

Afghanistan Oxygen Scale-up Partners Workshop Report

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WHO EMRO WHE/IHP



Eastern Mediterranean Region

EMRO Mission Members

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Executive Summary

The Afghanistan Oxygen Scale-up Partners Workshop brought together key stakeholders to review the current state of medical oxygen access and explore strategic directions for developing a National Oxygen Roadmap. This report summarizes findings from partner presentations, group discussions and collaborative sessions, offering a foundation for Afghanistan's efforts to scale up oxygen access.

Throughout the workshop, partners shared insights into their ongoing activities, challenges, and priorities regarding oxygen access in Afghanistan. Presentations highlighted significant gaps in technical capacity, infrastructure, and coordination, and funding which collectively limit the availability and reliability of medical oxygen across the country. Key findings included a shortage of trained biomedical engineers and technicians, frequent power outages affecting oxygen plants, and fragmented data-sharing practices. These issues underscored the need for stronger multisectoral collaboration and a unified approach to oxygen supply management.

The findings from the workshop were integrated to form recommendations for roadmap development. Specific tools and methods were proposed to guide data collection and implementation planning, with key partners assigned roles in the drafting process to bring cross-sector expertise into creating a comprehensive and actionable roadmap. By leveraging insights from this workshop, Afghanistan can take critical steps toward building a resilient oxygen ecosystem capable of supporting routine and emergency health needs.

Background

Oxygen is a critical, life-saving essential medicine with no substitute. The COVID-19 pandemic highlighted severe inequities in access to medical oxygen, with countries including Afghanistan disproportionately affected by shortages, leading to preventable fatalities. Despite oxygen supplies and support received during the pandemic, access gaps remain. To address these, a shared understanding of oxygen demand in both routine and surge situations, along with clear insights into the scale and type of support needed for cost-effective health system strengthening is required. A unified strategy is essential to maximize resource use and prevent duplicated efforts.

This workshop aimed to bring all stakeholders together to foster collaboration and develop a unified strategy for strengthening the oxygen ecosystem in Afghanistan.

Workshop Objectives

- Convene a national workshop bringing together state and non-state actors working in the oxygen space creating a coordination mechanism to support effective partnerships, advocacy and leveraged capabilities to increase and sustain medical oxygen in Afghanistan.
- Share and interpret collective medical oxygen ecosystem data for a nationally representative situational analysis and resource mapping toward having a system in place for tracking medical oxygen in Afghanistan.
- Obtain consensus on data sharing procedures, prioritizations based on needs assessments, and roles and responsibilities towards the development of a costed national oxygen strategy and a monitoring & evaluation framework for carrying out the priority actions in Afghanistan.
- Develop final recommendations for a national oxygen roadmap, focusing on collaboration, coordination, data sharing, key priority actions, addressing challenges, and establishing benchmarks for scaling up medical oxygen in Afghanistan.

Introduction

This report is organized into three parts as follows:

Part 1: A summary of findings from partner presentations on their oxygen-related activities, challenges and priorities in Afghanistan.

Part 2: Findings from group work sessions conducted on second day of the workshop.

Part 3: Recommendations for developing a national oxygen roadmap for Afghanistan.

Part 1: Findings from Partners Presentations

This section provides a summary of findings from presentations by key medical oxygen stakeholders. Each presentation highlighted the partners' contributions and focus areas, challenges and priorities for the future. These insights help identify strategic opportunities for collaboration and inform targeted interventions to improve quality, accessibility and sustainability of medical oxygen across Afghanistan's health system.

Current activities and focus areas of partners

Organizations	Focus areas and key activities
Ministry of Public Health (MoPH) – Biomedical engineer	<ul style="list-style-type: none"> • Establishment of a national oxygen task force. • Installation, maintenance and repair of PSA plants. • Data collection for the biomedical equipment central database. • Development of SOPs and technical trainings.
World Health Organization (WHO)	<ul style="list-style-type: none"> • Data collection for the Live Oxygen Platform (LOP), a data platform showing oxygen production capacity and requirements in real time. Data shared with MoPH but not yet with partners. • Conducting in-depth mapping of all PSA plants in the country. • Supporting with coordination of all stakeholders towards common goal of scaling up of oxygen in the country e.g. by convening this workshop. • Procurement of 3 oxygen PSA plants for Indira Gandhi Hospital to be commissioned in December 2024 or January 2025.
UNICEF	<ul style="list-style-type: none"> • Systematic contribution to enhance oxygen access in Afghanistan. • Initial procurement of 10 PSA oxygen plants across 10 provinces (1 currently functional, assessments conducted and feasibility of repairing the 9 remaining plants is being evaluated). • In the process of procuring 4 or 6 additional PSA plants to be available in 2025.
Aga Khan Health Services (AKHS)	<ul style="list-style-type: none"> • Installed two oxygen plants in Faizabad Provincial Hospital which are used to supply oxygen to 114 health facilities. • Installed two oxygen plants in Bamyan Provincial Hospital which are used to supply oxygen to 74 health facilities. Central piping also installed in three district hospitals in Bamyan.

	<ul style="list-style-type: none"> • AKHS mechanical and biomedical engineers provide 24/7 technical support to the oxygen plants. • Procure oxygen cylinders from the local market to supply oxygen to 84 health facilities in Baghlan. Central piping installed in critical departments of Baghlan district hospital. • Regularly collecting data on oxygen consumption and cylinder costs for each supported hospital, though data is not currently being shared with partners.
Medecins Sans Frontieres (MSF)	<ul style="list-style-type: none"> • Running active projects in 7 hospitals in the country. • 13 biomedical technicians across these hospitals conduct maintenance and repairs on the biomedical equipment. • Manage 315 oxygen concentrators (5LPM & 10LPM) in active use. • 102 oxygen concentrators (5 & 10LPM), 37 oxygen generators (20 & 30LPM) and 6 PSA oxygen plants in storage.
Afghanistan Private Hospitals Association (APHA)	<ul style="list-style-type: none"> • Private hospitals serve as referral centers for ICU & CCU care, cardiac, radiology, laboratory investigations etc. • Larger facilities have great experience in usage of medical oxygen and in recruitment & training of medical staff. • Most hospitals that deliver advance healthcare have central oxygen system with piping installed and stable electricity.

Note: Partners from Jhpiego are also members of the National Oxygen Taskforce but were unable to attend the workshop. Partner from International Medical Corps (IMC) attended the workshop but did not give a presentation at this stage.

Common challenges across partners

The key challenges identified by the MoPH and partners in enhancing oxygen services in Afghanistan are outlined below.

- **Limited technical and engineering capacity:** Small or insufficient teams of biomedical engineers and technicians struggle to support facilities across the country, with limited tools and inadequate training in advanced troubleshooting and maintenance of PSA plants.
- **Training and capacity building gaps:** Partners highlighted a need for comprehensive training to equip clinical and technical staff with essential skills in safe oxygen administration and handling, along with best practices in oxygen therapy.
- **Insufficient infrastructure and maintenance resources:** Most facilities lack maintenance plans, service contracts and reliable access to spare parts. This is compounded by inadequate budgets for maintaining existing plants and expanding infrastructure.
- **Non-standard and improper installations:** Some PSA plants are installed in unsuitable areas with non-standard piping, increasing risks and inefficiencies.

- **Supply chain and quality assurance problems:** Challenges with availability of spare parts and lack of quality assurance related to oxygen cylinders in facilities and in the local market create safety and operational issues.
- **Electricity challenges:** Frequent power cuts disrupt oxygen production, affecting service availability and causing additional wear on the PSA plants. These outages also raise costs as diesel generators are required to maintain continuous operation.
- **Lack of coordination and data management:** Absence of a coordinated approach among partners and government agencies, as well as a lack of centralized data management platform limit information sharing and efficacy of support.

Future priorities, activities and projects across partners

Below is a summary of the collective priorities and activities identified by the MoPH and partners.

- **Policy development and strengthening coordination:** Strengthen the existing national oxygen technical working group to enhance collaboration among stakeholders and support the development of a comprehensive national oxygen roadmap.
- **Training and capacity building:** Prioritize training for PSA plant operators, biomedical engineers and technicians, along with enhancing technical capacity at provincial and district hospitals to serve even the most remote areas.
- **Infrastructure expansion and maintenance:** Expand oxygen infrastructure to underserved areas by developing a comprehensive plan for repair and restoration of existing non-functional PSA plants, evaluating the feasibility of relocating plants to high-need regions, and procuring new plants.
- **Spare parts and resource management:** Establish a spare parts inventory to maintain consistent supply and coordinate efforts to ensure procured equipment have spare parts readily available in the local market
- **Funding and sustainable financing:** Develop sustainable funding strategies to support long-term oxygen infrastructure and maintenance needs, and advocate for increased funding to prioritize oxygen access.
- **Awareness and advocacy:** Raise awareness of the vital role of medical oxygen in healthcare by implementing educational initiatives for healthcare workers and the community. Collaborate with stakeholders to emphasize the necessity of oxygen access in policy and funding discussions.

Core Membership of the National Oxygen Task Force.

After the presentations, participants reaffirmed the role of the existing National Oxygen Task Force, with core membership from the following organizations: MoPH, WHO, UNICEF, MSF, Jhpiego, AKHS, IMC and APHA. Members from other organizations or government ministries may be invited as needed or assigned roles within sub-task forces to address specialized areas.

The task force members agreed to meet at least once a month, with each meeting guided by clear objectives, documented outcomes and detailed minutes to support follow-up actions and accountability. Upcoming meetings should prioritize discussions on the development of the National Oxygen Roadmap to establish a framework for sustainable oxygen access, while also addressing immediate needs by developing a plan to repair and activate PSA plants to improve oxygen availability as quickly as possible.

While specific comments from partners have been integrated into the recommendations for the National Oxygen Roadmap in Part 3, the following points have been identified for further discussion during upcoming Oxygen Task Force meetings:

- Can MSF donate the 102 oxygen concentrators (5 & 10LPM), 37 oxygen generators (20 & 30LPM) and 6 PSA oxygen plants in storage to the MoPH?
- What is required for AKHS to provide training on maintenance of medical equipment to other biomedical engineers and technicians?
- Consider inviting all PSA plant donors to become members of the oxygen task force and discuss others that should be invited.
- Discuss the plan for repair of PSA plants donated by partners, as summarized in Annex A.

Part 2: Findings from the Group sessions

This section provides a summary of findings from two group work sessions conducted on the second day of the workshop, as well as an overview of the two open discussion sessions held.

Group work 1 - Collaboration, coordination and data sharing

Participants worked in groups to address critical aspects of coordination and information sharing related to medical oxygen access and supply. Specifically, participants were asked to:

- i. Evaluate the current coordination framework for medical oxygen in Afghanistan and identify improvements needed for sustainable access.
- ii. Review national forecasting and data-sharing practices for medical oxygen, identifying gaps and suggesting improvements.

Recommendations identified by participants for improving coordination included –

- Expanding the oxygen task force to sub-national level.
- Inviting members from other government ministries (e.g. Ministry of Education, Ministry of Higher Education, Ministry of Finance, Ministry of Commerce and Industry).
- Incorporating various methods of communication such as email, WhatsApp, online meetings to ensure broader accessibility and engagement.

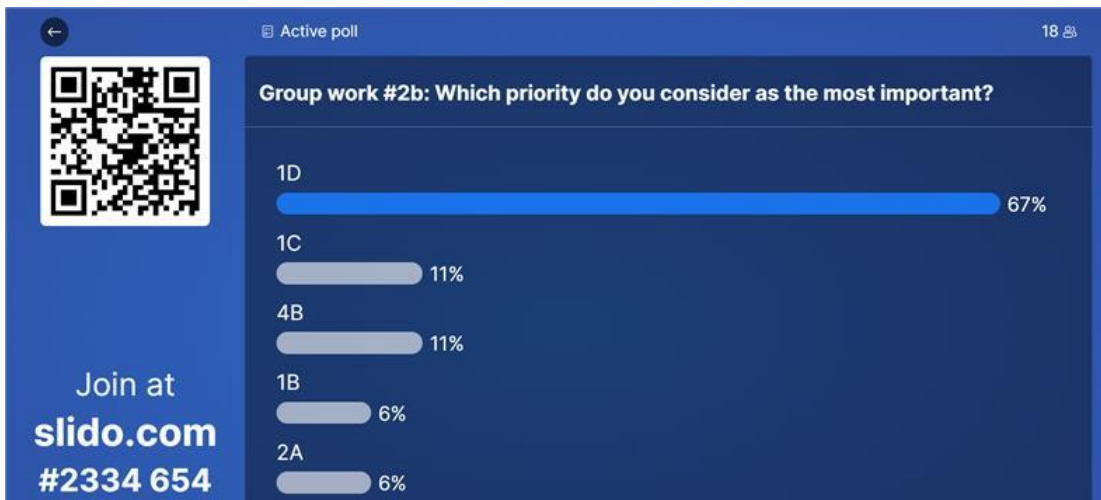
Recommendations identified for strengthening forecasting and data sharing practices included -

- Establishing a central database to consolidate data from various stakeholders and sources, enabling regular data analysis and integration with existing data collection platforms.
- Standardization of data collection protocols and training on data management, interpretation and utilization.
- Conducting regular audits and quality checks to maintain accuracy and reliability for effective planning.

Group work 2 – Identifying priorities and addressing challenges

In the second group work session, participants were tasked with categorizing activities from the WHO “Increasing access to medical oxygen” resolution, as outlined in the Increasing Access to Medical Oxygen Scorecard (ATMO2S) into priority timelines: immediate (0 – 6months), short-term (6months – 1year) or long-term (1.5 years – 3 year).

Following this, participants were asked to select the highest immediate priority from these activities. Results of the poll are shown in the image below and can serve as a reference to guide discussions during subsequent meetings of the National Oxygen Taskforce.



Descriptions of voted priorities

1D - Strengthen coordination mechanisms across state and non-state actors to support effective partnerships, evidence use, advocacy and leveraged capabilities to increase and sustain oxygen access.

1C - Include medical oxygen in national emergency and disaster preparedness and response plans and drills.

4B - Have sufficient trained biomedical engineers/technicians, with access to appropriate equipment and supplies, to manage medical oxygen technology safely and effectively.

1B - Include medical oxygen into national strategic and operational health plans (e.g., as a National Oxygen Strategy) which includes a realistic costing and financing plan

2A - Increase ability to produce or acquire sufficient medical oxygen supply to meet need during routine conditions.

Session 3 introduced Key Performance Indicators for the medical oxygen ecosystem, identifying critical metrics for Afghanistan and requirements for integrating their monitoring within local context. And in the final session of the day, participants were introduced to the National Oxygen Roadmap template in Annex B, and they engaged in an open discussion to explore methodologies for gathering essential data, identify partners for key sections of the roadmap and establish time frames for implementation.

The insights from these discussions have been integrated into the recommendations outlined in part 3.

Part 3: Practical recommendations towards development of a National Oxygen Roadmap for Afghanistan

This section provides actionable recommendations to guide the development of a comprehensive National Oxygen Roadmap for Afghanistan drawing on insights from partner presentations and broader workshop discussions. The goal is to establish a clear, strategic framework that enables Afghanistan to improve access to medical oxygen sustainably and equitably. Suggested leads and supporting partners for each section of the roadmap are included to ensure coordinated and effective implementation.

This section should be reviewed in conjunction with the oxygen roadmap template provided in Annex B, which serves as the primary framework. The recommendations below offer supplementary guidance.

SECTION 1: Situation analysis

Conduct a comprehensive situation analysis to gain a thorough understanding of Afghanistan's current oxygen ecosystem to identify gaps and opportunities.

Key activities

Hypoxemia context and review of national health guidelines and policies.

- Conduct a literature review and use available morbidity and mortality data to quantify the impact of limited oxygen access on key health indicators, especially for high burden conditions such as tuberculosis, pediatric pneumonia, maternal and neonatal conditions.
- Review all existing national health strategies and clinical guidelines related to medical oxygen to identify gaps.

Lead: MoPH, WHO and UNICEF

Supporting partners: AKHS, Jhpiego, MSF, IMC, APHA

Oxygen quantification and gap analysis

- Baseline data on all existing oxygen sources in public hospitals (PSA plants and oxygen concentrators) can be obtained from WHO's Live Oxygen Platform (LOP).
- Data on PSA plants in private facilities can be obtained from APHA.
- UNICEF OSPT is recommended to be used to forecast the oxygen need at facility and national levels. The tool can also support in identifying supply sources needed to meet demand, including essential accessories, spare parts and oxygen delivery consumables. Required input data can be sourced from partners.
- Evaluate the availability and training gaps of clinical and technical staff in oxygen administration, equipment operation, and maintenance to identify capacity-building needs. Indicators from ATMO2S can be used to support.

SECTION 2: Goals and objectives

Define the vision, mission and strategic objectives of the roadmap.

Key activities

- Establish clear, overarching goals that align with national health priorities, SDGs, the WHO Increasing access to medical oxygen resolution, and other relevant global targets for healthcare quality and access.
- Define the key strategic objectives that will guide the roadmap such as improving oxygen infrastructure, training a competent workforce, ensuring sustainable financing.

Lead: MoPH & WHO

Supporting partners:
UNICEF

SECTION 3: Governance, management and coordination

Outline the governance, management, and coordination framework needed to establish effective collaboration, accountability, and oversight for implementing the national oxygen roadmap.

Key activities

- Identify all stakeholders including other government ministries and agencies, national and international organizations and private companies relevant for oxygen scale up in Afghanistan.
- Outline the roles and responsibilities of each of these towards scaling up oxygen in Afghanistan.
- Define a clear governance structure showing the decision-making hierarchy and how each partner fits into the overall structure.

Lead: MoPH & WHO

Supporting partners:
UNICEF, AKHS, MSF,
IMC, Jhpiego, APHA

SECTION 4: Implementation plan

Section 4 of the roadmap template in Annex B outlines essential considerations for interventions and activities to be implemented. Additionally, the challenges identified by partners during their presentations, along with insights from the WHO Increasing Access to Medical Oxygen resolution and ATMO2S data can help identify additional gaps and potential interventions specific to the Afghan context.

Key activities

- Outline the broad interventions to be implemented, along with the key activities under each intervention ensuring alignment with the strategic objectives of the roadmap.
- Create a phased roadmap implementation workplan outlining realistic milestones, timelines and resources required for each stage.
- Clearly assign roles and responsibilities for each phase to relevant partners, ensuring accountability.
- Include regular review intervals to monitor progress towards achieving the goals of the roadmap.

Lead: MoPH &
Jhpiego

Supporting partners:
WHO, UNICEF,
AKHS, MSF, IMC,
Jhpiego, APHA

SECTION 5: Monitoring, evaluation and operational research

Establish a robust M & E framework to track progress, measure impact and enable continuous learning and adaptation for the roadmap's development and implementation.

Key activities

- [WHO's KPIs for medical oxygen ecosystem](#) discussed during the workshop can be used to support in defining relevant KPIs to track progress.
- Consider indicators to track progress for each of the interventions to be implemented over the defined period.
- Outline a system for regular data collection, reporting and analysis at the facility and national levels. This includes setting up data collection intervals, methods and reporting lines.
- If a Health Management Information System (HMIS) exists, determine essential oxygen-related indicators to be integrated for comprehensive monitoring.
- Establish a plan for compiling and disseminating progress reports.

Lead: MoPH & AKHS

Supporting partners:
MSF, IMC, WHO

SECTION 6: Costing

After the key interventions are outlined, create a financial analysis and costing framework that details capital and operational expenses for sustainable oxygen access.

Key activities

- Use [UNICEF OSPT](#) and [WHO oxygen tools](#) to estimate CAPEX and OPEX budget required for infrastructure investments. Local market costs can be sourced from AKHS, APHA and other partners.
- Estimate costs for all other strategic activities over the duration of implementation of the roadmap as detailed in the roadmap template.
- Analyze and outline potential funding sources including government budgets, donor funding and private investments.
- Work with APHA and private oxygen companies to develop strategies for leveraging public-private partnerships, identifying opportunities for cost-sharing, technical support and investments from the private sector.

Lead: MoPH &
UNICEF

Supporting partners:
WHO, AKHS, APHA

Annex

Annex A: Interim data on PSA plants in Afghanistan (data validation is ongoing)

No	Hospital	Province	Donor	Status
1	Ustad Burhanuddin Rabani Shaheed Hospital	Badakhshan	AKHS	Functional
2	Ustad Burhanuddin Rabani Shaheed Hospital	Badakhshan	AKHS	Functional
3	Pul-e-Khomri Molki Hospital	Baghlan		Functional
4	Mazar-i-Sharif Regional Hospital	Balkh		Non-functional
5	Mazar-i-Sharif Regional Hospital	Balkh	UNICEF	Functional
6	Bamyan Provincial Hospital	Bamyan	AKHS	Functional
7	Bamyan Provincial Hospital	Bamyan	AKHS	Functional
8	Dykundi Hospital	Daykundi		Functional
9	Farah Hospital	Farah	UNICEF	Non-functional
10	Farah Covid-19 and Infectious Diseases Hospital	Farah		Functional
11	Mimana Hospital, New Building	Faryab		Non-functional
12	Old Building of Hospital which is now Public health Directry	Faryab	UNICEF	Non-functional
13	Ghazni Regional Hospital	Ghazni		Non-functional
14	Ghor Hospital	Ghor	Coordination of Humanitarian Assistance (CHA)	Non-functional
15	Lashkar Gah Hospital (Bost Hospital)	Helmand	UNICEF	Non-functional
16	Herat 650 bed Regional Hospital	Herat		Functional
17	100-Bed Shaheed Basim Infectious Diseases Hospital	Herat	UNICEF	Non-functional
18	100-Bed Shaheed Basim Infectious Diseases Hospital	Herat	Cordaid	Functional
19	Stare-General Abdul Rashid Dostum 200 Beds Hospital	Jawzjan	UNICEF	Non-functional
20	Afghan Indonesia Poly Clinic Hospital	Kabul		Non-functional
21	Afghan Japan Communicable Diseases Hospital	Kabul		Non-functional
22	Jamhoryat Hospital	Kabul		Non-functional
23	Wazir Akbar Khan Hospital	Kabul		Functional
24	Abni Sina Emergency Hospital	Kabul		Functional
25	Indra Gandhi Child Health Hospital	Kabul		Functional
26	Indra Gandhi Child Health Hospital	Kabul	UNICEF	Functional
27	Indra Gandhi Child Health Hospital	Kabul	WHO	Not commissioned
28	Indra Gandhi Child Health Hospital	Kabul	WHO	Not commissioned
29	Indra Gandhi Child Health Hospital	Kabul	WHO	Not commissioned
30	KhairKhana Hospital	Kabul		Non-functional
31	Sardar Mohammad Dawood Khan 400 beds hospital	Kabul		Functional

32	Sardar Mohammad Dawood Khan 400 beds hospital	Kabul		Non-functional
33	Sheikh Zahed Hospital	Kabul		Functional
34	Sheikh Zahed Hospital	Kabul		Non-functional
35	Police 300 Beds Hospital	Kabul		Functional
36	French Medical Institute for Mothers and children (FMIC)	Kabul		Functional
37	French Medical Institute for Mothers and children (FMIC)	Kabul		Functional
38	French Medical Institute for Mothers and children (FMIC)	Kabul		Functional
39	Aino Meana 350 beds Hospital	Kandahar		Non-functional
40	Mirwais Hospital	Kandahar	Jhpiego	Functional
41	Asadabad Provincial Hospital	Kunar	HealthNet TPO	Functional
42	Kunduz Regional Hospital	Kunduz		Functional
43	Khan Abad District Hospital	Kunduz		Non-functional
44	Mehtarlam Provincial Hospital	Laghman	HealthNet TPO	Non-functional
45	Naeb Aminullah Khan Logari Hospital	Logar		Non-functional
46	Nangarhar Regional Hospital	Nangarhar		Non-functional
47	Neshtar Kidney National Hospital	Nangarhar		Not installed
48	Nimroz Covid-19 and Infectious Diseases Hospital	Nimroz	Cordaid	Non-functional
49	Nimroz Covid-19 and Infectious Diseases Hospital	Nimroz		Non-functional
50	Nimroz Covid-19 and Infectious Diseases Hospital	Nimroz		Non-functional
51	Paktia Regional Hospital	Paktia		Non-functional
52	Paktia Regional Hospital	Paktia		Non-functional
53	Paktia Regional Hospital	Paktia	UNICEF	Non-functional
54	Parwan Provincial Hospital (new building)	Parwan	UNICEF	Non-functional
55	Covid-19 Hospital	Samangan	UNICEF	Non-functional
56	Dr. Akramuddin Wakil zada Provincial Hospital	Samangan		Functional
57	Sar-e-pul Hospital	Sar-e-pul	UNICEF	Non-functional
58	Shaheed Ahmad Shah Masood Hospital	Takhar		Functional
59	Covid-19 Hospital Takhar	Takhar		Non-functional
60	Terinkot Hospital	Uruzgan	Cordaid	Functional
61	Zabul Hospital	Zabul		Non-functional

Note: PSA plants that can be powered on but operate with limited functionality due to significant maintenance needs are marked as non-functional.

61 total PSA plants were identified in public hospitals in the country (26 functional, 31 non-functional, 3 not yet commissioned, 1 not installed).

Out of the 34 total provinces in Afghanistan,

- there are 7 provinces with no PSA oxygen plants installed at all: Badghis, Kapisa, Khost, Nuristan, Paktika, Panjshir, Wardak
- there are 10 provinces with PSA oxygen plants installed but none are functional: Faryab, Ghazni, Helmand, Jawzjan, Logar, Nangarhar, Nimroz, Paktia, Parwan, Zabul

Annex B: Additional resources

- [Published oxygen roadmaps from other countries](#)
- [WHO Increasing access to medical oxygen resolution](#)
- Oxygen Roadmap Template

Oxygen Roadmap Template

Zero draft

SECTION 1: Situation analysis

1.1	Hypoxaemia context: Summarize burden of hypoxaemic disease, hypoxaemia outcome trends, determinants and causes of hypoxaemia. Provide appropriate level of disaggregation (e.g. by age, sex, location, ethnicity, socioeconomic status and disability).
1.2	Multisectoral stakeholder landscaping.
1.3	Review of national regulations/standards related to oxygen: Review existing national regulations and standards covering quality/safety standards for medical oxygen. Mention if oxygen is included in national essential medications list; mention if medical devices for oxygen therapy are included in a national list; note programmes with oxygen in their strategic and operational plans, such as RMNCAH, COVID-19 and surgery.
1.4	Review of existing national health strategies and clinical guidelines relating to medical oxygen: Include discussions of previous oxygen roadmaps and the results of their implementation.
1.5	Oxygen quantification and gap analysis: Assess the scale of medical oxygen access gaps in the health system, including at subnational- and local-level health facilities, needed to provide patients with: <ul style="list-style-type: none">• the required amounts of medical oxygen and related diagnostic tools (including pulse oximeters and patient monitors);• medical devices that deliver oxygen therapy (including invasive and non-invasive ventilators and continuous positive airway pressure); and• qualified staff availability.
1.6	Percentage of health facilities with reliable oxygen supply.

SECTION 2: Goals and objectives

2.1	Context: Provide context for objectives and goals informed by and consistent with internationally agreed recommendations including universal health coverage, Sustainable Development Goals, Safe Hospitals and World Health Assembly resolution 76.3; emphasize commitment to equity.
2.2	Impact goals: Describe overall impact goals related to patient outcomes or universal access to oxygen.
2.3	Objectives: List objectives with outcomes that are SMART: specific, measurable, achievable, relevant and time-bound.

SECTION 3: Governance, management and coordination

3.1	Governance: Describe multisectoral and multistakeholder governance arrangements at both national and subnational levels that specify management, oversight, coordination, consultation and reporting mechanisms. Consider specific mechanism for intra-governmental coordination to facilitate a whole-of-government approach to implementation.
3.2	Oxygen task force: Establish or maintain taskforce(s) or technical working group(s) including key stakeholders and subject matter experts to advise and support implementation of the roadmap.
3.3	Advocacy and communication: Promote engagement of all relevant stakeholders and implementation of planned actions at national and subnational levels.
3.4	Linkages to other oxygen-relevant sectoral strategies and plans: Recognize the role of oxygen in emergency preparedness and response by referring to the following national assessments and plans: Joint External Evaluation (of International Health Regulation capacities) and National Action Plan for Health Security.

Transparency

3.5	Description of roadmap/policy/strategy development process: Provide details of stakeholder and technical advisor participation, including which stakeholders from which sectors were involved in the development process – starting from validation of the situation analysis, as specific to the national context. Also describe how the consultation process ensures lead by government and effective participation of all stakeholders at local and national levels, so they can provide input systematically, with reasonable deadlines and time for consultation, into plan development and in foreseen annual operational planning.
3.6	Reporting conflicts of interest: Describe the institutional framework needed for identifying and managing conflicts of interest and how this is linked with other oversight mechanisms.
3.7	Commitment to make roadmap and future progress reports publicly available.

Accountability

3.8	Description of roadmap development process: Provide details of stakeholder and technical advisor participation, including which stakeholders from which sectors were involved in the development process – starting from validation of the situation analysis, as specific to the national context. Also describe how the consultation process ensures lead by the ministry or committee responsible for implementation that is accountable to the government through accountability mechanisms.
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SECTION 4: Implementation plan

Systems for oxygen production, storage and distribution

4.1	Mixed production approach to increase oxygen supply.
4.2	Intra-facility distribution: Distribution methods within facilities (e.g. medical gas piping systems).
4.3	Inter-facility distribution: Safe liquid oxygen and gaseous cylinder distribution networks.
4.4	Contingency planning: Ensure continuous oxygen availability during expected downtime, unexpected downtime and surges in demand (e.g. pandemic, emergency and disaster planning).

Regulations, guidelines and policies

4.5	Create and/or update regulations related to medical oxygen, respiratory medical devices and associated equipment.
4.6	Create and/or update protocols/guidance: Include installation, maintenance and repair of oxygen systems and related infrastructure.
4.7	Create and/or update clinical protocols: Include ensuring appropriate and safe use of oxygen, and harmonization with existing clinical policies and guidelines.
4.8	Referral processes: Include processes within the health care system for hypoxaemic patients, including oxygen availability for ambulance/inter-facility patient transfer system.

Infrastructure

4.9	Integration of medical oxygen and other medical gas systems into the construction of health care infrastructure.
4.10	Coordination with electrical grid as part of planned oxygen infrastructure development.
4.11	Mechanism(s) for ensuring maintenance of oxygen infrastructure.
4.12	Mechanism(s) for timely procurement and distribution of spare parts for oxygen infrastructure.

Respiratory medical devices

4.13	Mechanism(s) for respiratory medical devices inventory tracking and forecasting.
4.14a	Mechanism(s) to assess the different respiratory medical devices required for diagnostics, monitoring and administration of medical oxygen.
4.14b	Mechanism(s) to ensure the procurement and supply of required respiratory medical devices: Identify needs inclusive of installation, testing, commissioning and training.
4.15	Mechanism(s) for ensuring appropriate disinfection, reuse and disposal: Include decommissioning of medical devices.

Staff

4.17	Approach that aims to deliver the sustainable supply of the necessary clinical workforce including hiring and initial and ongoing clinical training in oxygen therapy for health care workers.
4.18	Approach that aims to deliver sustainable supply of the necessary biomedical engineering workforce including hiring and initial and ongoing training in operation and maintenance of oxygen equipment/infrastructure for biomedical engineering and technician staff.
4.19	Approach that aims to deliver the sustainable supply of the necessary non-clinical/non-biomedical engineering workforce including hiring and initial and ongoing training for necessary non-clinical/non-biomedical engineering workforce (procurement, finance, IT/data management, and monitoring and evaluation).

Equity and social support

4.20	Measures to ensure equitable universal oxygen access.
4.21	Measures to mitigate the financial burden of oxygen therapy on patients: Inclusion (or potential inclusion) of oxygen in insurance schemes.
4.22	Support for home-based oxygen therapy.

SECTION 5: Monitoring, evaluation and operational research

Monitoring and evaluation

5.1	Develop key performance indicators.
5.2	Standardized procedures for data collection and analysis.
5.3	Data management integrated into routine health information systems.
5.4	Feedback mechanisms to relay data and results to key stakeholders.

Operational research

5.5	Evaluate the impact of policies or interventions implemented.
5.6	Evaluate the cost-effectiveness of specific policies or interventions implemented.
5.7	Establish research priorities.
5.8	Support domestic research agenda.

SECTION 6: Costing

Costing of plan activities

6.1	Assessment of top-line budget requirements for all planned activities: Include description of the ownership model (e.g. government owned, public-private partnership, lease), costing methodology used and budget assumptions.
6.2	Assessment of budget requirements for staff, including recruiting, training and ongoing mentorship: Include description of the costing methodology and budget assumptions.
6.3	Assessment of budget requirements for infrastructure investments: Include CAPEX and OPEX, and description of the costing methodology and budget assumptions.
6.4	Assessment of budget requirements for governance, management and coordination activities: Include description of the costing methodology and budget assumptions.

Sustainable financing

6.5	Estimate of current budget allocations for oxygen spending, financial commitments for plan implementation, shortfall in funds for implementation and ongoing costs: Include, where available, ongoing commitments from key stakeholders.
6.6	Prioritization of plan activities based on available funding.
6.7	Consideration of public-private partnerships for oxygen production and maintenance: Include, where available, details of how public-private partnerships will meet identified gaps or increase efficiency of plan implementation.
6.8	Commitment to local production and distribution of medical oxygen.
6.9	Consideration of budget requirements for operating expenses beyond the plan's implementation phase.

Annex C: List of workshop participants

WHO EMRO

No	Name	Title
1	Chiori Kodama	Medical Officer
2	Hauwa Mohammed	Biomedical Engineering Consultant
3	Florestan Boualame	Biomedical Engineering Consultant

WHO Afghanistan Country Office

No	Name	Title
1	Jamshed Tanoli	WHE Team Lead

2	Naseer Ahmad Durrani	Emergency Officer
3	Hedayat Alnoor	Hospital Specialist
4	Shafiqullah Shafaq	NPO
5	Sailab Ayubi	NPO
6	Najibullah Mujadidi	Trauma Officer
7	Shamsullah Momand	National Technical Officer
8	Abdula Ala Akbari	Biomedical Engineer
9	Ghulam Hazrat	ICU Trainer

Afghanistan Oxygen Stakeholders and Partners

No	Name	Title	Organization
1	Amin Pakteen	Biomedical Engineer	MoPH
2	Hekmatullah Sabir	Director, Administrative	MoPH
3	Naseer Stanikzai	HSS Technical Expert	MoPH
4	Ali Kamran	Advisor	MoPH
5	Asadullah Motaqi	Technical Support	MoPH
6	Ali Kamran	Senior Technical Specialist	MoPH
7	Noorullah	Doctor	MoPH
8	Hedayatullah Hamidi	Planning & Reporting Senior Specialist	MoPH
9	A W Ahmdi	Biomedical Director	MoPH
10	Saidraheem Sadat	Doctor	Infectious Disease Hospital - ICU
11	Najibullah Nejrabi	Engineer	Central Workshop
12	Ahmed Ali Mohammedi	Engineer	Central Workshop
13	Mujiburahman Momand	Hospital Director	Afghanistan Private Hospitals Association (APHA)
14	Mujeeb Naseri	Deputy Director	APHA
15	Sheir Ahmad Resooly	Admin & Finance	APHA
16	Mohamed Asef Jabarkhil	CEO	APHA
17	Beena Kuttiparambil	Chief of Adolescent Development	UNICEF
18	Karim Alawi	Health Specialist	UNICEF
19	Naweed Azizi	Biomedical Engineer	Indira Gandhi Hospital - UNICEF
20	Abdul Qahar Momand	Programme Development Manager	Aga Khan Health Services (AKHS)
21	Hussain Karim	Head of Engineering	AKHS
22	Besmillah Khan	Biomed Referent	Medecins Sans Frontieres (MSF)
23	Hamedudin Azizi	Pharmacy Manager	International Medical Corps (IMC)

Annex D: Photos from the oxygen workshop

