

# Climate and Clean Air Coalition

## Methane Roadmap Action Programme (M-RAP)

### Roadmap Template

(Version - Feb 2023)



**CLIMATE &  
CLEAN AIR  
COALITION**  
TO REDUCE SHORT LIVED  
CLIMATE POLLUTANTS

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UNEP convened initiative

## Why Act on Methane?

Methane is a powerful but short-lived climate pollutant (SLCP) that accounts for about half of the net rise in global average temperature since the pre-industrial era. Reducing human-caused methane emissions is one of the most cost-effective strategies to rapidly reduce the rate of warming and contribute significantly to global efforts to limit temperature rise to 1.5°C.

Methane has an atmospheric lifetime of roughly a decade, is a potent greenhouse gas tens of times more powerful than carbon dioxide at warming the atmosphere and contributes to the formation of ground-level ozone, a dangerous air pollutant and greenhouse gas. Ozone attributable to anthropogenic methane emissions causes approximately half a million premature deaths per year globally and harms ecosystems and crops by suppressing growth and diminishing production

According to the latest Intergovernmental Panel on Climate Change (IPCC) report, methane is responsible for nearly 45% of the net warming and is second only to carbon dioxide in driving climate change during the industrial era.

The amount of methane in the atmosphere has more than doubled since pre-industrial times and is increasing now faster than at any time since global monitoring began in the 1980s. In the absence of additional policies, methane emissions are projected to continue rising through at least 2040. The growing human-caused emissions come from all three major emitting sectors: fossil fuels, agriculture and waste.

The 2021 Global Methane Assessment (GMA) concluded that the Paris Agreement's 1.5°C target cannot be achieved at a reasonable cost without reducing baseline methane emissions by 30-60 per cent by 2030 from 2020 levels. This would require substantial, but achievable mitigation from all major methane emitting sectors of about 60 per cent from fossil fuels, 30-35 per cent from waste, and 20-25 per cent from agriculture by 2030, relative to 2020 emissions.

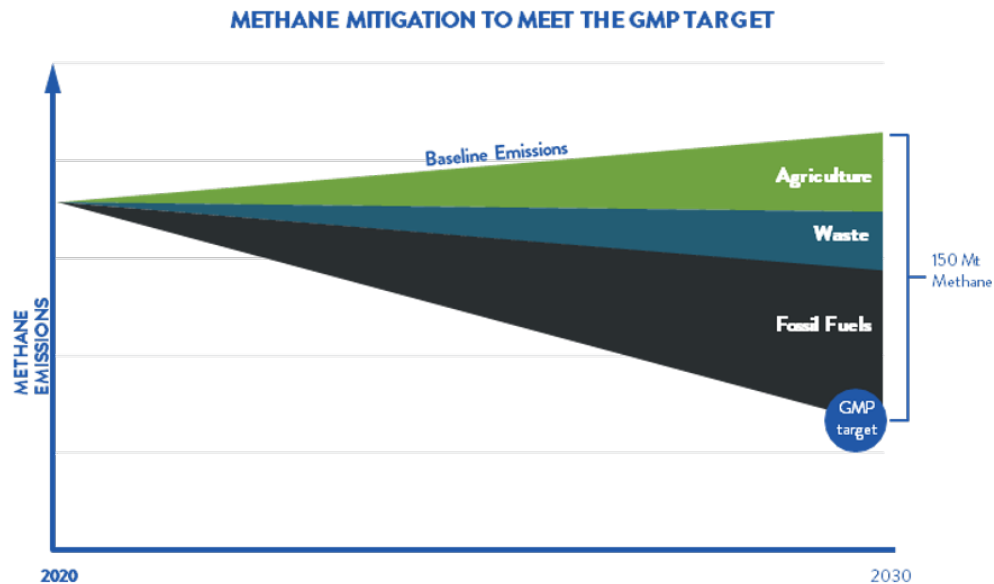
Fortunately, currently available targeted and behavioral change measures could reduce emissions from these major sectors by approximately 180 Mt/yr, or as much as 45 per cent by 2030. Implementing these measures could avoid nearly 0.3°C of global warming by the 2040s and complement all long-term climate change mitigation efforts. It would also, each year, prevent 255 000 premature deaths, 775 000 asthma-related hospital visits, 73 billion hours of lost labour from extreme heat, and 26 million tonnes of crop losses globally.

## The Global Methane Pledge

Catalyzed by the conclusions of the 2021 Global Methane Assessment, the Global Methane Pledge (GMP) launched at the Nov 2021 Conference of the Parties (COP26) in Glasgow. The GMP now includes 150 countries representing more than 50% of global anthropogenic methane emissions and over two thirds of global GDP. Participants joining the Pledge agree to take voluntary actions to contribute to a collective effort to reduce global anthropogenic methane emissions at least 30 per cent (~150 Mt/yr) from 2020 levels by 2030 (see figure 1).

According to the 2022 GMA: 2030 Baseline Report, achieving the GMP target would reduce warming by at least 0.2C between 2030 and 2070 as compared with baseline emissions scenarios.

The Global Methane Pledge complements broader carbon dioxide reduction efforts which will reduce some methane, but not enough to align with 1.5°C scenarios. Methane reductions from decarbonization (mostly reduced fossil fuel use) make up a little less than one-third of the total methane mitigation required to meet IPCC 1.5°C scenarios.



**Figure 1:** Illustrative example of the GMP-consistent methane emissions reduction pathway to 2030. Mitigation in all three main anthropogenic sectors is required to achieve the GMP target in 2030 with slightly more than half of the mitigation expected to come from the fossil fuels sector.

## CCAC Introduction and Background

The Climate and Clean Air Coalition (CCAC) is a core implementing partner of the Global Methane Pledge. CCAC Methane Roadmap Action Programme (M-RAP) supports countries to develop Methane Action Plans and implementation Roadmaps detailing their commitment to mitigate methane, and how this commitment will be achieved. The M-RAP acknowledges that countries are not at the same stage in their methane mitigation planning, and that there is not one way in which methane mitigation ambition, and planning can be communicated. Instead, the M-RAP aims to support countries in achieving the core building blocks of methane mitigation planning described in the Methane Roadmap Template.

### Methane Mitigation Planning Building Blocks

The Climate and Clean Air Coalition has a decade of experience in national Short-Lived Climate Pollutant (SLCP) action planning gained through practical projects with Partner Countries. The projects and experience has identified common elements that are routinely useful for increasing understanding of the scale of the problem of SLCP emissions, and in the development of realistic plans to implement priority measures identified to contribute to alleviate it. The M-RAP building blocks are five core areas which have been shown through the CCAC’s national SLCP planning to be necessary components of plans, strategies and commitments. See Box 1 for a short description of the Building Blocks.

The building blocks, taken together, can allow countries to clearly communicate their methane emission reduction commitment, and hence their contribution to achieving the Global Methane Pledge, and to demonstrate that these commitments are underpinned by specific prioritised measures, and implementation pathways that can be funded and operationalised. The aims of conceptualising effective methane mitigation planning as a set of five building blocks are to:

1. Provide a clear framework for countries to assess their achievements and existing status on methane mitigation planning, and to identify opportunities to further strengthen methane mitigation planning. Many countries will already have many of these building blocks within their national climate change planning, and therefore this framework allows countries to identify which building blocks are already covered, which could be enhanced, and which could begin in a particular country.

2. To synthesise existing knowledge from CCAC Partner Countries on SLCP planning into a framework tailored to methane mitigation planning.
3. To allow progress to be tracked consistently across countries on methane mitigation planning to provide a comprehensive overview of the current state of methane mitigation action, and how this increases over time as more countries advance in their methane mitigation planning.
4. To identify clear, fundable opportunities for the CCAC, Global Methane Hub and others of where additional country support could be targeted to have maximum impact on accelerating methane mitigation action.

## BOX 1 – The 5 Building Blocks of Methane Mitigation Planning



**Building Block #1 - Emissions:** Quantification of national total methane emissions disaggregated by major source sectors for recent historic years



**Building Block #2 - Analytics:** Data, tools and methods to identify, evaluate and prioritise methane mitigation *measures* through quantitative assessment of the emission reduction and additional benefits achievable from their implementation



**Building Block #3 - Targets:** Communicated target that outlines a commitment that will achieve a reduction in methane emissions



**Building Block #4 - Implementation Pathways:** A concrete set of actions that provide a clear pathway to the implementation of priority methane mitigation measures, accounting for different types of regulatory, legislative, infrastructure, financing, incentive, monitoring and enforcement, communication and other actions necessary for implementation. Also accounting for barriers to implementation and how these can be overcome, as well as how these actions can be turned into fundable projects.



**Building Block #5 - Monitoring, Reporting and Verification:** Systems in place to sustainably track progress on i) implementation of priority measures, ii) actions needed for their implementation and iii) impacts from their implementation.

Each building block does not represent a single approach, method, structure, or formulation for its achievement, and is therefore not prescriptive in terms of how countries decide to approach them. For example, Building Block #1: Emissions can be achieved through the application of multiple different methodologies to quantify methane emissions for particular sectors, e.g., the most simple IPCC Tier 1 methods to the complex IPCC Tier 3 methods. The decision on the way in which this building block is achieved will depend on national context and other factors such as national technical capacity, data availability, and key source sectors. Each approach to addressing the building blocks has advantages and draw-backs, including in terms of ease of implementation, and in robustness and utility. For example, for Building Block #2: Analytics, to evaluate specific methane mitigation measures requires that higher Tier emission inventory methods are used (e.g. to evaluate feed optimisation or improved breeding to reduce livestock methane emissions), which will provide more robust results, but requires a more detailed level of data compared to the application of simpler emission inventory methods. The aim in including multiple approaches to covering the M-RAP building blocks is to balance the importance of covering all building blocks with globally applicable approaches to advance methane mitigation planning in all countries, with the importance of developing the most robust, detailed methane mitigation commitments and plans possible that is achieved through application of more detailed approaches. The CCAC's M-RAP aims to provide practical support to national partners to facilitate the step-wise progression of national methane planning towards covering building blocks using the more detailed approaches outlined below.

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## HOW TO USE THE M-RAP TEMPLATE

This template is designed to provide general guidance on the content and structure for a National Methane Roadmap. The template is split into two sections: Section 1 includes introductory and background information on the national and international context of methane mitigation; Section 2 includes each of the five national planning building blocks in sequence. Each element includes a description of the purpose of the section, suggestions for important content and framing, links to useful resources and good practice examples to draw from.

Countries are welcome to adjust the structure and content as needed to fit their specific needs, audiences, and national situations.

This template is a working document which will continue to be improved and refined based on feedback from users and as new resources and good practice examples are identified. If you would like to suggest changes or submit examples or resources, please send your contributions to [nathan.borgford-parnell@un.org](mailto:nathan.borgford-parnell@un.org).

## SECTION 1 – CONTEXT

### 1.1 Importance of Methane Mitigation

*Aim:* A short section describing why methane mitigation is important for your country and why your country joined the Global Methane Pledge. This section may be aimed at an international and/or national audience. For an international audience, it may provide greater understanding as to why the country joined the Global Methane Pledge, and what its priorities are for methane mitigation. For a national audience, it may provide crucial background information to convince key stakeholders as to why methane mitigation should be a priority (e.g. links to development priorities, achievement of international commitments etc.).

*This section:*

- Provides an overview of the importance of methane mitigation in the country, so that national stakeholders have a clear understanding as to why taking action on methane is essential to achieving national climate change goals as well as achieving other benefits for food security and human health,

*Content could include:*

- Description of the importance of addressing methane emissions to achieve near-term climate benefits and contribute to long-term climate stabilization
- Describe the link between methane mitigation, reduction of tropospheric ozone and accompanied benefits for public, agricultural and ecosystem health and other sustainable development goals.
- Describe how action on methane could produce other benefits such as create high-quality jobs or spur innovation in relevant industries and sectors.

*Possible Resources to complete section:*

- Official statements made when joining the Global Methane Pledge
- Global Methane Assessment benefits tool
- Global Methane Assessment: <https://www.ccacoalition.org/en/resources/global-methane-assessment-full-report>

### 1.2 National Context

*Aim:* A section describing the current status of methane emissions in the country. The political, socio-economic, and climate context of the country. Alongside, any other relevant information, such as country position relative to best performing nations. Note that some elements of national context will be covered through the description and content included within the building blocks (e.g. building block #1 on national methane emission sources, and building block #4 on implementation pathways). The roadmap developer should decide the extent to which the national context is outlined within this section, or included in later sections on each building block.

*This section:*

- Describes the national context of methane mitigation within the country, including inclusion of methane mitigation in key national plans and strategies such as the Nationally Determined Contribution (NDC), climate change action/implementation plan, sectoral strategies (e.g. in the oil and gas, agriculture and waste sectors), as well as relevant laws and regulations that target methane sources

- outlines the objectives and goals the National Methane Roadmap/Action Plan.

*Content could include:*

- Overview of the multiple domestic benefits that can be achieved from actions that reduce methane, including reductions in tropospheric ozone air pollution that benefit human health and increase crop yields.
- Description of national plans, strategies, laws and regulations that directly relate to methane emissions. Possible plans and strategies to be detailed here included:
  - Nationally Determined Contribution
  - Climate change implementation/action plan
  - National agriculture strategy
  - National waste management strategy
  - Oil, gas, and/or coal development plan
  - National energy strategy
- Overview of institutional responsibilities related to methane mitigation, including the role of overarching institutions such as the Ministry of Environment, the role of policy making institutions such as sectoral Ministries, and enforcement agencies such as Environmental Protection Agencies, departments of environment or other relevant institutions for methane mitigation. This could include an organogram of key institutions.
- Governance, Population, Economy (Overview, Highlights, Trends).

*Possible resources to complete section:*

- National reported Demographic Statistics
- National Communications / Biennial Reports submitted to UNFCCC
- Global Methane Assessment: <https://www.ccacoalition.org/en/resources/global-methane-assessment-full-report>

### 1.3 International Content

*Aim:* A short section detailing international commitments for methane mitigation.

*This section:*

Describes the countries' participation in methane related international agreements, MEAs, regional agreements, relevant association.

*Content could include:*

Content could include:

- Short description of membership, nature of membership and any relevant activities, date the country joined
- Membership/participation in alliances (global, regional, sectoral), programmes, treaties/agreements which address methane

*Possible Resources to complete section:*

- UNFCCC Paris Agreement ratification status, Kyoto Protocol
- Regional agreements?
- Membership/affiliation in relevant organizations – CCAC Partner

*Possible Resources to complete section:*

- [CCAC list of State Partners](#)
- UNFCCC Paris Agreement – [Status of Ratification](#)



## SECTION 2 - BUILDING BLOCKS



### Building Block #1: National Methane Emissions Sources

Emissions inventories establish a clear, consistent understanding of the historic magnitude of methane emissions within the country, how emissions have changed over time, including current and projected emissions, and show the contribution of source sectors to national total methane emissions to identify those sectors which need to be focused on to achieve large-scale reductions.

#### *This section:*

- Provides a clear, consistent understanding of the magnitude of methane emissions within the country, using internationally recognised methodologies for the quantification of methane emissions.
- Shows the contribution of source sectors to national total methane emissions, to identify those sectors which need to be focused on to achieve large-scale reductions in methane emissions

#### *Content could include:*

- National total methane emissions for recent historical years (e.g. 2010-2020). Where possible, the methane emissions should be extracted from a national greenhouse gas emission inventory which has been developed through a national process and has used internationally recognised methodologies for the quantification of methane emissions (e.g. the Intergovernmental Panel on Climate Change (IPCC) National Emission Inventory Guidelines 2006, or 2019 Refinement).
- Contribution of different source sectors to national total methane emissions. Source sectors should be disaggregated according to internationally recognised (i.e. IPCC) emission source categorisation, wherever possible. Methane emissions should be disaggregated to the finest level of detail available within the national GHG emission inventory. Understanding the contribution of methane from sources at a high level of disaggregation is important to identify those sectors which have the potential to achieve large scale reductions in methane emissions. Representing this information visually via tables and graphs may be useful.
- Methane emissions should be reported in physical units (e.g. tonnes) rather than in units of CO<sub>2</sub>-equivalents. This facilitates consistency and transparency in reporting of methane across countries and avoids inconsistencies due to the application of different global warming potentials.

#### *Data Resources:*

- National or sectoral greenhouse gas emission inventories developed by relevant national ministries
- [Biennial Reports](#) to the UNFCCC
- [National Communications](#) submitted to the UNFCCC
- EDGAR emission database provides methane emission estimates for all countries:  
<https://edgar.jrc.ec.europa.eu/>

#### *Country Examples*

- Uruguay 4<sup>th</sup> Biennial Update Report: <https://unfccc.int/documents/424128>
- UK National Emission Inventory Report: [https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2206220830\\_ukghgi-90-20\\_Main\\_Issue1.pdf](https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2206220830_ukghgi-90-20_Main_Issue1.pdf)
- Ghana 5<sup>th</sup> National Inventory Report:  
[https://unfccc.int/sites/default/files/resource/gh\\_nir5\\_15052022\\_final.pdf](https://unfccc.int/sites/default/files/resource/gh_nir5_15052022_final.pdf)



## Building Block #2: Analytics and Mitigation Measure Assessment

This section identifies and quantifies methane mitigation opportunities/measures, alongside their mitigation potential, impacts, gaps and opportunities, this represents a critical building block for effective national planning.

### *This section:*

- Describes the key policies and measures that will be taken forward in the relevant sectors within the country to reduce methane emissions.
- Outlines the prioritisation of policies and measures at the national level to achieve sectoral emission reductions.
- Presents the quantified methane emission reductions that could be achieved from the implementation of sectoral policies and measures.
- Outlines any co-benefits from the implementation of the methane mitigation measures (e.g. health, crop yield, economic).

### *Content could include:*

- Baseline projection of sectoral methane emissions into the future (to 2030, and to 2040 or 2050 if possible) without implementation of policies and measures. For many countries, population and socioeconomic drivers may increase methane emissions into the future without implementation of specific policies and measures designed to reduce methane emissions. The baseline methane projection therefore outlines the expected increase in methane emissions from this sector that would occur without the implementation of policies and measures that are designed to reduce methane emissions.
- Description of the policies and measures that the country is committed to implement in the national methane roadmap. These policies and measures could include:
  - Measures included in existing plans and strategies: many countries will have existing measures in major methane emitting source sectors such as oil and gas, waste and agriculture included in plans and strategies such as the NDC. These measures should be included in the national methane roadmap.
  - Additional measures: there may be opportunities for methane mitigation that are not covered within the NDC, or other plans and strategies. The National Methane Roadmap can also include policies and measures which increase methane mitigation ambition above what has been committed to in other plans and strategies.
- Evaluation of methane mitigation potential from implementation of policies and measures included in the National Methane Roadmap. This evaluation should state the tonnes of methane that could be reduced from implementation of the policies and measures included in the National Methane Roadmap. The methane emission reductions should be reported for policies and measures individually, as well as the overall methane emission reductions that would be expected from implementation of all measures included in the roadmap.
- Identifying specific methane mitigation measures to achieve a level of methane emission reduction, showing the quantified methane emission reduction from implementation of each individual mitigation measures, and quantifying additional impacts from implementation of each mitigation measure (e.g. health, climate, economic, crop yield, costs of implementation).

### *Data Resources:*

Information for this Building Block is likely to be found in:

- Nationally Determined Contribution mitigation commitments;
- sub-national plans (state/province, major cities);
- corporate/sectoral climate commitments/plans;

- SLCP national strategies;
- *CCAC Guidance Document: Opportunities for Increasing Ambition of Nationally Determined Contributions through Integrated Air Pollution and Climate Change Planning: A Practical Guidance document:*  
<https://www.ccacoalition.org/en/resources/opportunities-increasing-ambition-nationally-determined-contributions-through-integrated>

#### *Country Examples*

- Uruguay 4<sup>th</sup> Biennial Update Report: <https://unfccc.int/documents/424128>
- UK National Emission Inventory Report: [https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2206220830\\_ukghgi-90-20\\_Main\\_Issue1.pdf](https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2206220830_ukghgi-90-20_Main_Issue1.pdf)
- Ghana 5<sup>th</sup> National Inventory Report: [https://unfccc.int/sites/default/files/resource/gh\\_nir5\\_15052022\\_final.pdf](https://unfccc.int/sites/default/files/resource/gh_nir5_15052022_final.pdf)



### **Building Block #3: Targets:**

Identify methane mitigation target(s) endorsed at high political-levels and/or legislation that will achieve reductions in methane emissions. This could include a single national, economy-wide target, sectoral, sub-national, industry target(s) or a combination of targets. Where possible, targets should be communicated in reported in physical units (e.g. tonnes) rather than un unites of CO<sub>2</sub>-equivalents.

#### *This section:*

- Outlines a methane specific reduction target to be achieved by the country

#### *Content could include:*

- A methane-specific emission reduction target with enough information to understand the level of methane mitigation that will be achieved, i.e. base year/baseline methane emissions, percentage reduction in methane emissions compared to base year/baseline, national methane budget/emission ceiling in a particular year.
- A GHG reduction target for a major methane emitting source (refer to BB1).
- Inclusion of methane in the scope of national GHG reduction target.

#### *Data Resources*

Information for this Building Block is likely to be found in:

- Nationally Determined Contribution, Long-term Strategy;
- Sub-national plans (state/province; major cities);
- Corporate/sectoral climate commitments/plans;
- National sustainable development plan

#### *Country Examples*

- Japan's NDC: [https://unfccc.int/sites/default/files/NDC/2022-06/JAPAN\\_FIRST%20NDC%20%28UPDATED%20SUBMISSION%29.pdf](https://unfccc.int/sites/default/files/NDC/2022-06/JAPAN_FIRST%20NDC%20%28UPDATED%20SUBMISSION%29.pdf)
- Uruguay's NDC: [https://unfccc.int/sites/default/files/NDC/2022-06/Uruguay\\_Primer%20Contribuci%C3%B3n%20Determinada%20a%20nivel%20Nacional.pdf](https://unfccc.int/sites/default/files/NDC/2022-06/Uruguay_Primer%20Contribuci%C3%B3n%20Determinada%20a%20nivel%20Nacional.pdf)
- Nigeria's NDC: [https://unfccc.int/sites/default/files/NDC/2022-06/NDC\\_File%20Amended%20\\_11222.pdf](https://unfccc.int/sites/default/files/NDC/2022-06/NDC_File%20Amended%20_11222.pdf)
- Cote d'Ivoire's NDC: [https://unfccc.int/sites/default/files/NDC/2022-06/CDN\\_CIV\\_2022.pdf](https://unfccc.int/sites/default/files/NDC/2022-06/CDN_CIV_2022.pdf)
- Togo's NDC: [https://unfccc.int/sites/default/files/NDC/2022-06/CDN%20Revis%C3%A9es\\_Togo\\_Document%20int%C3%A9rimaire\\_rv\\_11%2010%2021.pdf](https://unfccc.int/sites/default/files/NDC/2022-06/CDN%20Revis%C3%A9es_Togo_Document%20int%C3%A9rimaire_rv_11%2010%2021.pdf)

- Central African Republic's NDC: <https://unfccc.int/sites/default/files/NDC/2022-06/CDN%20Revis%C3%A9%20RCA.pdf>
- Benin's NDC: [https://unfccc.int/sites/default/files/NDC/2022-06/CDN\\_ACTUALISEE\\_BENIN2021.pdf](https://unfccc.int/sites/default/files/NDC/2022-06/CDN_ACTUALISEE_BENIN2021.pdf)
- New Zealand's NDC: <https://unfccc.int/sites/default/files/NDC/2022-06/New%20Zealand%20NDC%20November%202021.pdf>



#### Building Block #4: Implementation pathways for priority measures

This section aims to present a concrete set of actions that are required to achieve the full implementation of the policies and measures included in Building Block #2 for each priority sector within the country.

##### *Content could include:*

- A clear set of actions that can achieve full implementation of the sectoral mitigation measures. Different methods can be used to summarise and visualise the set of actions identified for a particular measure. Figures 1 and 2 below show how measures to increase waste separation and composting of organic waste in Nigeria were summarised along the waste value chain (Figure 1) and in a logical framework analysis (Figure 2) (Source: Malley et al. 2021). These approaches show how a set of action combine to achieve implementation of the measures.
- In addition, the action included to implement each measure should clearly identify the institution responsible for their implementation, possible barriers to their implementation, how each action could be financed and the indicators to monitor their implementation.
- Types of action that are relevant for the implementation of a mitigation measure include regulations, laws, infrastructure development, resource mobilization, training and capacity building, technological advancement, communication etc.
- The assessment of barriers to implementation of the mitigation measures also needs to identify possible enabling actions that can overcome these barriers (e.g. access to finance, regulation, political will, access to technology etc.)
- The timeline to achieve each of the actions in the implementation plan should also be outlined, and what effect barriers may have on delaying the achievement of this timeline.
- When a coherent implementation has been developed, it should be possible for the reader of the Methane Roadmap to understand exactly how the priority mitigation measures (building block #2) identified to achieve a methane emission reduction target (building block #3) will be implemented, and what resources will be needed to achieve this implementation.

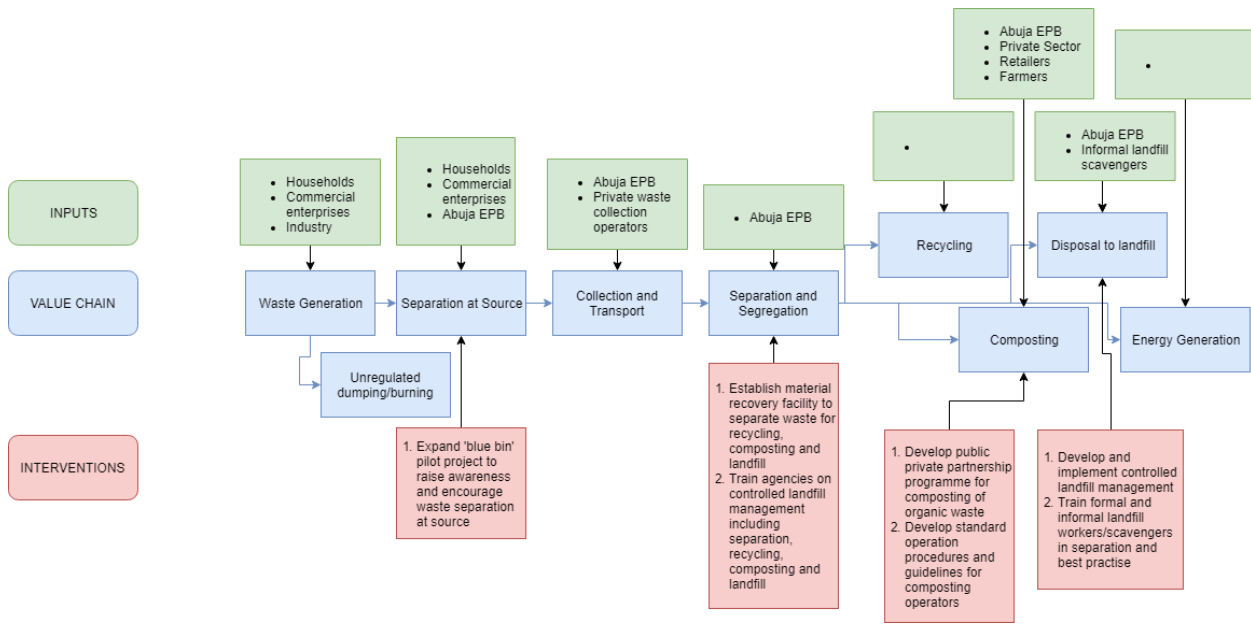
##### *Possible Resources to complete section:*

- Guidance Document: National Planning for reducing short-lived climate pollutants (SNAP): <https://www.ccacoalition.org/en/resources/guidance-document-national-planning-reducing-short-lived-climate-pollutants-snap>
- Integration of climate change mitigation and sustainable development planning: Lessons from a national planning process in Nigeria: <https://www.sciencedirect.com/science/article/pii/S1462901121002422#sec0055>

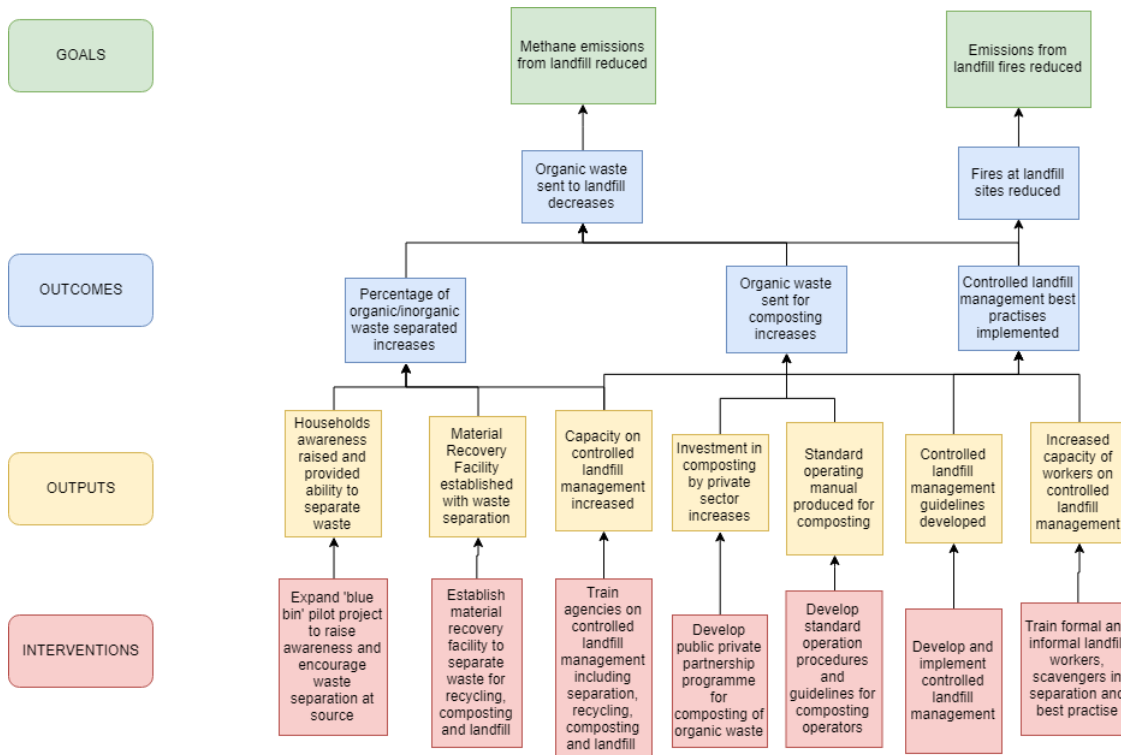
## Framework for Development of Implementation Pathways

Implementation pathways aim to break down priority mitigation measures into the steps or actions needed for their implementation. A possible approach for the development of these implementation pathways is outlined in Malley et al. (2021), and includes 4 steps:

- 1. Development of a value chain relevant for each mitigation measure:** In this application, a value chain summarizes the system that the mitigation measure(s) seeks to change (e.g. rice production, waste management, oil and gas production etc.). A value chain decomposes a system into the set of steps that represent the whole system. Greater detail on the steps can be provided for those that are particularly important to the implementation of mitigation measures. Figure 1 below shows an example value chain for solid waste management, with the value chain described from waste generation to collection, and final disposal and treatment through different waste streams.
- 2. Identification of actions within the value chain to implement mitigation measure:** The disaggregation of the system where a measure is implemented into its different components provides the basis for assessing what actions are needed to implement a measure across the whole system. For each component of the system, actions should be identified that could contribute to achieving the measure. This identifies where in the system actions needed to be taken to achieve implementation of the mitigation measures. Figure 1 shows an example of these actions for sold waste management in Abuja, Nigeria.
- 3. Development of logical framework to assess how actions contribute to achieving emission reduction goals:** A Logical Framework Analysis can be used to outline how implementation of the actions identified across the value chain would combine to achieve the expected goal of the intervention (i.e. the estimated emission reductions). For each action, a specific *output* should be identified that would result directly from the successful achievement of this action. Higher-level, or longer-term *outcomes* from achievement of an action (or, in many cases, combinations of multiple actions) can then be identified next, and finally, the *goal*, in most cases the successful implementation of the measure, resulting from the achievement of all outcomes, is identified. The logical framework aimed to create a link between the actions identified along the value chain to achieve the implementation of the mitigation measure, and to highlight where additional actions may be needed.
- 4. Identify key information on implementation of each action:** Key information for each identified action that provide an understanding of how it is implemented includes the organizations responsible, the funding necessary and its likely source, and the indicators that can monitor its implementation. An example table for each action is shown in Table 1.
- 5. Identification of indicators to monitor and evaluate implementation of mitigation measure:** The logical framework analysis developed in Step 3 provides the basis for the identification of indicators that can monitor and evaluate the implementation of each mitigation measure. Indicators were identified for all outputs, outcomes, and goals in the logical framework analysis. The aim of defining indicators at these levels is to allow progress toward the overall goal to be monitored, but also the actions that were identified for the goal itself to be achieved. Achievement of outputs and outcomes can show whether progress is being made in implementing the mitigation measure, and can also highlight where the Logical Framework Analysis is incomplete or requires revision (e.g. if actions are implemented but achievement of outcomes and/or goals do not follow, or if outcomes and/or goals are achieved without implementation of a particular action). This provides the basis for achieving Building Block 5.



**Figure 1.** Value chain analysis identifying actions needed to implement the Measure: 'Reduction of methane emissions and open burning of waste at dump sites'



**Figure 2.** Logical framework analysis identifying actions needed to implement the Measure: 'Reduction of methane emissions and open burning of waste at dump sites'

**Table 1:** Example information needed to understand how to implement each action

1. Action/What					
2. Why					
3. Who					
4. How					
5. Where					
6. Barriers					
7. Finance	Cost	Method	Value	One-off or recurring	Source
8. Timing					
9. Enablers/ Context/ Progress Made					
10. Monitoring and Evaluation	Indicator	Source	Baseline	Frequency of reporting	Who is responsible for reporting
11. Benefits and long-term outcomes					



**Building Block #5: Monitoring, Reporting and Verification**

The aim of this section is to outline how the implementation of the National Methane Roadmap will be monitored and tracked over time, and how updates to the roadmap will be made in response to the speed of implementation

*Content could include:*

- A monitoring and evaluation plan for each of the measures included in the National Methane Roadmap. The M&E plan should include:
  - Indicators of outcome, i.e. monitoring as to whether a mitigation measures has achieved its intended goal (e.g. to reduce methane from a particular sources)
  - Indicators of implementation, i.e. monitoring as to whether the actions included in the implementation pathway for each measure have been achieved as intended
- For each indicator included in the M&E plan, the institution responsible for reporting on that indicator, and the source of data that will be used to collect information about that indicator should be specified.

- Table 1 below shows a set of M&E indicators for the example mitigation measure in the waste sector in Nigeria (source: Malley et al. 2021), that corresponds to the implementation pathway described in Figures 1 and 2.
- Outline the institutional arrangements for monitoring implementation of the plan, including responsibility for M&E, updating GHG emission inventory to include methane, and responsibility and frequency for updating and revising National Methane Roadmap

**Table 1.** Monitoring and evaluation indicators for Measure X. Reduction of methane emissions and open burning of waste at dump sites

	Overview	Indicators	Institution Responsible	Data source
Goal	Methane emissions from landfill reduced	Annual methane emissions from MSW sent to landfills		
	Emissions from landfill fires reduced	Emissions of air pollutants from MSW waste burning		
Outcomes	Organic waste sent to landfill decreases	Tonnes of organic waste sent to landfill		
	Percentage of organic waste separated increases	Percentage of organic waste separated from other waste		
	Organic waste composted increases	Tonnes organic waste composted		
	Controlled landfill management practises implemented	Number of sites operating to best practise guidelines		
	Fires at landfill sites reduced	Number of fires at landfill sites		
Outputs	Household awareness raised and ability to separate waste provided	Number of households reached in awareness raising campaign		
	Material recovery facility established	Establishment of material recovery facility		
	Capacity on controlled landfill management increased	Number of people trained on principles of controlled landfill management		
	Investment in composting by private sector increases	Funding allocated to composting		
	Standard operating manual produced for composting	Manual produced and published		
	Controlled landfill management guidelines developed	Guidelines developed and published		
	Increased capacity of workers on controlled landfill management	Number of workers trained to implement controlled landfill management		



## ANNEX 1 – ROADMAP REFERENCES

The following are additional reference materials, guidelines and examples for sectoral roadmaps.

### Oil & Gas

- [Driving Down Methane Leaks from the Oil and Gas Industry](#) – Regulatory Roadmap | IEA

### Energy/Coal

- [Net Zero by 2050](#) – Roadmap for the Global Energy Sector | IEA
- [Technology Roadmap](#) – High-Efficiency, Low-Emissions Coal-Fired Power Generation | IEA
- [Energy Roadmap 2050](#) – Roadmap for the EU Energy Sector | European Commission
- [Energy Efficiency Roadmap](#) – Roadmap for Energy Security in Bhutan | Royal Government of **Bhutan**, UNDP Bhutan
- [Coal Reduction Strategy and Roadmap for the Zhejiang Province](#) – Roadmap for the 14th Five-Year Plan Period and the Longer-Term | Zhejiang Economic Information Center, **China**
- [An Energy Sector Roadmap to Carbon Neutrality in China](#) – Roadmap for energy sector in **China** | IEA

### Waste

- [Municipal Solid Waste Management](#) – Roadmap for Reform for Policy Makers | World Bank
- [Roadmap for Sustainable Waste Management and Resource Circulation in South Asia](#) – Strategic Roadmap | SACEP, IGES, UNEP-IETC
- [National Strategic Roadmap on Integrated Waste Management](#) – Strategic Roadmap | Government of the Republic of **Sierra Leone**

### Agriculture

- [Realizing a New Vision for Agriculture](#) – A roadmap for stakeholders | World Economic Forum
- [Food and Agriculture Roadmap](#) – Policy Recommendations Roadmap | WBCSD
- [Australian Agriculture’s Plan for a \\$100 Billion Industry](#) – 2030 Roadmap | National Farmers Federation of **Australia**
- [Development of a New National Agriculture Sector Strategy \(NASS\) and National Agriculture Investment Plan \(NAIP\) for Yemen](#) – Roadmap for Policymaking | Ministry of Agriculture and Irrigation of the Republic of **Yemen**