment is locally manufactured or assembled. Priority is also given to the sub-sectors which need lower funds during stage I leaving the other sub-sectors to later stages.

Taking the example of technology, availability and accessibility were considered in the rating system and were defined according to what was used by TEAP in Decision XXXI/7 report, i.e., availability of the technology by suppliers, while accessibility is on a country basis.

For the banks of refrigerants inside existing equipment, this is calculated by multiplying the number of equipment of that sub-sector using refrigerant X by charge in kg and then multiplying again by the GWP of that refrigerant. When the total of all sub-sectors for all the refrigerants is known, calculate the percentage of sub-sector and determine the rating from the table below.

The factors are weighted on a scale of 1 to 10 according to the importance of the criteria, for example, the availability of low-GWP technology to replace the high-GWP refrigerant is given a weight of 10 since without the technology, it will not be possible to replace HFCs in that sub-sector. On the other hand, the ease of installation and service is given a weighting of 3 because the skills to install and service the equipment can be acquired through training.

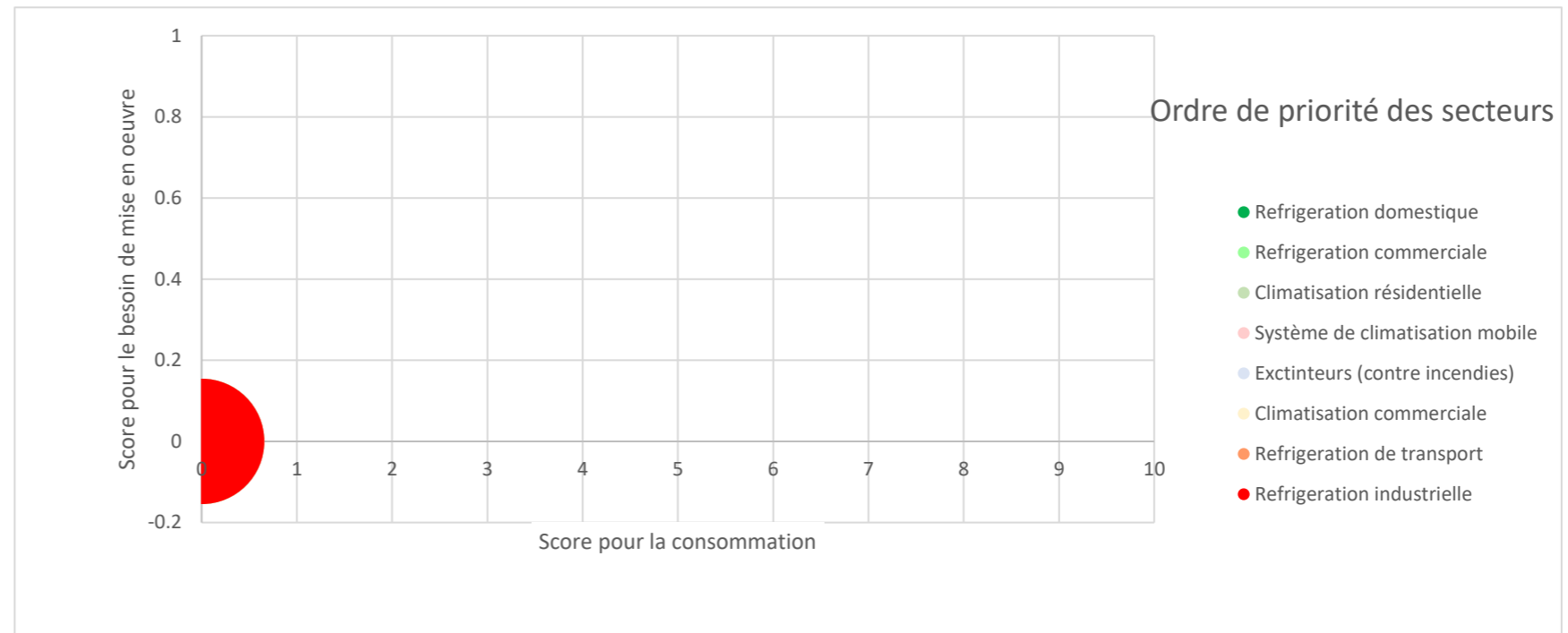
The axes of increasing need for implementation on the Y-axis and increasing consumption on the X-axis signify that sub-sectors scoring on the upper right hand portion of the graph should take priority in activities and funding during stage I. Those on the lower left hand portion of the chart have the least priority. Since the voting is on a 1, 3, and 9 scale for consumption, there are no sub-sectors in the middle of the chart making the choice an easy one.

| <b>Banques en CO2e</b>           | <b>2022</b> | <b>Pourcentage</b> |
|----------------------------------|-------------|--------------------|
| Refrigeration domestique         | 353,000     | 4%                 |
| Refrigeration commerciale        | 4,500,000   | 47%                |
| Refrigeration industrielle       | 50,000      | 1%                 |
| Refrigeration de transport       | 125,000     | 1%                 |
| Climatisation résidentielle      | 1,500,000   | 16%                |
| Climatisation commerciale        | 2,100,000   | 22%                |
| Systèmes de climatisation mobile | 600,000     | 6%                 |
| Exctincteurs (contre incendies)  | 400,000     | 4%                 |
| Total                            | 9,628,000   | 100%               |

|                                         | Préparation du marché                                        |                                                             |                              | Conditions du marché                                                                                         |                          |                     |                                                                 |                                           | Investissements requis                        | Score total | Consommation d'HFC en 2021 | Score pour la consommation |
|-----------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------|---------------------|-----------------------------------------------------------------|-------------------------------------------|-----------------------------------------------|-------------|----------------------------|----------------------------|
|                                         | Technologie à faible potentiel de réchauffement global (PRG) | Normes locales/régionales sur l'efficacité énergétique (EE) | Disponibilité des formations | Banques de fluides frigorigènes à l'intérieur des équipements existants en pourcentage du total (en éq. CO2) | Répartition géographique | Age de l'équipement | Aisance à installer et entretenir des technologies alternatives | Équipement importé ou assemblé localement | Investissements requis pour la phase I du KIP |             |                            |                            |
| <b>Coefficient (échelle de 1 à 10)</b>  | <b>10</b>                                                    | <b>4</b>                                                    | <b>6</b>                     | <b>6</b>                                                                                                     | <b>5</b>                 | <b>4</b>            | <b>3</b>                                                        | <b>8</b>                                  | <b>6</b>                                      |             |                            |                            |
| <b>Refrigeration domestique</b>         |                                                              |                                                             |                              |                                                                                                              |                          |                     |                                                                 |                                           |                                               | 0           |                            |                            |
| <b>Refrigeration commerciale</b>        |                                                              |                                                             |                              |                                                                                                              |                          |                     |                                                                 |                                           |                                               | 0           |                            |                            |
| <b>Climatisation résidentielle</b>      |                                                              |                                                             |                              |                                                                                                              |                          |                     |                                                                 |                                           |                                               | 0           |                            |                            |
| <b>Systèmes de climatisation mobile</b> |                                                              |                                                             |                              |                                                                                                              |                          |                     |                                                                 |                                           |                                               | 0           |                            |                            |
| <b>Extincteurs (contre incendies)</b>   |                                                              |                                                             |                              |                                                                                                              |                          |                     |                                                                 |                                           |                                               | 0           |                            |                            |
| <b>Climatisation commerciale</b>        |                                                              |                                                             |                              |                                                                                                              |                          |                     |                                                                 |                                           |                                               | 0           |                            |                            |
| <b>Refrigeration de transport</b>       |                                                              |                                                             |                              |                                                                                                              |                          |                     |                                                                 |                                           |                                               | 0           |                            |                            |
| <b>Refrigeration industrielle</b>       |                                                              |                                                             |                              |                                                                                                              |                          |                     |                                                                 |                                           |                                               | 0           |                            |                            |

| Notes | Technologie à faible PRG       | Normes locales/régionales sur l'EE                     | Formations                                  | Banques de fluides frigorigènes | Répartition géographique                    | Age de l'équipement | Installation et entretien des technologies alternatives | Équipement importé ou assemblé localement | Investissements requis pour la phase I du KIP             | Consommation d'HFC en 2021 |
|-------|--------------------------------|--------------------------------------------------------|---------------------------------------------|---------------------------------|---------------------------------------------|---------------------|---------------------------------------------------------|-------------------------------------------|-----------------------------------------------------------|----------------------------|
| 0     | Non disponible                 | Non utilisées                                          | Disponibles et déjà prévues                 | Non utilisés                    | Non utilisés                                | Moins de 2 ans      | Tous les techniciens sont compétents                    | Non utilisés                              | Ne peuvent pas être couverts par la phase I               | moins d' 1 tonne           |
| 1     | Disponible mais non accessible | Non planifiées au niveau régional                      | Disponibles                                 | Moins de 10 %                   | Utilisés dans 1 région                      | Entre 2 et 5 ans    | 20 % des techniciens sont compétents                    | Totalement importé                        | Requiert plus de 10 % des fonds alloués à la phase I      | Entre 1 et 100 tonnes      |
| 3     | Accessibilité limitée          | Planifiées dans les 5 prochaines années                | En cours de développement (encore au début) | Entre 10 et 20 %                | Utilisés dans plus d'une capitale régionale | Entre 5 et 10 ans   | 10 % des techniciens sont compétents                    | Importé et assemblé localement            | Requiert entre 5 % et 10 % des fonds alloués à la phase I | Entre 100 et 300 tonnes    |
| 9     | Facilement accessible          | Disponibles ou planifiées dans les 3 prochaines années | Non disponibles                             | Plus de 20 %                    | Utilisés dans tous les régions              | Plus de 10 ans      | Niveau d'expertise faible ou nul                        | En majorité assemblé localement           | Requiert moins de 5 % des fonds alloués à la phase I      | Plus de 300 tonnes         |

|                                 | Score total | Score pour la consommation |
|---------------------------------|-------------|----------------------------|
| Refrigeration domestique        | 0           | 0                          |
| Refrigeration commerciale       | 0           | 0                          |
| Climatisation résidentielle     | 0           | 0                          |
| Système de climatisation mobile | 0           | 0                          |
| Extincteurs (contre incendies)  | 0           | 0                          |
| Climatisation commerciale       | 0           | 0                          |
| Refrigeration de transport      | 0           | 0                          |
| Refrigeration industrielle      | 0           | 0                          |



La priorisation des sous-secteurs est une mesure de la consommation du sous-secteur en question par rapport à la nécessité de mettre en œuvre l'Amendement de Kigali pour ledit sous-secteur. Celle-ci dépend des facteurs suivants :

- Disponibilité et accessibilité des alternatives à faibles PRG
- Préparation du marché à l'adoption des réfrigérants alternatifs en termes de normes et de formation ;
- Conditions du marché en termes de répartition géographique du parc d'équipements, de l'âge des équipements et de la facilité d'installation ou d'entretien des alternatives ;
- Provenance de l'équipement (s'il est assemblé localement ou totalement importé);
- Investissements requis pour éliminer progressivement les HFC à fort PRG.

Les parties prenantes évaluent les facteurs ci-dessus en utilisant le système d'évaluation 0,1,3,9. Celui-ci oblige les évaluateurs à faire un choix tranché parmi un ensemble de critères d'évaluation. L'objectif est d'éviter que les évaluateurs optent spontanément pour des notes moyennes, non discriminatoires, comme souvent dans le cas du système de notation continue allant de un à dix.

L'idée est de donner la priorité aux secteurs dont les équipements sont âgés, qui consomment beaucoup, pour lesquels **des technologies alternatives et les normes existent mais dont le marché n'est pas encore complètement prêt (par exemple en raison du manque des cours de formation, d'expertise des techniciens ou parce que la plupart des équipements sont fabriqués ou assemblés localement)**. La priorité est également donnée aux sous-secteurs qui ont le moins besoin de fonds pendant la phase I, ce qui nous permet de garder les autres sous-secteurs pour des phases ultérieures.

Prenant l'exemple de la technologie; la disponibilité et l'accessibilité ont été prises en compte dans le système de notation et ont été définies conformément à ce qui a été utilisé par le GETE (Groupe de l'Evaluation Technique et Economique) dans le rapport de la décision XXXI/7, i.e. la disponibilité de la technologie auprès des fournisseurs et l'accessibilité à l'échelle nationale.

Pour les banques de fluides frigorigènes à l'intérieur des équipements existants, cela est calculé en multipliant le nombre d'équipements de ce sous-secteur utilisant le fluide frigorigène X par la charge en kg, puis en multipliant à nouveau par le PRG de ce fluide frigorigène. Lorsque le total de tous les sous-secteurs pour tous les réfrigérants est connu, calculez le pourcentage du sous-secteur et déterminez la note à partir du tableau.

Les facteurs sont pondérés sur une échelle de 1 à 10 en fonction de l'importance des critères. Par exemple, la disponibilité d'une technologie à faible PRG pour remplacer un réfrigérant à fort PRG se voit attribuer une pondération de 10 car sans cette technologie, il ne sera pas possible de remplacer les HFC dans ce sous-secteur. D'autre part, la facilité d'installation et d'entretien se voit attribuer une pondération de 3 car les compétences pour installer et entretenir l'équipement peuvent être acquises par le biais d'une formation.

Les axes X et Y ( respectivement le score pour le besoin de la mise en oeuvre et le score pour la consommation) permettent de déduire que les sous-secteurs se situant dans la partie supérieure droite du graphique sont prioritaires en matière d'activités et de financement au cours de la phase I. Ceux qui se trouvent dans la partie inférieure gauche du graphique sont les moins prioritaires. Comme la notation se fait sur une échelle de 1, 3 et 9 pour la consommation, il n'y a pas de sous-secteurs au milieu du graphique, ce qui rend le choix plus simple.



| Sub-sectors                    | Consumption in metric tonnes |                 |                 |
|--------------------------------|------------------------------|-----------------|-----------------|
|                                | 2020                         | 2021            | 2022            |
| Domestic refrigeration         | 90.7                         | 93              | 96              |
| Commercial refrigeration       | 1,312.60                     | 1,249.60        | 1,094.20        |
| Industrial Refrigeration       | 1.9                          | 2               | 2               |
| Transport refrigeration        | 27.6                         | 25              | 26              |
| <b>Sub-Total Refrigeration</b> | <b>1,432.80</b>              | <b>1,369.60</b> | <b>1,218.20</b> |
| Residential AC                 | 430.4                        | 357.5           | 372.4           |
| Other AC                       | 160                          | 138.9           | 135.5           |
| MAC                            | 54.5                         | 56              | 57              |
| <b>Sub-Total AC</b>            | <b>644.9</b>                 | <b>552.4</b>    | <b>564.9</b>    |
| <b>Firefighting</b>            | <b>4.5</b>                   | <b>4.5</b>      | <b>4.5</b>      |
| <b>Grand Total</b>             | <b>2,082.20</b>              | <b>1,919.50</b> | <b>1,774.00</b> |

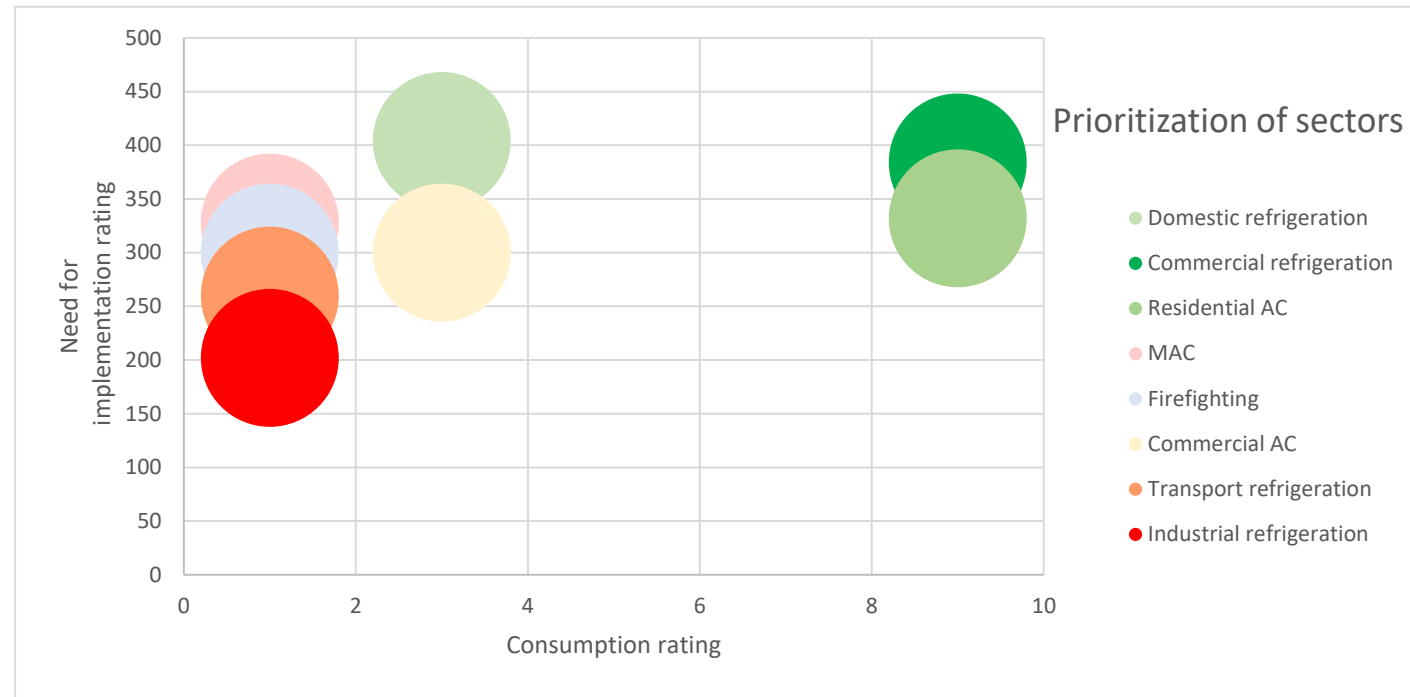
| Consumption in CO <sub>2</sub> eq tonnes |                  |                  |
|------------------------------------------|------------------|------------------|
| 2020                                     | 2021             | 2022             |
| 129,701                                  | 132,990          | 137,280          |
| 2,272,186                                | 2,055,024        | 1,838,782        |
| 2,717                                    | 2,860            | 2,860            |
| 83,637                                   | 78,361           | 79,791           |
| <b>2,488,241</b>                         | <b>2,269,235</b> | <b>2,058,713</b> |
| 856,333                                  | 707,599          | 727,246          |
| 334,000                                  | 289,954          | 282,856          |
| 77,935                                   | 80,080           | 81,510           |
| <b>1,268,268</b>                         | <b>1,077,633</b> | <b>1,091,612</b> |
| <b>14,490</b>                            | <b>14,490</b>    | <b>14,490</b>    |
| <b>3,770,999</b>                         | <b>3,361,358</b> | <b>3,164,815</b> |

|                                 | Market readiness                   |                             |                                  | Market conditions |                   |                  |                                                 |                               | Investment needed             | Total Score | Consumption in 2021 | Consumption rating |
|---------------------------------|------------------------------------|-----------------------------|----------------------------------|-------------------|-------------------|------------------|-------------------------------------------------|-------------------------------|-------------------------------|-------------|---------------------|--------------------|
|                                 | Availability of low-GWP technology | EE standards Local/Regional | Availability of training courses | Banks in CO2      | Geographic spread | age of equipment | Ease of installation & service for alternatives | Imported or locally assembled | Investment needed for stage I |             |                     |                    |
| <b>Weight (scale 1 to 10)</b>   | <b>10</b>                          | <b>4</b>                    | <b>6</b>                         | <b>6</b>          | <b>5</b>          | <b>4</b>         | <b>3</b>                                        | <b>8</b>                      | <b>6</b>                      |             |                     |                    |
| <b>Domestic refrigeration</b>   | 9                                  | 9                           | 9                                | 9                 | 9                 | 9                | 9                                               | 1                             | 9                             | <b>404</b>  | 1080.9              | 9                  |
| <b>Commercial refrigeration</b> | 3                                  | 3                           | 9                                | 9                 | 9                 | 9                | 9                                               | 9                             | 9                             | <b>384</b>  | 123                 | 3                  |
| <b>Residential AC</b>           | 9                                  | 9                           | 9                                | 9                 | 9                 | 9                | 1                                               | 1                             | 1                             | <b>332</b>  | 356                 | 9                  |
| <b>MAC</b>                      | 3                                  | 1                           | 9                                | 9                 | 9                 | 9                | 9                                               | 3                             | 9                             | <b>328</b>  | 57                  | 1                  |
| <b>Firefighting</b>             | 9                                  | 9                           | 3                                | 3                 | 3                 | 9                | 9                                               | 1                             | 9                             | <b>302</b>  | 135                 | 3                  |
| <b>Commercial AC</b>            | 9                                  | 9                           | 3                                | 3                 | 3                 | 9                | 3                                               | 3                             | 9                             | <b>300</b>  | 36                  | 1                  |
| <b>Transport refrigeration</b>  | 3                                  | 1                           | 9                                | 3                 | 9                 | 1                | 9                                               | 3                             | 9                             | <b>260</b>  |                     | 3                  |
| <b>Industrial refrigeration</b> | 3                                  | 1                           | 9                                | 3                 | 3                 | 3                | 9                                               | 3                             | 3                             | <b>202</b>  |                     |                    |

| Ratings  | Low-GWP technology           | Regional EE standards           | Training courses    | Banks in CO2        | Geographic spread                      | Age of equipment       | Installation & service of alternatives | Imported or locally assembled  | Investment needed                            |
|----------|------------------------------|---------------------------------|---------------------|---------------------|----------------------------------------|------------------------|----------------------------------------|--------------------------------|----------------------------------------------|
| <b>0</b> | Not available                | Not used                        | Available & planned | Not used            | Not used                               | Less than 2 years      | All techs are skilled                  | Not used                       | Cannot be covered by stage I                 |
| <b>1</b> | Available but not accessible | Not planned at regional level   | Available           | Less than 10 %      | Used in one region                     | Between 2 and 5 years  | 20% skilled techs                      | Totally imported               | Requires more than 10% of stage I funds      |
| <b>3</b> | Limited availability         | Planned within next 5 years     | Early development   | Between 10 and 20 % | Used in more than one regional capital | Between 5 and 10 years | 10% skilled technicians                | Imported and locally assembled | Requires between 5% and 10% of stage I funds |
| <b>9</b> | Easily available             | Available or planned in 3 years | Not Available       | More than 20 %      | Used in all regions                    | More than 10 years     | no to low level of expertise           | Most locally assembled         | Requires less than 5% of stage I funds       |

| HFC consumption          |
|--------------------------|
| Less than 1 ton          |
| Between 1 and 100 tons   |
| Between 100 and 300 tons |
| More than 300 tons       |

|                          | Rating | Consumption |
|--------------------------|--------|-------------|
| Domestic refrigeration   | 404    | 3           |
| Commercial refrigeration | 384    | 9           |
| Residential AC           | 332    | 9           |
| MAC                      | 328    | 1           |
| Firefighting             | 300    | 1           |
| Commercial AC            | 300    | 3           |
| Transport refrigeration  | 260    | 1           |
| Industrial refrigeration | 202    | 1           |



| Sub-Sector                      | Domestic Ref | Commercial Ref | Industrial Ref | Transport Ref | Residential AC | Commercial AC | MAC    | Fire Fighting |
|---------------------------------|--------------|----------------|----------------|---------------|----------------|---------------|--------|---------------|
| <b>Tonnes of CO<sub>2</sub></b> | 246,693      | 1,711,369      | 2,860          | 90,949        | 716,211        | 282,856       | 81,510 | 14,367        |
| <b>Rating</b>                   | 9            | 3              | 1              | 1             | 9              | 3             | 1      | 1             |

| Sub-sectors                    | Consumption in metric tonnes |                 |                 | Consumption in CO <sub>2</sub> eq tonnes |                  |                  |                  |                  |
|--------------------------------|------------------------------|-----------------|-----------------|------------------------------------------|------------------|------------------|------------------|------------------|
|                                | 2019                         | 2020            | 2021            | 2019                                     | 2020             | 2021             | 2022             | Baseline         |
| Domestic refrigeration         | 213.3                        | 211.6           | 185.1           | 305,019                                  | 302,588          | 264,693          | 290,789          | 286,023          |
| Commercial refrigeration       | 1190                         | 1,131.00        | 1005.1          | 2,096,868                                | 1,885,426        | 1,711,369        | 1,897,888        | 1,831,561        |
| Industrial Refrigeration       | 1.9                          | 2               | 2               | 2,717                                    | 2,860            | 2,860            | 2,812            | 2,844            |
| Transport refrigeration        | 27.6                         | 26.4            | 28.8            | 83,637                                   | 83,940           | 90,949           | 86,175           | 87,021           |
| <b>Sub-Total Refrigeration</b> | <b>1,432.80</b>              | <b>1,371.00</b> | <b>1,221.00</b> | <b>2,488,241</b>                         | <b>2,274,814</b> | <b>2,069,871</b> | <b>2,277,664</b> | <b>2,207,449</b> |
| Residential AC                 | 430.4                        | 349.1           | 356             | 856,333                                  | 701,964          | 716,211          | 758,169          | 725,448          |
| Other AC                       | 160                          | 138.9           | 135.5           | 334,000                                  | 289,954          | 282,856          | 302,270          | 291,693          |
| MAC                            | 54.5                         | 56              | 57              | 77,935                                   | 80,080           | 81,510           | 79,842           | 80,477           |
| <b>Sub-Total AC</b>            | <b>644.9</b>                 | <b>544</b>      | <b>548.5</b>    | <b>1,268,268</b>                         | <b>1,071,998</b> | <b>1,080,577</b> | <b>1,140,281</b> | <b>1,097,619</b> |
| <b>Firefighting</b>            | <b>4.5</b>                   | <b>4.5</b>      | <b>4.5</b>      | <b>14,490</b>                            | <b>14,546</b>    | <b>14,367</b>    | <b>14,468</b>    | <b>14,460</b>    |
| <b>Grand Total</b>             | <b>2,082.20</b>              | <b>1,919.50</b> | <b>1,774.00</b> | <b>3,770,999</b>                         | <b>3,361,358</b> | <b>3,164,815</b> | <b>3,432,413</b> | <b>3,319,528</b> |

We are basing our baseline calculation on the premise that Article 7 data is correct while CP data needs to be changed. Reason: Art 7 data is published

| Refrigerant | sub-sector               | Park installed to 2020 (Units) | Park installed to 2021 (Units) | Park installed to 2022 (Units) |
|-------------|--------------------------|--------------------------------|--------------------------------|--------------------------------|
| HFC-134a    | Domestic refrigeration   | 1,992,320                      | 2,024,626                      | 2,057,138                      |
|             | Commercial refrigeration | 282,680                        | 292,874                        | 302,912                        |
|             | Industrial refrigeration | 247                            | 270                            | 280                            |
|             | MAC                      | 504,000                        | 514,000                        | 524,000                        |
|             | Transport refrigeration  | 2,500                          | 2,500                          | 2,550                          |
| R-404A      | Commercial refrigeration | 48,235                         | 56,525                         | 64,815                         |
|             | Transport refrigeration  | 3,150                          | 3,150                          | 3,150                          |
| R-410A      | Residential AC           | 376,540                        | 400,260                        | 426,200                        |
|             | Other AC                 | 49,280                         | 49,720                         | 50,160                         |
| R-407C      | Residential AC           | 129,950                        | 135,065                        | 147,615                        |
| R-507       | Transport refrigeration  | 1,250                          | 1,250                          | 1,250                          |

| No. of equipment         | 2020      | 2,021     | 2,022     |
|--------------------------|-----------|-----------|-----------|
| Domestic Refrigeration   | 1,992,320 | 2,024,626 | 2,057,138 |
| Commercial refrigeration | 330,915   | 349,399   | 367,727   |
| Industrial refrigeration | 247       | 270       | 280       |
| Transport refrigeration  | 3,750     | 3,750     | 3,800     |
| Residential AC           | 506,490   | 535,325   | 573,815   |
| Other AC                 | 49,280    | 49,720    | 50,160    |
| MAC                      | 504,000   | 514,000   | 524,000   |

| Banks in CO2e            | 2020      | 2021      | 2022      |
|--------------------------|-----------|-----------|-----------|
| Domestic Refrigeration   | 341,882   | 347,426   | 353,005   |
| Commercial refrigeration | 5,934,101 | 6,405,009 | 6,873,686 |
| Industrial refrigeration | 44,151    | 48,263    | 50,050    |
| Transport refrigeration  | 119,788   | 119,788   | 120,789   |
| Residential AC           | 1,219,847 | 1,290,153 | 1,381,847 |
| Other AC                 | 2,057,440 | 2,075,810 | 2,094,180 |
| MAC                      | 540,540   | 551,265   | 561,990   |



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

Montreal  
Protocol Unit



# Thanks for your attention