

Webinar 1 - Policy for Sustainable
Medical Oxygen Supply (Lessons from
early experiences in various states)

3rd September 2021

Technical Assistance for National Capacity-Building and Enhancing the Oxygen Logistics and Supply Management System to the states of West Bengal, Meghalaya, Uttarakhand, and Andhra Pradesh

The World Bank
September 2021



2201 Westlake Avenue
Suite 200
Seattle, WA 98121 USA

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WEBINAR SERIES

**BUILDING SUSTAINABLE MEDICAL OXYGEN SYSTEMS:
EXPERIENCES AND LESSONS FROM INDIA'S COVID-19 RESPONSE**

AGENDA FOR WEBINAR #1
POLICY FOR SUSTAINABLE MEDICAL OXYGEN SUPPLY
Lessons from early experiences in various states

September 3, 2021, Friday | 05:00 PM to 06:30 PM

05:00 – 05:10 PM	<u>Welcome and Context Setting</u> <i>Mr. Neeraj Jain, Country Director India and Director South Asia, PATH</i>
05:10 – 05:25 PM	<u>Opening Remarks</u> World Bank's initiatives in accelerating medical oxygen availability <i>Dr. Trina Haque, Practice Manager for Health, Nutrition and Population, South Asia, the World Bank</i>
05:25 – 05:35 PM	<u>Keynote Address</u> Sustainable medical oxygen supply policy: Experience and lessons from India <i>Ms. Sumita Dawra, Additional Secretary, Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, Government of India</i>
05:35 – 05:45 PM	<u>Spotlight Address#1: Public sector experience and lessons</u> Becoming Oxygen Surplus: Lessons from Kerala, the first Indian state to become oxygen self-sufficient <i>Mr. Balamurali D, Managing Director, Kerala Medical Services Corporation Limited, India</i>
05:45 – 05:55 PM	<u>Spotlight Address#2: Private sector experience and lessons</u> Delivering oxygen to COVID-19 patients: Experience and lessons of an Indian healthcare corporate <i>Dr. Narayan Pendse, Vice President, Medical Strategy and Operations Group, Fortis Healthcare Limited</i>
05:55 – 06:05 PM	<u>Global Perspectives</u> Sustainable access to oxygen: Global experience and lessons relevant for South Asia <i>Dr. Alex Rothkopf, Supply Chain Management and Data Science Advisor, PATH</i>
06:05 – 06:25 PM	<u>Open House</u> Questions and answers from the audience
06:25 – 06:30 PM	<u>Summary and Closing Remarks</u> <i>Mr. Neeraj Jain, Country Director India and Director South Asia, PATH</i>

Background

The second wave of COVID-19 that swept across India between April 2021 to June 2021 brutally exposed the frailties of the country's much-criticized public- and its much-vaunted private-sector health infrastructure in dealing with a crisis that came with enough early warning signs. At its peak, reported daily new infections in India crossed 410,000 with daily reported deaths at more than 6,100.¹ The demand for hospital beds, personnel, drugs, testing kits, and life-saving oxygen spiked to unprecedented levels. The demand for medical oxygen peaked to around 11,000 metric tons (MT) per day by the beginning of May 2021 from around 3,800 MT per day in the mid-March 2021; an increase of over four times.²

As the recent spate of new infections demonstrated, medical oxygen is the single most important intervention for moderate and severe cases of COVID-19. It becomes ever more critical that its production and supply infrastructure are ramped up before the ominous third wave, as is being predicted by many experts, arrives. To prepare to meet the future demand for medical oxygen, the Government of India has allocated funds from PM CARES to establish and commission over 1,400 oxygen generation plants³ at government hospitals across the country. Several corporates, philanthropic foundations, and friendly governments have stepped up, offering to build Pressure Swing Adsorption (PSA) oxygen generation plants in hospitals across states. Government hospitals up to primary healthcare facilities are setting up oxygen concentrators to prepare for the next wave. Everyday new initiatives are being launched to make the health systems in India more responsive, robust, and reliable.

Considering the anticipated third wave, the World Bank, in collaboration with PATH, is conducting a five-part regional webinar series to share the challenges faced, best practices emerged, lessons learnt, and insights on India's evolving oxygen ecosystem in context of the COVID-19 pandemic. The first of the five webinars was conducted on Friday, September 3, 2021, and attended by 472 subject matter experts, government officials, development partners, healthcare professionals, and private-sector representatives from India and countries in South Asia, North Africa, and Middle East. The speakers for the inaugural webinar on "Policy for Sustainable Medical Oxygen Supply: Lessons from Early Experiences in India" –

- Shared lessons from the global community of practitioners and Indian states on various approaches adopted to strengthen the oxygen ecosystem.
- Discussed the way forward in preparing for the third wave of the COVID-19 pandemic in context of making medical oxygen available and accessible across the country.

This report provides a summary of key discussions, lessons learnt, and recommendations that emerged from the webinar on medical oxygen management.

World Bank's initiatives in accelerating medical oxygen availability

Dr. Trina Haque, Practice Manager for Health, Nutrition and Population, South Asia, World Bank, acknowledged the surge in COVID-19 infections across South Asia leading to unprecedented shortages in medical oxygen. She shared that:

- The sudden surge in demand for medical oxygen due to unprecedented increased in COVID-19 cases during the second wave presented three challenges: (1) increasing oxygen production, (2)

¹ Source: <https://www.mohfw.gov.in/>

² Source: <https://www.orfonline.org/research/preventing-a-repeat-of-the-covid-19-second-wave-oxygen-crisis-in-india/>

³ Source: <https://dst.gov.in/850-oxygen-plants-being-set-various-districts-country-secretary-drdo>
<https://pib.gov.in/PressReleasePage.aspx?PRID=1713904>

improving storage, and (3) ensuring a smooth supply chain based on short- and medium-term requirements.

- The World Bank Group has been supporting South Asian countries to manage the demand-supply gap by strengthening efforts to ramp up infrastructure for production of oxygen, as well as improve the supply chain for medical oxygen. The World Bank in partnership with Government of India and several state governments facilitated rapid purchase and delivery of 22,600 high-quality oxygen concentrators in the country, and aided in sourcing oxygen cylinders across the country by restructuring the existing World Bank projects across multiple sectors.
- The World Bank has been working with PATH in India to provide strategic as well as technical assistance to four states to help them respond to medium-term challenges with production, supply, and distribution of oxygen. The assistance from PATH encompasses support in planning and constructing new PSA plants, technical assistance for operation and maintenance and ensuring adequate distribution of medical oxygen via reliable transport and storage facilities.

Sustainable medical oxygen supply policy: Experience and lessons from India

Sharing lessons from various initiatives that the central and state governments in India together implemented to address the surge in the oxygen demand during second wave of COVID-19, Ms. Sumita Dawra, Additional Secretary, Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, Government of India, observed that:

- Steps to immediately ramp up existing oxygen production, chiefly liquid oxygen and making it available for use helped address the short-term demand. This was achieved by –
 - Accelerating the production of liquid medical oxygen (LMO) in public- and private-sector establishments, including industrial units like steel and petroleum refineries. The Drug Controller General of India advised the industrial oxygen manufacturers in April 2020 to produce medical-grade oxygen.
 - Prioritizing and promoting LMO over producing gaseous oxygen.
 - Increasing the storage capacity for LMO across all major health facilities.
 - Releasing excess stocks of LMO, for example, safety stock in storage tanks of the steel plants was brought down to a requirement of 2.5 days from about 3.5 days, thereby, increasing the availability of LMO from the stocks for medicinal use.
- It is important to acknowledge that oxygen burden is always not the same across the states, hence, it is important to (a) classify them geographically (states, provinces, districts, etc.) as high burden, moderate burden, and low burden areas, (b) scientifically assess oxygen demand-supply gap, and (c) plan and allocate oxygen using a dynamic framework. This was done by:
 - Using a standardized formula to calculate demand-supply gap and future oxygen requirement for states.
 - Developing a nationwide supply plan, matching with the production centers, and sharing the oxygen sources between states.
 - Creating web portals such as oxygen demand aggregation system to capture oxygen shortage data.

- Regularly updating and reviewing allocation plan, making it responsive to increased demand. During the second wave, the plan was reviewed every alternate day and allocations were made in consultations with the state governments facilitated by the health ministry.
- It is critical to enhance the elasticity of the oxygen supply chain by leveraging non-traditional modes for transportation of medical oxygen. In India's case:
 - High oxygen requirements from high-burden states were met by providing additional LMO from the steel plants situated in the eastern states.
 - Other sectors such as the Indian Railways and Indian Airforce were engaged in addition to the traditionally used roadways to transport medical oxygen. The Indian Airforce helped in lifting containers from overseas - ISO, empty, tankers to the source of production.
 - Nitrogen and argon tankers were converted to oxygen tankers for transportation, bringing in hundreds of ISO containers into the country, each with 20 tons of oxygen capacity, and making special allocations to states at a short notice via railways.
 - To track the daily movement of oxygen tankers, an oxygen digital tracking system was established, along with geotagging of cylinders.
- Expanding the storage capacity at facilities along with reducing wastage of oxygen is important to ensure seamless availability of medical oxygen.
 - India augmented the number of medical oxygen cylinders from 450,000 cylinders in March 2020 to 1.27 million cylinders by August 2021.
 - The number of cryogenic storage tanks was also increased.
 - Oxygen management committees were set up to monitor the rational use of oxygen through oxygen audits and ensuring the protocols for home care and triage system were being followed.

Becoming oxygen surplus: Lessons from Kerala, the first Indian state to become oxygen self-sufficient

Despite of the high disease burden, Kerala saw a case fatality rate of only 0.5% with a seropositivity of 43%.⁴ Mr. Balamurali D. provided insights on the measures taken by Government of Kerala to address the surge in the demand met with limited resources in a short span.

- **Reducing oxygen wastage**
 - The oxygen wastage reduction strategy adopted by Kerala aided in meeting the demands in less time. The state government equipped 56 major hospitals with medical gas pipelines which otherwise used cylinders.
 - Patients were triaged depending on severity and need for oxygen in September 2020. Patients were categorized into three categories based on severity of disease as - A, B, C. Hospitals were categorized as - first line treatment centers, second line treatment centers, and COVID-19 hospitals.
 - Oxygen audit committees were formed which consist of anesthetists and biomedical engineers. Audits were done before the second wave, which helped in identifying and correcting wastage at the local level.
- **Regulations set by state and union governments**

⁴ Source: <https://thewire.in>

- Regulations such as the use of industrial oxygen producing units for production of liquid medical oxygen, were imposed by the national government. There is one major LMO producer in Kerala which previously produced about 50 to 60 MT of oxygen. The oxygen production increased to 180 MT by the first week of June.⁵

- National Disaster Management Authority also issued directive of diverting industrial oxygen cylinders for storage of medical oxygen.

- **Improving the storage capacity**

- Three buffer storages were created at strategic locations based on the distance between production and supply units in the state. For example, two buffer zones at Kochi which is towards central part of the state, and one at the southern industrial area were established for emergency which together accounted for 60 MT.
- Private hospitals complied with the government's advice on increasing storage capacity. Major private medical colleges which previously relied on daily oxygen supply were identified and equipped with increased storage capacity.

- **Supply chain management perspective**

- In Kerala, there was one liquid oxygen producing unit, 11 air separation units, 17 re-filers, and 100+ hospitals including public and private sector. Some of these hospitals purchased oxygen from states like Karnataka and Tamil Nadu through existing contracts and supply chains. A command system called state war room and district-level war room was established. It was one-stop platform for management of all the oxygen-related demands.
- IT platforms were created to map the demand for government and private health institutions. These mapped the capacity of patient bed; patient load; storage capacity; oxygen production; and major suppliers like dealers, gaseous generation units, manufacturers, re-filers, etc.
- Data collection of 24-hour oxygen usage pattern, weekly usage history etc. aided in evaluating allocation requirement, wastage and overstocking that further helped in prudent decision-making.
- Transportation was subsidized and several rules were introduced such as tankers to be run at full capacity with no idling time for any tanker.
- Hub and Spoke model was created that mapped the nearest suppliers to the institution in need and optimized the oxygen supply chain and evacuation capacity of LMO.

- **Production upgradation**

- The state government identified non-functional air separation units and made them functional by adding more production in gaseous oxygen.
- The state also increased the bed capacity surrounding places nearby industries that were producing other gases along with gaseous oxygen as a byproduct like KMML (public sector unit) and a refinery in Kochi.

- **Incentives/benefits provided to private sector for active participation in oxygen supply and management**

⁵ Source: <https://www.indiatoday.in/india-today-insight/story/how-kerala-ramped-up-oxygen-capacity-and-supply-1795614-2021-04-27>

- Economic incentive was provided such as subsidized transportation charges for private sector and government funded transportation means.
- Regulatory incentives for speeding up installation of new oxygen production units by relaxation on the legal clearance helped in increasing oxygen production.

Preparation for subsequent waves

The government is focusing on investing in PSA plants since establishing liquid oxygen production units is a time-consuming practice. The aim is to achieve 85 MT of capacity per day, to meet peak requirements during the predicted surges and purchasing more cylinders to further improve the storage capacity. The state government is also increasing the storage capacity for LMO.

Delivering oxygen to COVID-19 patients: experience and lessons of an Indian healthcare corporate

Dr. Narayan Pendse addressed the challenges faced by the private sector concerning the surge in oxygen demand and their response to the same. Collating information received from all sources such as medication/admission/bed allocation/treatment was an important task during the second wave of COVID-19. Some urgent measures implemented by private healthcare sector were:

1. Determining a target oxygen saturation level

The target oxygen saturation level was brought down to 94%-95% from 98%-99%. For those with chronic obstructive pulmonary disease, patients were acclimatized to lower oxygen concentrations, hence, their target saturation could be lowered to a greater extent.

2. Adopting efficient ways to deliver oxygen

Generally, oxygen is delivered via high flow nasal cannula which has a high potential of oxygen wastage. The private-sector hospitals segregated patients into moderate and severe COVID-19 cases. Non-rebreather masks were used for moderate cases and helmet masks/ face masks for severe cases as a method to reduce oxygen wastage. Some clinicians also used self-designed masks for local oxygen delivery with high efficiency.

3. Improving oxygen supply and minimizing wastage

Liquid oxygen tanks were installed in most of the hospital premises. They also established gas manifold systems including B and D type cylinders. The focus was to provide uninterrupted supply of oxygen to the demand site and minimize wastage through proactive monitoring. Nurses and medical attendants were trained to switch off the flowmeter while patient was having a meal. Oxygen nurses were deployed to continuously monitor, educate, and train the nurses and other colleagues on efficient usage of oxygen. Risk assessments were conducted, and results were analyzed. Regular oxygen consumption reports were submitted to medical superintendents and administrators to study the consumption patterns and plan how to efficiently make use of limited resources.

"The strong connect with the clinicians and more importantly, the message that the clinicians took out and shared with their colleagues across various hospitals increased the acceptability amongst the medical professionals."

- Dr. Narayan Pendse

4. Information sharing among clinicians/healthcare professionals

Private hospitals organized focus group sessions including biomedical engineers and senior professionals with prior experiences to share knowledge among themselves about oxygen management and best modes of oxygen delivery. COVID-19 expert groups were formed with experienced professionals and clinicians who were well versed with handling COVID-19 cases

to guide the fellow medical professionals on minimizing oxygen requirement and efficient delivery of oxygen therapy via timely discussion sessions.

Global Perspectives

Sustainable access to oxygen: Global experience and lessons relevant for South Asia

Dr. Alex Rothkopf from PATH Seattle shared insights on a global perspective concerning sustainable medical oxygen use. Sustainability could be achieved in oxygen use through five major components:

1. **Maintenance and servicing of oxygen-supply equipment** either by recruiting a team of biomedical engineers or by contacting a service provider. This is essential to sustain oxygen infrastructure and function efficiently.
2. **Robust and effective supply chain management** is important in ensuring availability of equipment and accessories such as spare parts, however, continuous funding for procuring the same is challenging but a crucial exercise.

"Think about data more holistically and use the data to the advantage of access to oxygen. To convince public and private funders to spend on oxygen, data analytics is the key."

- Dr. Alex Rothkopf
3. **Training and capacity building** is important to diagnose and categorize patients based on their criticality, as to determine who needs oxygen therapy. Medical workforce should be made aware of and skilled in appropriate usage of oxygen equipment and sustained for future crisis situations.
4. **Financing** is crucial to converge pivotal investments in oxygen management, and sustainability in oxygen supply and access.
5. **Data analysis and management** through rigorous systematic data collection and its effective utilization in assessment and formulation of new policies and practices is essential. Other measures such as online dashboards to ensure open-source data availability, and an oxygen tracker to estimate oxygen need may be explored.

A key takeaway from the South Asian experience is that medical oxygen is important and lifesaving. Unlike other disaster responses, sudden rise in oxygen demand cannot be met in a short duration. Installing equipment requires time and skill, hence, long-term oxygen sustainability should be achieved.

Conclusion

The key learnings and takeaways are as follows:

- **Increasing investment in oxygen production and oxygen storage capacity:** There is a need to channelize resources to improve production and storage capacities of oxygen across geographies for sustainability and catering to all future demand surges
- **Improving oxygen supply and transport:** Efficient supply chain management can be supported by setting up war rooms for universal communications and technology platforms for mapping demands and capacity. Transportation can be monitored with the help of digital tracking systems.
- **Enhancing data collection, analysis, and knowledge sharing:** It is crucial to collect timely data about oxygen supply and consumption to assess gaps and identify areas of improvement. Knowledge sharing is not only vital for the medical professionals but also for the administrative stakeholders who could learn from the experiences from other settings.

- **Training medical professionals:** Patients must be triaged based on their severity through timely audits and risk assessment exercises. Oxygen wastage can be prevented by providing appropriate training to medical nurses about proactive monitoring and oxygen equipment usage.
- **Improving service and maintenance of oxygen production units:** It is not only essential to build new infrastructures for oxygen production and storage, but also maintain them so that they can function effectively. Continuous operational funds for sourcing equipment, regular maintenance service provision, and capacity-building are essential in that regard.
- **Collaboratively working and innovating:** All the stakeholders including public, private, and civil society must engage and work synergistically to accomplish the set goals. It is also vital to learn from previous experiences and improve strategies and policies in real time.

Webinar Creatives

Agenda



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Building Sustainable Medical Oxygen Systems

South Asia Webinar Series

POLICY FOR SUSTAINABLE MEDICAL OXYGEN SUPPLY
Lessons from early experiences in various states

3 September, 2021
5:00 PM to 6:30 PM IST (GMT+5:30)

DETAILED AGENDA

Welcome and Context Setting

05:00 – 05:10 PM

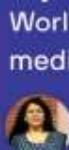


Mr. Neeraj Jain

Country Director India and Director South Asia, PATH

Opening Remarks

05:10 – 05:25 PM



World Bank's initiatives in accelerating medical oxygen availability

Dr. Trina Haque

Practice Manager for Health, Nutrition and Population, South Asia, the World Bank

Keynote Address

05:25 – 05:35 PM

Sustainable medical oxygen supply policy:
Experience and lessons from India



Ms. Sumita Dawra

Additional Secretary, Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, Government of India

Spotlight Address #1

05:35 – 05:45 PM

Public sector experience and lessons
Becoming Oxygen Surplus: Lessons from Kerala, the first Indian state to become oxygen self-sufficient



Mr. Balamurali D

Managing Director, Kerala Medical Services Corporation Limited, India

Spotlight Address #2 05:45 – 05:55 PM
Private sector experience and lessons
Delivering oxygen to COVID-19 patients:
Experience and lessons of an Indian
healthcare corporate



Dr. Narayan Pendse

Vice President, Medical Strategy and Operations
Group, Fortis Healthcare Limited

Global Perspectives 05:55 – 06:05 PM
Sustainable access to oxygen:
Global experience and lessons relevant for South Asia



Dr. Alex Rothkopf

Supply Chain Management and Data Science Advisor, PATH

Open House 06:05 – 06:25 PM
Questions and answers from the audience

Summary and Closing Remarks 06:25 – 06:30 PM



Mr. Neeraj Jain

Country Director India and Director South Asia, PATH

Save the Date

Building Sustainable Medical Oxygen Systems

SAVE THE DATE

A South-Asian Regional Knowledge Exchange Webinar Series

3 September, 2021 | 5:00 PM to 6:30 PM IST (GMT+5:30)

Medical oxygen has become the single most important intervention for moderate and severe cases of COVID-19.

We invite you to register for a five-part webinar series conducted by the World Bank and PATH where experts, innovators and healthcare professionals share the challenges faced, best practices, lessons learnt and insights on India's evolving oxygen system.

Join us for the first webinar,
Policy for Sustainable Medical Oxygen Supply

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Registration Page



Building Sustainable Medical Oxygen Systems
Experiences and Lessons from India's COVID-19 Response

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18th August 2021 4 pm - 6:30 pm

POLICY FOR SUSTAINABLE MEDICAL OXYGEN SUPPLY:
Lessons from early experiences in various states

27th August 2021 4 pm - 6:30 pm

OXYGEN CONCENTRATORS: Distribution,
Maintenance and Decontamination

Register

Invite



Building Sustainable Medical Oxygen Systems

South-Asia Webinar Series

Join the inaugural webinar:
Policy for Sustainable Medical Oxygen Supply
3 September 2021 | 5 PM IST onwards



Ms. Sumita Dawra

Additional Secretary, Department for
Promotion of Industry and Internal Trade,
Ministry of Commerce and Industry,
Government of India



Dr. Trina Haque

Practice Manager for Health, Nutrition
and Population, South Asia, World Bank



Dr. Narayan Pendse

Vice President, Medical Strategy and
Operations Group, Fortis Healthcare



Mr. Balamurali D

Managing Director, Kerala Medical
Services Corporation Limited, India

Moderated By



Mr. Neeraj Jain

Country Director-India, PATH

*Additional speakers to be confirmed soon