

Perceptions of Refrigeration and Air-conditioning Service Technicians on India Cooling Action Plan

Enhancing Servicing Sector Jobs for a Just Transition

Himanshu Dixit, Shikha Bhasin, Paras Bhattarai, Sunil Mani, and Arnab K. Laha

Report | October 2023





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Suggested citation:

Dixit, Himanshu, Shikha Bhasin, Paras Bhattraï, Sunil Mani, and Arnab K. Laha. 2023. *Perceptions of Refrigeration and Air-conditioning Service Technicians on India Cooling Action Plan: Enhancing Servicing Sector Jobs for a Just Transition*. New Delhi: Council on Energy, Environment and Water.

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Acknowledgments:

The authors would sincerely like to acknowledge the support and inputs provided by various individuals at different stages of preparing this report.

For their time and expertise, we would like to extend our deepest thanks to the leading organisations in the sector: Refrigeration and Air-conditioning Manufacturers Association (RAMA), Refrigeration and Air-conditioning Servicing Sector Society (RASSS) and Refrigeration and Air-Conditioning Trades Association (RATA). Various members of the industry organisations generously provided their time to guide us on servicing issues and helped us interact with the larger ecosystem. We would particularly like to thank Air Marshal Naresh Verma (Adviser to RAMA President), Harsh Pant (Secretary, RAMA), Ajit Panicker (ex-President, RATA), Vinod Ayar (National Coordinator, RASSS) and Vishal Kapur (Chair Advocacy, ISHRAE). The report wouldn't have been possible without their support.

Lastly, we extend our warm gratitude to all our colleagues at CEEW who offered their consistent support and suggestions through the course of this research project. We thank the Outreach team for their support in publishing the report and its dissemination.

Cover image:

iStock.

Peer reviewers:

Prof. Radhey Agrawal, Adviser, Ozone Cell; Prof. Gopichandran Ramachandran, Faculty, NTPC School of Business; Jitendra Bhambure, Adviser, Council on Energy, Environment and Water (CEEW) and Dhruvak Aggarwal, Programme Associate, CEEW.

Publications team:

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Organisation:

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The active participation and engagement of service technicians with government plans for skill enhancement and certification are important for the success of these initiatives.

Executive summary

Air-conditioning is one way to mitigate the effects of rising heat on human population, and is therefore rightly acknowledged as a developmental necessity under the *India Cooling Action Plan* (ICAP) (MoEFCC 2019). As India rapidly urbanises and grows in population, the need to enable access to cooling in hot temperatures will inevitably increase the prevalence of air-conditioning.

The rise in the access and use of air-conditioning will pose challenges from climate and energy consumption standpoints. First, the refrigerant technologies and fluorinated gases used presently in air-conditioning systems have high global warming potential (GWP). For instance, modelling assessments suggest that with about 10 per cent leakage rate, R410A alone will be responsible for about 16 per cent of total global warming by 2030 (Chaturvedi and Sharma 2015). Second, the energy requirements of a cooling system are substantial. Just the space cooling segment is responsible for about 12 per cent of total electricity use in the country (MoEFCC 2019). Simultaneous use of cooling units by a large number of people put the electricity grid under stress, which results in blackouts as well as high price of electricity to service that power demand. Hence, there is sizeable scope and opportunity to mitigate the primary (caused by refrigerants) and secondary (electricity use) emissions in the cooling sector, as well as make cooling more affordable to the larger populace.

In order to ensure that the cooling sector delivers the potential dividend in terms of climate change mitigation and energy efficiency, the fitness of cooling units during their operational lifecycle has to be maintained. Service technicians, therefore, assume a very important role as regular servicing is crucial to maintaining efficiency and performance. This is true right from the installation of air-conditioners to preventive servicing and maintenance at regular intervals.

The prevailing standards of servicing in India, particularly in the room air-conditioning segment,

need substantial improvement, as also recognised and enshrined in the ICAP. Several aspects have been prioritised: training and upskilling of service technicians; access to toolkits; and fixing the supply and demand side of servicing to a) improve the quality of service and b) provide commensurate remuneration for technicians' time. Deliberations on these plans have been ongoing since the publication of the ICAP. Certain recommended actions have also been implemented but a large-scale roll out hasn't happened yet.

In this light, through a sample survey of service technicians the report tries to capture certain attributes of the sector such as levels of training and awareness of technicians, income drivers and financial status of technicians, challenges on the job, etc., as well as technicians' aspirations and preferences in terms of what should happen in order to revamp the RAC informal sector in India. With this background, the report attempts to answer the following **research questions**:

- How do the service technicians view government aims/targets pertaining to training and certification, HFC phase-down and skill needs in the RAC servicing sector?
- Based on the way existing plans and policies are perceived, how can the preferences and needs of service technicians be incorporated into the roll-out strategy?

The study adopts a mixed method research design. It's based on a sample survey with 369 technicians, three focussed group discussions with service technicians, interviews and discussions with experts from OEMs and service providers, and desk research to capture information about the policies directed at the RAC servicing sector.

The fitness of cooling units during their operational life cycle must be maintained to improve energy efficiency and reduce refrigerant consumption.

Key findings

Training

A majority of technicians laid emphasis on good training as well as to following the prescribed servicing practices.

- About **57 per cent technicians** received their last training/skill workshop more than five years ago.
- More than **70 per cent respondents** received some kind of certificate for the attended training.
- About **73 per cent of respondents** opined that a Government of India (GoI) training programme would be helpful for technicians.
- Training engenders a preference for working with formal establishments such as OEMs and online service platforms.

Certification

On certification, an overwhelming majority of the surveyed service technicians showed an inclination to get a formal certificate approved by the GoI.

- About **75 per cent technicians** believed it would be a useful add-on.
- **73 per cent technicians** expressed willingness to take the test to earn the certificate, if required.
- Further, **72 per cent technicians** also thought that a skill certificate would improve their status as a service technician.

New refrigerants

- More than **60 per cent technicians** reported little to inadequate knowledge about the new refrigerants.
- **Online resources** remain the leading source for technicians to learn about new refrigerant gases and ways of handling them.

Customer behaviour

- About 70 per cent technicians reported that customers call for servicing and maintenance only after the unit breaks down.
- More than 55 per cent technicians believed that very few customers care about training or know its importance.

- Only **20 per cent technicians** reported that their customers actually cared about disposing their units properly after talking to them.
- Perception about customer awareness is strongly linked with the practice of good servicing practices (GSPs) by service technicians.

Other insights

- The majority of technicians are engaged in servicing work for only about **4-6 months** in the year. However, share of technicians **working throughout the year** is also significant at **23 per cent**.
- **Inadequate compensation** is reported to be the primary reason for not following proper servicing practices. About **60 per cent technicians** report that customers' insistence on **low payment standards** affects their ability to perform all servicing activities.
- Formal training and ownership of servicing toolkits increase the odds of higher income attainment by service technicians by 1.82 and 2 times, respectively.
- Service technicians reportedly prefer to work with OEMs. About **65 per cent technicians** will prioritise working at OEM servicing centres.
- Technicians exhibit little awareness about various social protection and financing schemes. More than **65 per cent technicians** had no idea about the government schemes.

Key recommendations

1. A majority of technicians either don't attend the foundational training courses at ITIs and polytechnics or prematurely drop out of training schools, with 40 per cent technicians having no formal training. Efforts should be made to decrease the drop-out rate. This will have to include:
 - a) assessment of the current drop-out rate;
 - b) understanding the reasons for dropping out and mitigating them; and
 - c) facilitating and incentivising the completion of training by providing campus opportunities.

57% technicians surveyed received their last training/skill workshop more than five years ago.

2. 65 per cent technicians reported a preference for working with OEMs. The discussions with technicians' groups also brought forth the point about the good quality of training provided by manufacturers. Therefore, an industrial apprentice programme for service technicians in partnership with OEMs and online platforms like Urban Company should be started. Moreover, opportunities to participate in such programmes should also be made available to technicians having no formal association with training schools.
3. Technicians reported an increasing relevance of digital networks in training and learning. Hence, training programmes should leverage the digital infrastructure and technicians' networks to deliver informative material, campaigns and outreach for knowledge camps. Going forward, an e-training platform should be developed to increase the reach of training initiatives.
4. A combination of oral, written and hands-on testing modules should be prepared and widely shared in the technicians' network through bodies like RAMA, RASSS, RATA and ISHRAE.
5. About two-third technicians showed interest in taking a test to get certified. An e-testing portal can be developed to encourage technicians to apply for certification. The candidates can then be summoned for hands-on testing to complete the testing process. This will reduce the stress on the physical testing infrastructure.
6. The survey found considerable overlaps between the servicing of different equipment types which require different levels of knowledge and skills. Therefore, certification has to be linked to various skill levels. Two criteria can be kept in mind for this: (1) type of servicing job; and (2) type of cooling equipment. A clear typology of different kinds of servicing jobs such as installation, regular maintenance which includes dry and wet servicing, electronics repair, refrigerant recovery, etc. should be created. Standards of servicing for different cooling equipment segments should be developed and widely popularised.
7. Significant linkage was seen between customer awareness and practice of GSPs by the technicians. To leverage this trend, a customer guidelines document should be prepared that includes important questions to be asked of the technician while servicing. Customers should be sensitised about the importance of adequate compensation and training of technicians. Campaigns to discourage them from choosing the lowest cost option should be undertaken.
8. More than 65 per cent technicians had no idea about the social safety schemes of the government. Awareness campaigns to educate technicians about the existing social security schemes must be initiated. The e-network of service technicians should be leveraged in order to reach as many technicians as possible. As the next step, certification should be used as a criterion to provide access and benefits of other specific schemes such as accidental insurance, income support, etc.
9. With an eye to encourage micro-entrepreneurship among service technicians, credit support through micro loans for certified technicians can be provided through an appropriate mechanism. OEMs should be encouraged as well to support technicians in procuring the right tools through their CSR budgets and campaigns.

1. Introduction

The effects of global warming are knocking on our doors. Across the world, many countries are dealing with unprecedented heat waves which have rendered their efforts to provide temperature-controlled comfort ineffective. For instance, in the United Kingdom where housing is predominantly designed to retain heat, it has become extremely difficult to cope with the heat waves (Victor 2022). As a result, unexpected heat waves have led to a jump in demand for air-conditioners in several places where air-conditioning demand was absent before (Frost 2022).

Several areas in India, with their predominantly tropical climate, are highly heat-stressed. As the climate crisis worsens, it is expected that the intensity and occurrence of heat waves in the country will increase, and can be 30 times more likely (Zachariah et al. 2022) than the present day. Certain long-term models predict wet-bulb temperatures¹ in India well beyond the limits of human tolerance by the end of the 21st century (IPCC 2014).

1. Wet-bulb temperature combines dry-air temperature with humidity. Instead of exposing the thermostat directly to air, a wet cloth is wrapped around it to measure the temperature. This is especially relevant for understanding thermal comfort as it provides the real 'feel' of the temperature. A wet-bulb temperature of 32 degrees is exceedingly harmful for human beings, and 35 degrees and above is unsurvivable.

This will have a large-scale impact on human health, which will have cascading economic ramifications such as productivity loss and reduction in working hours (Woetzel 2020).

Air-conditioning is one way to mitigate the effects of rising heat on human population, and is, therefore, rightly acknowledged as a developmental necessity under the ICAP (MoEFCC 2019). Therefore, as India rapidly urbanises and grows in population, the need to find thermal comfort in hot temperatures will inevitably increase the prevalence of air-conditioning.

At the outset, it must be stated that there are tremendous growth opportunities in the cooling sector. Only 8 per cent households in India are reportedly in possession of an air-conditioning unit (MoEFCC 2019). Just the room air-conditioning segment is projected to grow at 11 per cent compounded annual rate (MoEFCC 2019). Expansion in cold-chain infrastructure to support increased consumption movement and storage of agricultural commodities across the country will provide growth opportunities in other segments as well. Technologies such as variable refrigerant flow (VRF) systems, chillers and deep freezers will also see significant growth in their respective market segments (MoEFCC 2019).

The rise in the access and use of air-conditioning will pose challenges from climate and energy consumption standpoints. First, the refrigerant technologies and fluorinated gases used presently in air-conditioning systems have high global warming potential (GWP). Any leakage in the system causes the gas to escape out and disproportionately contribute to global warming.

Second, the energy requirements of a cooling system are substantial. Just the space-cooling segment is responsible for about 12 per cent of total electricity use in the country (MoEFCC 2019). Also, simultaneous use of cooling units by a large number of people put the electricity grid under stress, which results in blackouts as well as high price of electricity to service that power demand. In fact, cooling was responsible for the highest-ever peak power demand in New Delhi, India's national capital, in May 2022 (The Economic Times 2022). In general, power demand peaking in the summer season has been found to be driven by heating, ventilation and cooling devices. Hence, there is a sizeable scope and opportunity

to mitigate the primary (caused by refrigerants) and secondary (electricity use) emissions in the cooling sector, as well as make cooling more affordable to the people at large.

In order to ensure that the cooling sector delivers the potential dividend in terms of climate-change mitigation and energy efficiency, the fitness of cooling units during their operational lifecycle has to be maintained. Service technicians, therefore, assume an important role right from the installation of air-conditioners to preventive servicing and maintenance at regular intervals in helping achieve optimum fitness.

The prevailing standards of servicing in India, particularly in the room air-conditioning segment, need a lot of improvement. Several aspects have to be prioritised: training and upskilling of service technicians, access to toolkits, and fixing the supply and demand side of servicing to a) improve the quality of service and b) provide commensurate remuneration for technicians' time. This requires both policy intervention and business innovation.

The ICAP looks to holistically address the needs of the room air-conditioning servicing sector. It puts service technicians at the centre of its recommendations and links training and certification with their livelihood enhancement and social safety requirements (MoEFCC 2019). Building on the initiatives rolled out under the HCFC Phase-out Management Plan (HPMP) II², the ICAP takes a long-term view of the expanding sector, and how some of the interventions can be dovetailed with other flagship social sector policies of the Government of India.

In order to ensure smooth operationalisation of the ICAP recommendations, it is also important to understand the perception of service technicians towards these overarching plans. It is all the more crucial in this context as any training or skill building programme will need the technicians to actively come on board. Their own viewpoint, inclination and understanding of sectoral needs can help improve the design of the programmes and improve their subsequent delivery. In this light, the report tries to capture certain attributes of the sector through a sample survey of service technicians, i.e., levels of training and awareness of service technicians, financial status of technicians, challenges on the job,

2. Launched in 2017 for a duration of six years, Hydrochlorofluorocarbons (HCFCs) Phase-out Management Plan II aimed to phase out ozone-depleting and high global-warming substances as mandated under the Montreal Protocol. Under the plan, more than 400 enterprises, including MSMEs in the foam manufacturing sector and six large air-conditioning manufacturing enterprises, were supported for conversion to non-HCFC technologies from HCFCs. In addition, synergies to improve the RAC servicing sector trainings with the Skill India Mission were given priority to multiply the impact of skilling and training. It was also envisaged that nearly 16,000 service technicians would be trained under HPMP II.

etc., as well as their aspirations and preferences in terms of revamping the sector and what might and might not work according to the plan.

With this backdrop, the report attempts to answer the following **research questions**:

- How do the service technicians view government aims/targets pertaining to training and certification, HFC phase-down and skill needs in the RAC servicing sector?
- Based on the way existing plans and policies are perceived, how can the preferences and needs of service technicians be incorporated into the roll-out strategy?

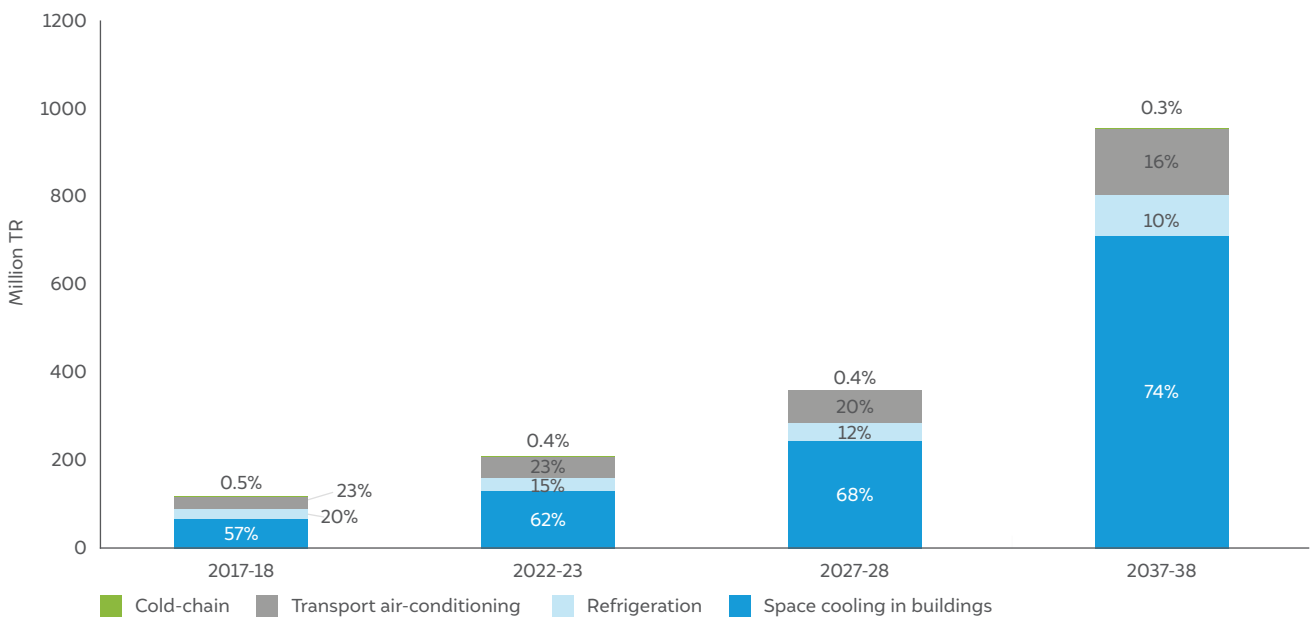
The report has been organised as follows. Section 2 gives a brief overview of the policies advanced by the relevant ministries over the years. Section 3 outlines the need for the current study and specific research questions being answered in the report. Thereafter, Section 4 is a deep-dive into the primary data and insights that can be drawn from it. Based on the data insights, Section 5 proposes the salient recommendations for decisionmakers. Section 6 concludes the study.

2. AC servicing sector in India: Status quo and policies

Air-conditioning and refrigeration are critical sectors to achieve growth and industrial competitiveness. They are required for a healthy working and living environment to boost productivity and comfort, as well as for the preservation and distribution of perishable commodities over long distances. India has also been witnessing a very rapidly growing stock of buildings, which is driving the need for space cooling.

As per official projections, the need for space cooling will represent about 75 per cent of the total tonnage of refrigeration by 2037–38³, thus making it one of the most critical segments to address as far as servicing practices are concerned. With the growth in the air-conditioning sector, servicing requirements are also growing at a similar scale in the country. It is expected that the requirements will grow multi-fold in the next 20 years.

Figure 1 Cooling demand across different sectors in India is expected to grow exponentially



Source: India Cooling Action Plan, Ozone Cell

3. Tonnage of refrigeration is a unit of power used to express the heat extraction capacity of refrigeration and air-conditioning units. In the ICAP, TR has been used to indicate the cooling demand in the coming years across various end-use segments.

Moreover, the new alternative refrigerants to HCFCs and high-GWP HFCs are either mildly flammable or highly flammable. These refrigerants call for additional safety standards to address issues such as pressure safety, toxicity, electrical safety, flammability and explosion protection, and general safety of machinery and technicians (MoEFCC 2019). A large number of skilled as well as semi-skilled service technicians are currently engaged in this sector. In addition, the servicing sector also provides a huge opportunity for employment generation in the country. In the subsequent sections, salient characteristics of the servicing sector have been presented in more detail.

2.1 Servicing enterprises

The servicing sector in India is made up of a diverse range of establishments that provide maintenance services for all types of refrigeration and air-conditioning systems. Manufacturers operate the service network through their own team of technicians and with franchises (so-called ‘authorised’ or ‘franchised’ service workshops) across the country (Sridhar and Chaturvedi 2017). Besides, there is a fairly large informal service sector with no tie-up to manufacturers. These workshops are present in large metropolitan areas as well as small towns. It is estimated that there are around 200,000 technicians operating in the air-conditioning service sector, based on the existing AC stock present in the country (MOEFCC 2019). A majority of the technicians engaged in this sector have not gone through the formal technical education and training. As there are virtually no entry barriers to start working as a service technician, most of these technicians have learnt while working in the field over several years.

Service of RAC equipment during the warranty period is done through the manufacturer’s service centres or through the network of franchised repair workshops (Daikin India 2022; Voltas Service 2022). The manufacturers conduct training programmes for their service network technicians across the country. Due to this, the manufacturer service network technicians acquire a good understanding of the particular manufacturer’s brand equipment. However, most of the installed equipment beyond the warranty period

is serviced by the informal sector as the cost-sensitive consumers are able to get low-cost services.

In the current study, the technicians who are in the direct employ of air-conditioner manufacturers, or identify themselves as being associated with authorised dealerships of OEMs, and are associated with formal establishments such as online service providers like Urban Company and Onsitego, are considered formal sector technicians⁴. On the other hand, technicians who are employed in a servicing shop not owned by them, or are running their own micro-enterprise of servicing are considered informal sector technicians. There are considerable and interesting overlaps between the two, and these have been highlighted at several points in the report.

2.2 Current servicing practices

It has been established that the AC servicing sector uses as much as 40 per cent of the total refrigerant consumption (Montreal Protocol Report 2016). The level of consumption can be scaled down by employing what is generally referred to as good service practices (GSPs), which include inter alia a) following standardised procedures while servicing, b) use of proper tools and c) regular servicing of air-conditioning equipment. These practices have the potential to reduce the environmental impact of servicing and ensure efficient operation of an AC system.

While service practices differ in different segments of the cooling sector, certain GSPs are followed everywhere such as leak testing before refrigerant charging, calibrated charging, flushing with dry nitrogen, brazing or flaring of parts, etc⁵. Moreover, practices differ as per the refrigerant in the system as protocols for safe handling of refrigerants vary a lot due to difference in flammability, toxicity and pressure requirements of different refrigerants (Ozone Cell, MoEFCC, 2019).

Service technicians in more organised segments like commercial air-conditioning are more likely to have the updated skills and tools as opposed to informal service technicians.

4. A similar categorisation has been used by Sridhar and Chaturvedi (2017).

5. Based on the inputs provided by manufacturers and technicians.

As mentioned earlier, the servicing sector is largely composed of technicians who can be classified as informal. Prevalence of informality leads to a large variance in the skill levels of service technicians (NSDC 2019). Service technicians in more organised segments like commercial air-conditioning (CAC) are more likely to have the updated skills and tools as opposed to informal service technicians. Therefore, the GSPs required to achieve reduction of refrigerant consumption and subsequent emissions are largely not followed in the informal sector, particularly the room air-conditioning segment.

The service practices that most technicians follow currently lead to significant venting of refrigerants into the environment. Some of these practices such as flushing with refrigerants, leak testing using compressed air or refrigerant, inadequate evacuation, poor brazing, inaccurate charging, etc. have become prevalent in the market. **As the climate and energy footprint of the cooling sector expands, addressing this skill gap in servicing remains a major priority.**

2.3 Servicing sector policies in India

The unorganised servicing sector comprises local technicians, small shops and micro-enterprises with 10 technicians or more. Apart from training and skill deficiencies, their ability to afford advanced servicing tools and tackles is also very low. Not having access and ownership of servicing tools has a direct impact on whether or not GSPs are followed. Moreover, **certain logistical constraints** such as use of two-wheelers by technicians, size of vacuum pumps, etc. restrict the transportation of equipment to the site⁶.

Improving the servicing sector has been acknowledged as crucial to meeting the Montreal Protocol goals. Over the years, several policies have been advanced, in line with the requirements to achieve refrigerant transition(s) in the cooling sector. In recent times, with the potential for high growth in the sector, the servicing sector policies have been framed with an eye to not just make technicians transition ready but also achieve livelihood enhancement, tap into opportunities for overall upskilling, encourage micro-entrepreneurship and

provide a social safety net to the sector's large workforce. Here's an overview of the salient policies impacting the servicing sector and their implementation so far.

Montreal Protocol implementation

Right from the inception of the ozone-depleting substances (ODS) phase-out in India, the servicing sector has been the focus of several policies of the government. In 1991, the refrigeration and air-conditioning sector was identified as one of the priority sectors for phase-out due to its large consumption of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs).

Ecological Refrigeration Project (ECOFRIG) and the Human and Institutional Development in Ecological Refrigeration (HIDECOR), an Indo-Swiss initiative, were the first programmes rolled out in order to phase out ODS in India. ECOFRIG and HIDECOR jointly established a training programme with modules and qualified trainers across the country. The programme's activities were restricted to six states and the target group were small and medium informal enterprises (Sridhar and Chaturvedi 2017).

In 2004, the Executive Committee of the Multilateral Fund (MLF) of the Montreal Protocol approved funding for the National CFC Consumption Phase-out Plan (NCCoPP) to phase out 1,502 ODP tonnes of CFCs from the RAC sector. The NCCoPP took over from HIDECOR and expanded its programme to establish training infrastructure in 15 states and conducted awareness-raising workshops across the country (Sridhar and Chaturvedi 2017).

NCCoPP focused its efforts on enterprises which were consuming 50 kg or more of refrigerants per year. The programme also expanded training programmes to technicians in the mobile air-conditioning (MAC) and commercial refrigeration sectors. While the ODS emission reduction from these efforts has not been quantified, more than 20,000 technicians were trained under HIDECOR and NCCoPP.

As the climate and energy footprint of the cooling sector expands, addressing the skill gap in servicing remains a major priority.

6. Based on the inputs provided during FGDs and by industry experts.



Image: iStock

HPMP I and II

The phase-out of HCFCs was carried out through the HCFC Phase-Out Management Plan (HPMP). The roadmap document to the HPMP identified the RAC-servicing sector as a major priority sector with a target of reducing this sector's HCFC consumption by 10 per cent. The three activities identified for Stage I were:

- Continuing training programmes for servicing technicians on good servicing practices across the country.
- Focusing on the existing reclamation centres associated with institutional users as these could adopt suitable policies on the reclamation and reuse of refrigerants.
- Promoting recovery and reclamation in the private sector in cooperation with the existing reclamation centres.

Stage II of the HPMP for India was launched in March 2017. Plans for the servicing sector included specific interventions for the provision of technical assistance and capacity building. The planned reduction of HCFC-22 consumption is 1,250 MT by 2023, with an investment of USD 5.1 million (Ozone Cell 2017). The specific planned activities include:

- Increasing the number of training programmes to reach more technicians and using new training partners to reach the technicians.
- Institutional-strengthening activities like revising the syllabus at ITIs, increasing the number of trainers at such institutes, and establishing state-of-the-art institutes.
- Awareness-raising activities like organising workshops, especially for spare parts dealers, to disseminate information, and producing more printed material, especially on new refrigerants, servicing methods, etc.
- Certification programmes for technicians.

As of 2023, the Ministry of Environment, Forest and Climate Change (MoEFCC) has started the process of national consultations to design initiatives under HPMP III. As before, the focus of HPMP III will be on phasing-down of HCFCs in end-use applications.

Awareness-raising activities like organising workshops, especially for spare parts dealers, to disseminate information have been planned before.



Image: iStock

India Cooling Action Plan

The India Cooling Action Plan is a flagship document released by the MoEFCC in 2019 which takes a comprehensive view of the cooling needs of the country. Through a multi-stakeholder, integrated and consultative process, the ICAP sought to synergise actions for addressing the cooling demand across all sectors. The ICAP provides a 20-year perspective (2017-18 to 2037-38) and short-, medium- and long-term recommendations, to address the cooling requirements across sectors and ways and means to provide access to thermal comfort.

The key objectives of the policy actions for the service sector fall under the purview of developmental and environmental goals. The ICAP identifies five main stakeholders of the service sector that make contributions in various capacities at various levels to achieve successful outcomes: service technicians, industry, government, civil society, and customers (MoEFCC 2019). Depending on their involvement in the lifecycle of the cooling equipment, each stakeholder plays a different role.

For example, the government facilitates the transition through policies, regulations and incentive schemes, while the industry takes measures to increase **access to social security, training and certification** for technicians. Service technicians and customers are

responsible for field-level implementation of regular and appropriate servicing and maintenance practices. **Feedback from service technicians and customers is central to creating policy actions.**

Bettering training infrastructure was acknowledged in the ICAP as the biggest contributor to improving the service sector. Through **better training infrastructure**, many technicians can be trained effectively and regularly. Training infrastructure is to include but not limited to quality training centres across the country, communication channels, acquiring more trainers and training sessions (short-term and long-term), certification schemes and networking opportunities. Building a suitable training infrastructure is perhaps the most challenging among the interventions to plan and implement.

Recognition of Prior Learning

Recognition of Prior Learning (RPL) is an ongoing initiative of the Government of India wherein Indian youth can opt for industry relevant skill certification which will help them secure better livelihood opportunities. As part of the Pradhan Mantri Kaushal Vikas Yojana (PMKVY), individuals with prior learning experience or skills can register themselves and get assessed and certified under the RPL. It focuses mainly on individuals engaged in unregulated sectors.



Image: iStock

Several implementation models have been proposed for RPL such as RPL camps, RPL at employer's premises, RPL by demand, RPL with best-in-class employers and online RPL. Project Implementing Agencies (PIAs) such as public and private expert bodies in the sector, central and state government ministries and other agencies designated by the Ministry of Skill Development and Entrepreneurship (MSDE) are being incentivised to implement RPL projects based on any of the models.

Notably, to address knowledge gaps, PIAs offer bridge courses to candidates along with the 12-hour orientation in domain skills, soft skills, entrepreneurship tips and familiarisation with the assessment process.

MSDE also signed an MoU with MoEFCC on 2nd August 2018. The partnership was envisioned to boost skill employability through skill upgradation and RPL certification of 100,000 RAC service technicians for the benefit of the environment and better employment opportunities.

Highlights of the partnership between MSDE and MoEFCC are as follows:

- Initiative in line with India's Montreal Protocol obligations for the phase-out of HCFCs
- Focused on upskilling RAC technicians in the informal sector as RPL project under PMKVY

The training programmes under this partnership have so far reached about 3,300+ technicians (NSDC 2019). An additional 40,000 trainings were allocated in January 2020 (NewsTRAC 2020). This programme is under implementation across many different centres across the country.

3. Research methods

The research approach for this study is geared towards understanding the perception of service technicians about the sector, the patterns that influence servicing and technicians' income, challenges posed by the technology transitions, impact of different policies pertaining to training and certification, and what can be done differently to transform the sector. Although CEEW has earlier undertaken research work that involved surveying service technicians (CEEW 2020, Bhasin et al. 2022), the present effort is different in multiple ways.

- The study is predicated on the differences that prevail in the formal and informal parts of the servicing sector. Although this distinction often gets blurred, the servicing practices deviate considerably. Therefore, a study that documented perceptions and impressions of largely informal service technicians was deemed necessary.

- After the launch of the ICAP in 2019, a systematic effort to connect with the service technicians has not been made. Much has been proposed in the ICAP which directly affects the service technicians. A need was felt to establish a fresh connect with them and understand if given policy prescriptions would address their concerns.
- The recommendations to revamp the servicing sector have been proposed in the ICAP. However, the finer details need to be worked out in order to offer better implementation design and roll-out. The survey, therefore, seeks to unearth insights and patterns that can add nuance to the existing set of recommendations.

To this end, the study adopts a **mixed-methods design** to answer the following research questions:

- How do the service technicians view government plans and ambitions pertaining to training and certification, HFC phase-down and skill needs in the RAC servicing sector?
- Based on the way existing plans and policies are perceived, how can the preferences and needs of service technicians be incorporated into the roll-out strategy?

The major components of the mixed-methods research design adopted for this study are as follows:

- **Primary survey of 369 technicians**, largely from the informal sector.
- **Three focussed group discussions (FGDs)** with service technicians in both formal and informal sectors to validate the survey findings, as well as plug any information gaps not captured in the survey.
- Interviews and discussions with experts from OEMs (Jitendra Bhambure, Bluestar; Shashikant Juvekar, Godrej; Arun Kumar, Bluestar) and service providers (Ajit Panicker, RATA).
- Desk research to capture information about policies directed at the RAC servicing sector.

3.1 Survey methodology

This section provides details of the target population, sampling technique, criteria for location selection and limitations of the study.

Target population and sample size

The population of interest for the survey was primarily RAC service technicians in the informal sector across nine Indian cities. However, as the boundaries of formal and informal are not well defined, technicians from the formal sector also responded to the survey. This mixed sample and ‘interesting fallacy’ has been registered on account of two reasons:

- Informal sector technicians appear to be professionally networked with technicians in the formal sector and, therefore, attract the latter’s attention through their own connections. This could pertain to calls for servicing or sharing information about newer tools.
- Technicians or servicing stations in the formal sector are known to reach out to the informal sector when the demand for servicing hands goes up during the hot seasons. So, the connect tends to be seamless.

The following cities were shortlisted for this exercise: Delhi, Mumbai, Kolkata, Bengaluru, Chennai, Jaipur, Ahmedabad, Lucknow, and Patna. A sample of 369 technicians was surveyed for this study, with equal distribution across cities. Thus, 41 technicians in each city responded to the survey questions. The survey was administered by CEEW researchers who coordinated and trained the enumerators from Market Xcel, a market research agency based out of Delhi.

Sampling frame

One of the challenges of designing the survey was that no database of service technicians actually exists in the public domain. Therefore, there was no ready sampling frame available from which a sample selection could have been made. The inherent difficulties in separating informal from formal sector technicians also posed certain challenges. Bearing these constraints in mind, non-probability sampling techniques were considered appropriate for the survey.

Sampling technique

The non-availability of a sampling frame led the authors to choose a non-probabilistic sampling strategy to get respondents for the survey, viz., the **network sampling** method. Although the survey is mainly targeted towards

informal sector technicians, it proved to be difficult to avoid technicians active in the formal sector. Hence, no separate category of technicians was created to capture the differences between sub-populations, i.e., technicians who are active in both formal and informal sectors, technicians associated with brand service centres, etc.

The initial respondents were found and contacted based on the local leads. The researchers and enumerators went around in the area where servicing shops were located. From that point on, more contacts of technicians were generated that fell within the network of first-service

technicians. Enumerators were instructed to follow these leads diligently and generate contacts until the required sample size from each city was achieved.

Location selection criteria

The location to conduct the survey was selected on the basis of climatic zones, perceived availability of technicians and penetration of air-conditioners. This was done to ensure that the survey findings were representative of the pan-India situation, as well as to capture the diversity of responses.

Table 1 Locations targeted in the survey

Climate zone	State	City
Composite	Delhi	New Delhi
Composite	Bihar	Patna
Composite	Uttar Pradesh	Lucknow
Warm and humid	Maharashtra	Mumbai
Warm and humid	West Bengal	Kolkata
Warm and humid	Tamil Nadu	Chennai
Hot and dry	Rajasthan	Jaipur
Hot and dry	Gujarat	Ahmedabad
Temperate	Karnataka	Bengaluru



3.2 Questionnaire design

The survey questions⁷ were designed to capture the perception of service technicians towards key government policies. Therefore, questions were framed around the following themes:

- Background information on the technicians such as enterprise association, change in income pre- and post-COVID, kinds of servicing done, training level, etc.
- Training and certification: Importance of online platforms and offline training centres.
- Drivers of income: Technicians' income and factors that affect compensation for servicing jobs were included.
- Access to social security schemes: Questions framed around this theme were intended to assess the current level of awareness about prevailing schemes, gaps in access to benefits and draw inferences/action items from the technician's point of view.
- GSPs awareness: Assess the level of awareness about GSPs among the technicians and outline the bottlenecks faced by them when trying to adhere to them.
- Suggestions if any to establish a robust network for the benefit of service technicians.

Ethical practices

The service technicians were called prior to the meeting to confirm the time in advance. The purpose of the study and possible usage of data was clearly communicated to each and every technician. The technicians were promised that no personal information would be shared with any party and the data would be anonymised to protect their privacy.

3.3 Limitations of the study

Since the study was undertaken under resource constraints, it is important to highlight certain limitations to appropriately benchmark expectations and exercise caution while deriving inferences.

Sampling bias

As mentioned earlier, due to the lack of a sampling frame, the study opted for a non-probability sampling strategy, known as network sampling. Although the entire approach is geared towards achieving as much randomness in sample selection as possible, it is not completely random. Therefore, it is possible that certain members of the targeted population had more probability of getting selected while surveying, while some others had less probability of selection. Therefore, caution needs to be exercised when generalising the results of this study for the entire population of service technicians.



Image: iStock

7. See annexures for survey questions.

Response bias

The survey seeks to capture information about how technicians perceive a set of proposed government interventions, consumer behaviour, and their own preferences about it. An element of self-reporting is involved in the whole exercise. Therefore, there is a possibility that all the responses are not truthful. Certain kinds of questions are more prone to this bias. For example, the ones pertaining to annual incomes. This needs to be considered when analysing the survey results. A separate study on the determinants of preparedness of technicians to access information and enhance their readiness to adapt to changing circumstances will also be in order in the future. This will help fine-tune insights about barriers to information access to improve delivery of appropriate information in a timely manner.

3.4 Method of analysis

The survey collects responses from 369 technicians across many variables. The sample size is judged to be suitably large to undertake both descriptive and inferential analysis.

Descriptive statistics

The data is studied with the help of descriptive statistical techniques, primarily through measures of frequency. This helps us in understanding the range of responses collected from the given sample. This includes cross-tabulation of data, frequency distribution plots, pie charts, etc. to present the data as well as to build the narrative for providing appropriate recommendations at the end.

Inferential statistics

The study also makes use of inferential statistical techniques to understand the pattern of dependence between variables of interest. This is to check and ensure that the relationship between variables that is reported or vaguely observed is also statistically valid. Two techniques are worth mentioning at this point:

- **Chi-square test:** The chi-square test is primarily used to examine whether two categorical variables are independent in influencing the test statistic. It helps to find out whether a difference between two categorical variables is due to chance or a relationship between them. This is done by determining the difference between the observed and expected data. In the present study, the chi-square test has been used to understand the relationship between a) perception about customer awareness levels and practice of good servicing modalities, and b) work preferences and training status. The appropriate null and alternative hypothesis have been provided in the discussion.
- **Ordered logistic regression:** The motivation to use a regression model is to understand the drivers of income for service technicians, which can then enrich how we think about livelihood enhancement policies for the technicians. In this case, based on the prevailing understanding of the sector, a model is constructed to understand the factors that increase the probability of attaining a higher-income category.

The data collected through the survey is largely categorical. The dependent variable which is being studied, i.e., income categories, is an ordered variable. Therefore, ordered logistic regression is used to model the effects. Mathematically, the ordinal logistic regression model can be defined as follows:

$$\text{Logit}(P(Y \leq j)) = A + Bx_1 + Cx_2 + \dots + nx_n$$

where A, B, C, etc. are model coefficient parameters with predictors for $J=1, 2, 3, \dots, N-1$.

The description of the model used in the study is as follows:

$$\text{Income category} = A + B (\text{Employment with OEM servicing centre}) + C (\text{Employment with multi-brand dealerships}) + D (\text{Own shop}) + E (\text{Other's shop}) + F (\text{Freelancing}) + G (\text{Training status}) + H (\text{Access to tools})$$

The dependent variable, which is income category, has 5 different categories that are numerically denoted as 1-5.

Each of the explanatory variables captures the response in 1/2 form, where 1 means ‘yes’, and 2 means ‘no’. The interpretation of the model is provided in Section 4, and details of the model parameters calculation is provided in Annexures.

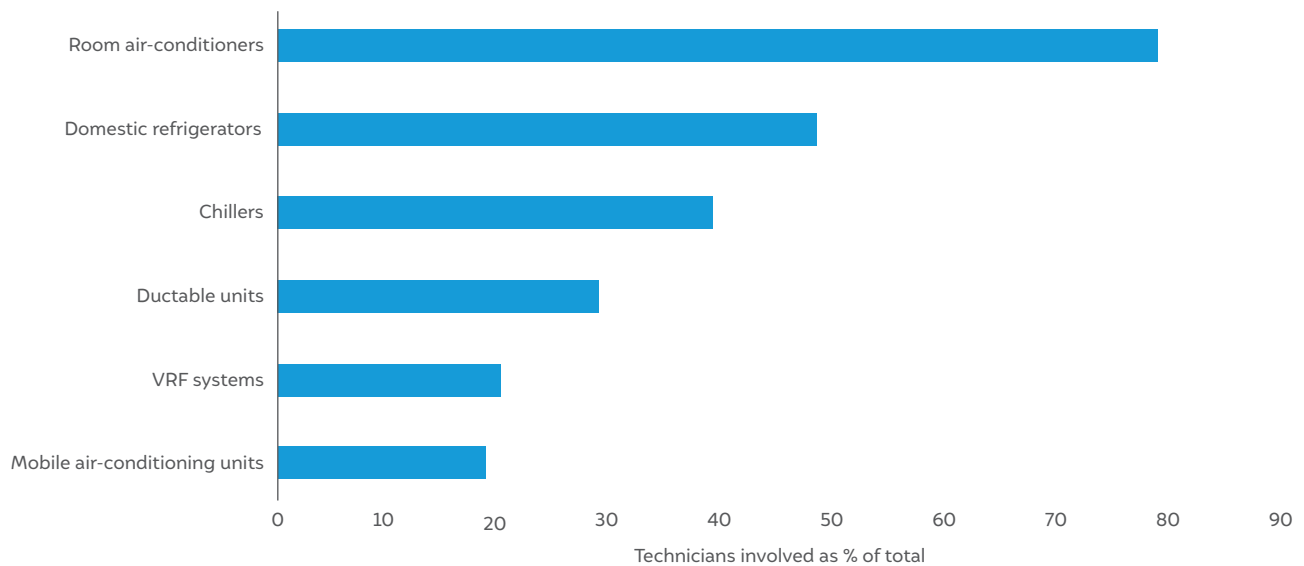
4. Survey findings and discussion

Apart from doing a review of the policies advancing various recommendations for the service sector technicians, the report is also using the data collected through the survey to showcase the status quo and perceptions of the service technicians. By establishing the conditions of work, and technicians’ preferences about the operational modalities of different programmes on training and certification, the report can propose the way forward for these programmes. To analyse the survey data, a combination of descriptive and inferential statistical analysis was undertaken to draw insights

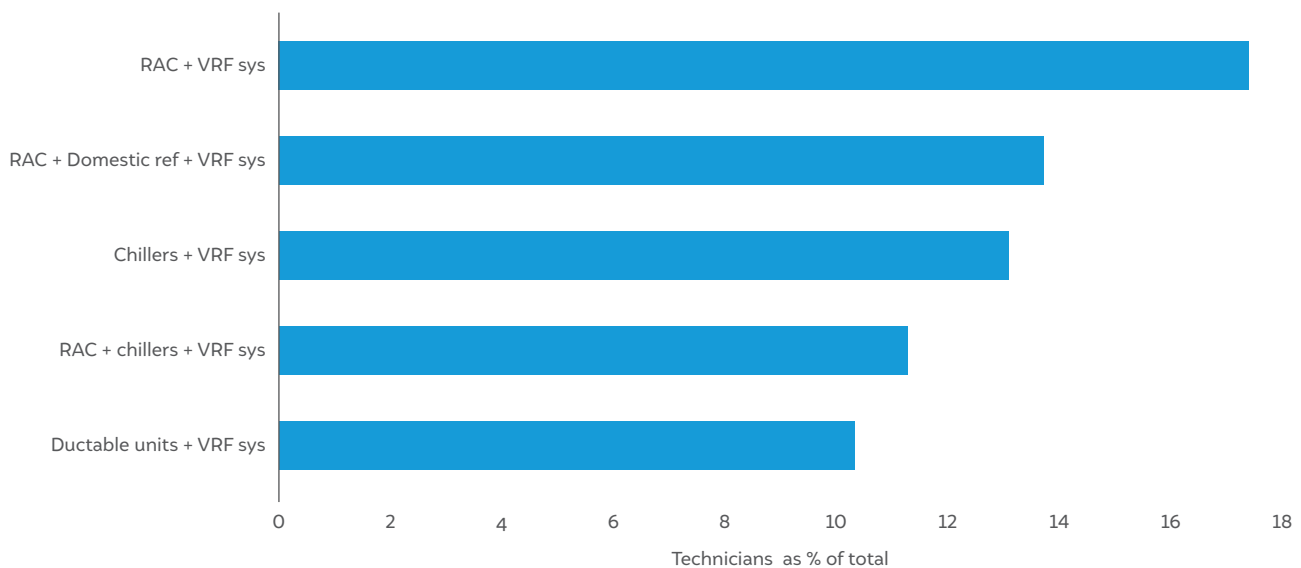
across a range of issue-areas. The following sub-sections will take the reader through various insights from the survey data as well as the focus group discussions.

Section 4.1 covers areas pertaining to enterprise properties in the servicing sector, and the involvement of formal and informal technicians in different cooling segments as well as kinds of servicing work, reported impact of COVID-19 and climatic zones on livelihoods and status of whether good servicing practices are followed or not. Section 4.2 covers the training status of technicians, their preferred modes and focus areas of training and how knowledge is generally being shared across technicians’ networks. Section 4.3 captures the perception of technicians about the proposed certification regime. Section 4.4 outlines the perceptions of technicians about consumers and their choices with respect to preventive maintenance and its linkage to energy efficiency. Section 4.5 covers certain other insights from the survey data about refrigerants, social security schemes and compensation.

Figure 2 Several types of equipment are serviced by the technicians



Source: Authors’ analysis

Figure 3 Considerable overlaps are found between servicing of different equipment types

Source: Authors' analysis

4.1 Servicing enterprise and livelihood characteristics

Overlap between servicing technicians of different cooling segments

Based on the survey, about **60 per cent service technicians** reported being employed within their own shop/workshop. **Only about 15 per cent service technicians had an association with OEM servicing centres.** As mentioned before, the difference between formal and informal employment is blurred and this is also evidenced by the survey. The same technician working in somebody's workshop is also associated with multi-brand dealers and online platforms like Urban Company and Onsitego. In focus group discussions, technicians admitted to providing services through multiple channels in order to supplement their income.

The top four categories of cooling equipment serviced by service technicians are room air-conditioners, air and water coolers, domestic refrigeration and chillers. 80 per cent of technicians reported to be involved in air-conditioner servicing, while only 20 per cent reported being involved in servicing of VRF systems. Also, there are considerable overlaps between servicing and different kinds of equipment. For example, about 17 per cent technicians reported to be servicing both residential ACs and VRF systems. The overlaps can have significant ramifications in terms of training modules for different groups of technicians. Also, except for the chillers segment, other segments showed an almost identical share of formal and informal technicians.

While the level of informality found through the survey was almost along expected lines, the responses to the total number of working months for servicing technicians diverged from an earlier study. As per Sridhar and Chaturvedi (2017), most technicians reported to be busy with servicing work throughout the year. This did go against the conventional understanding that RAC servicing is largely a seasonal market.

Servicing pattern across different zones and time

The survey shows that a majority of technicians are engaged in servicing work for only about **4-6 months in the year (Figure 5)**. However, share of technicians **working throughout the year** is also significant at **23 per cent**. This variation may be sub-sector dependent, like domestic refrigerators and commercial refrigeration, which are operational throughout the year and require servicing. The large share of seasonal technicians poses considerable challenges to livelihood protection. It also affects the efforts to professionalise the sector as technicians keep falling in and out of the market within a year in search of alternative livelihoods. Another pattern which was observed on the field is that technicians start fixing other electrical appliances not related to refrigeration and air-conditioning in the non-seasonal months. It will require more research to understand how generalising the offered services affect the level and quality of skills of the service technicians over time.

During focus group discussions with service technicians, it was reported that during the busy season, i.e., April–June, a lot of untrained people

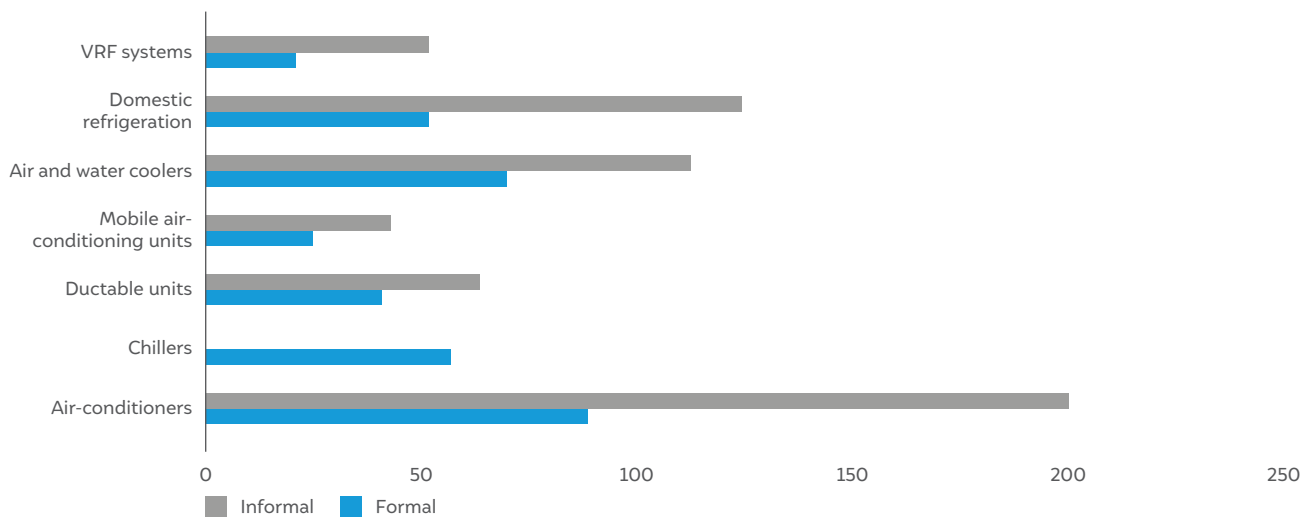
migrate to high servicing demand locations. This is due to the fact that as the air-conditioner sales go up, there are not enough technicians in the authorised service network of OEMs to service the corresponding demand for assembly and installation. Poor installation later causes many issues such as water leakage, refrigerant leaks and low cooling, among others.

The servicing work also varies by the climatic zone in which service technicians work. In warm and humid climates (Mumbai and Kolkata), about 35 per cent technicians reported to be working throughout the year, as opposed to temperate climates, where less than 5 per cent technicians

were active all year. In hot and dry climates, about 65 per cent technicians reported to be working about 4-6 months which coincides with the hottest months of the year.

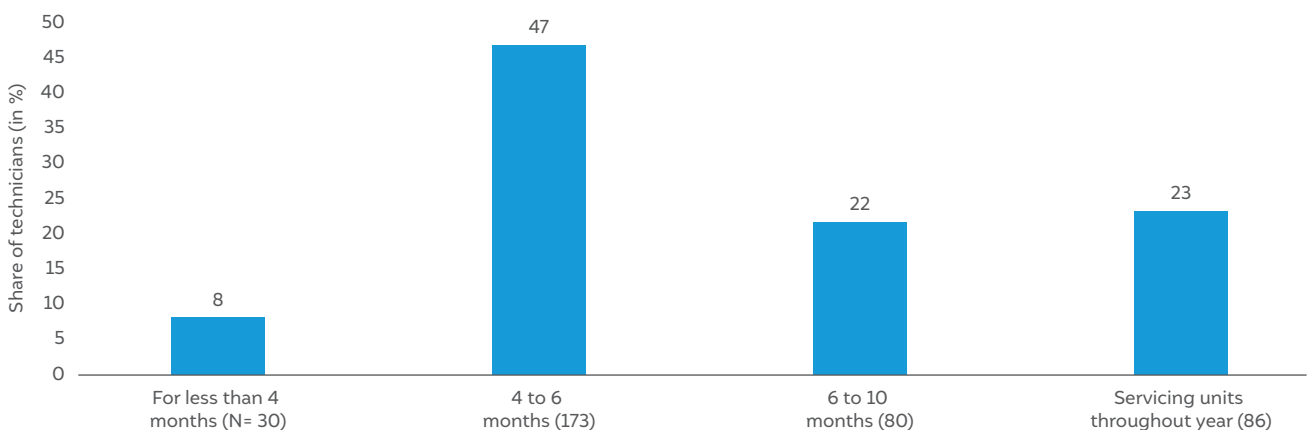
The survey also threw light on the type of work service technicians are getting. Regular servicing and maintenance are the most commonly provided type of service by the technicians, closely followed by repair work in case of break-down and assembly and installation of the air-conditioning unit. The share of technicians who are performing disposal and scraping at the end-of-life of the equipment remains very low.

Figure 4 Share of informal service technicians was highest in air-conditioners



Source: Authors' analysis

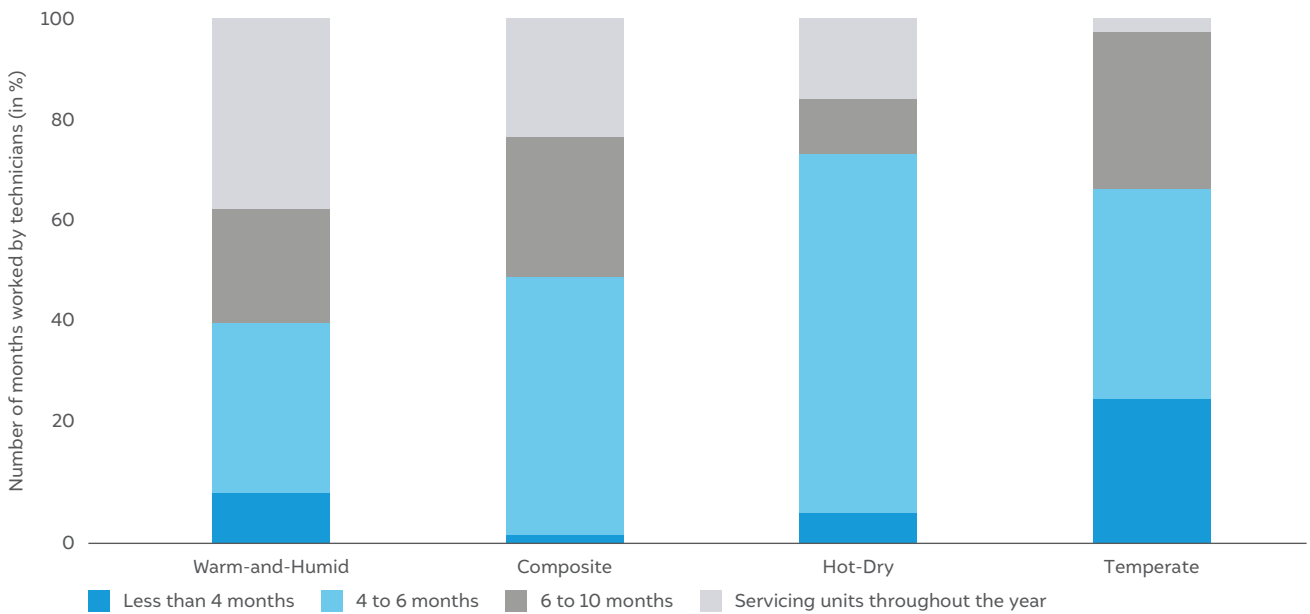
Figure 5 Most servicing technicians are active for 4-6 months in the year



Source: Authors' analysis

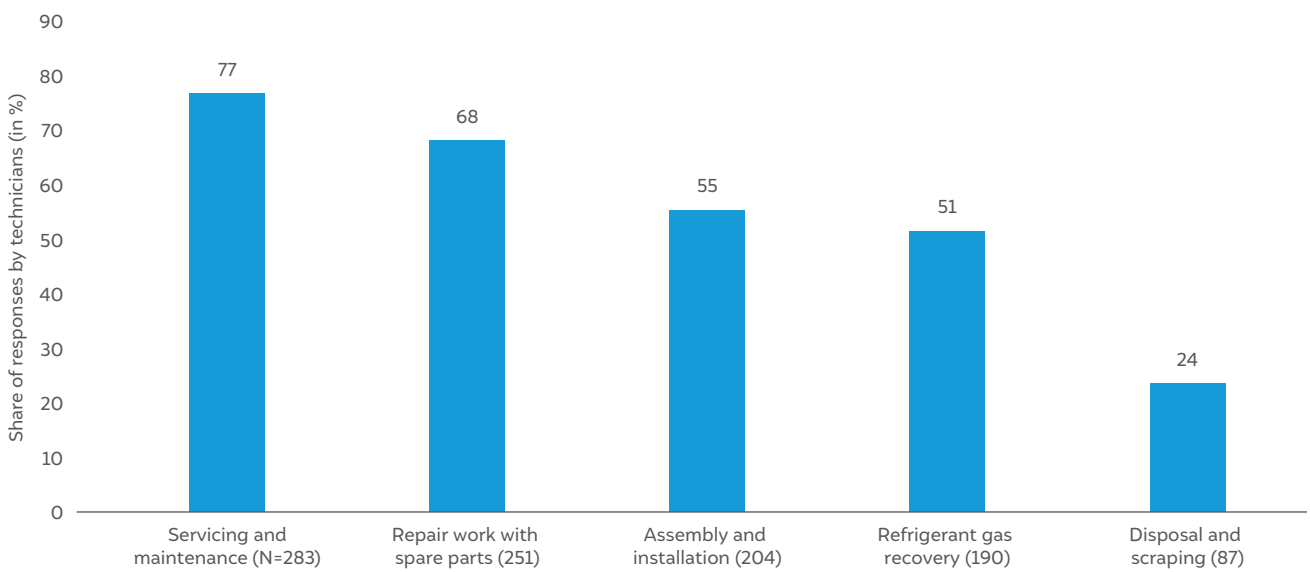
Note: The per cent value has been calculated against the total number of responses, i.e., 369

Figure 6 A significant percentage of technicians in warm and humid climate work round the year



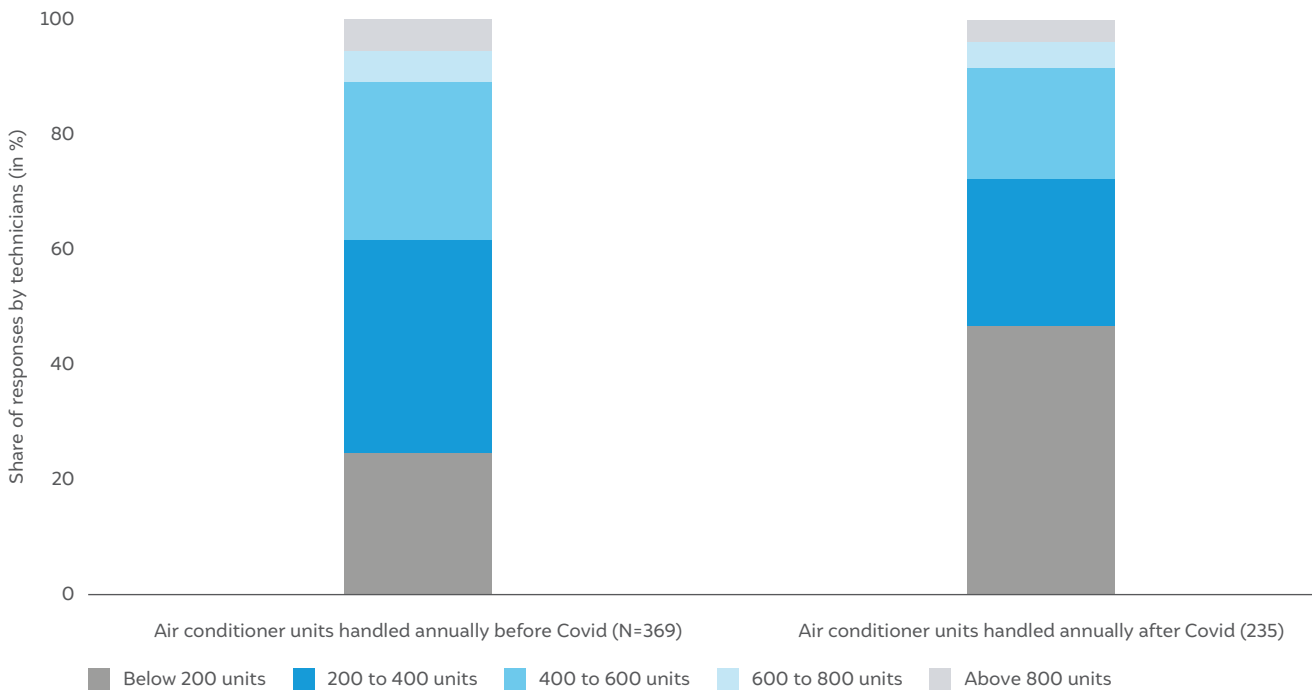
Source: Authors' analysis

Figure 7 Servicing and maintenance is the main activity performed by service technicians



Source: Authors' analysis

Note: We have taken the total number of surveyed technicians (369) as a base to analyse the above chart.

Figure 8 Share of technicians servicing less than 200 units almost doubled due to COVID-19

Source: Authors' analysis

Drivers of income for service technicians

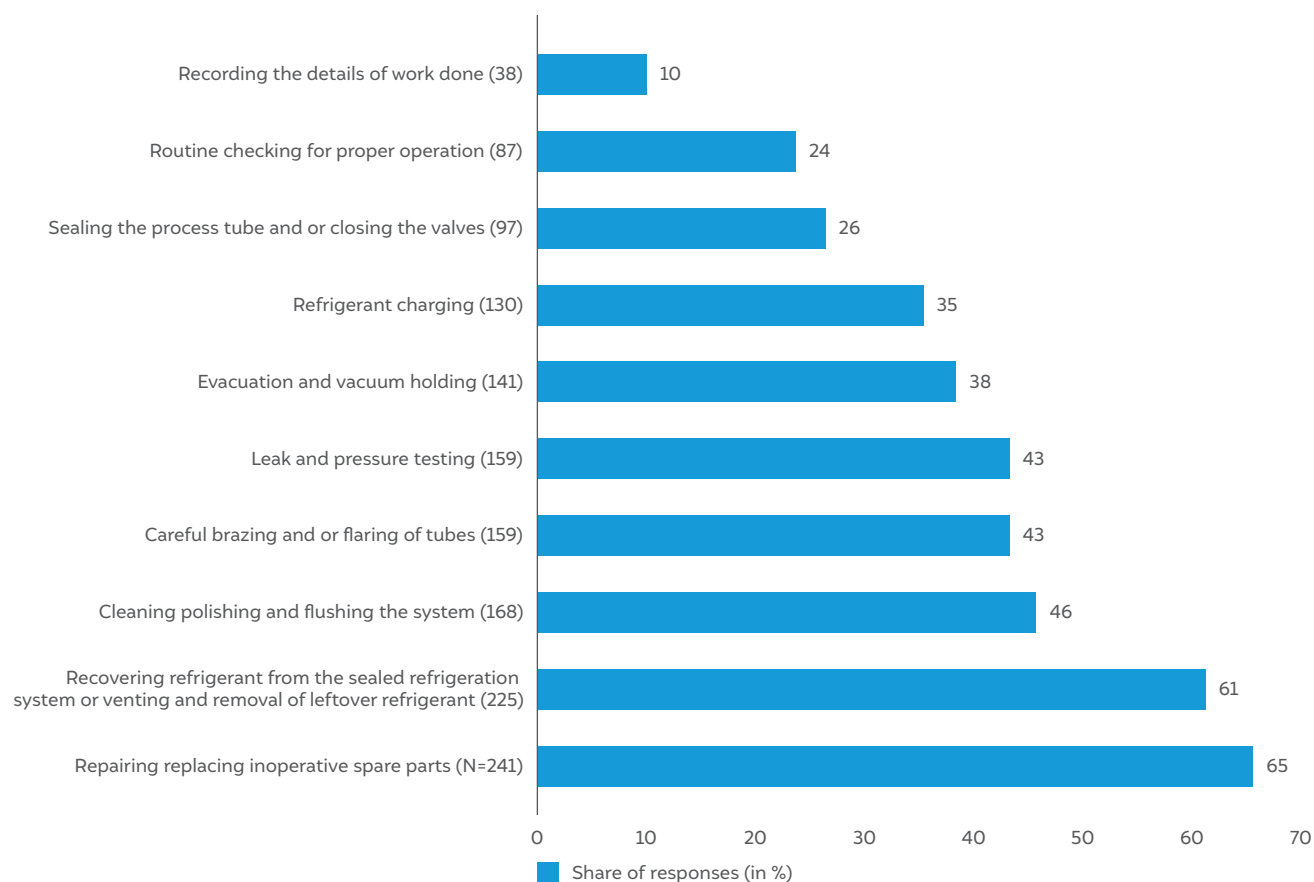
The survey also tried to capture the effect of the pandemic on service technicians and their livelihood. With social distancing norms being adopted during COVID time, a lot of customers were wary of coming in close contact with any outsider. Consequently, the servicing market did shrink temporarily. More than **70 per cent** technicians reported a contraction in demand for servicing and maintenance between pre- and post-COVID, as confirmed by the survey. Figure 8 breaks it down for different category-size of technicians. There was a reported increase in the number of technicians handling less than 200 units, while a sharp drop was seen in the number of technicians handling more than 200, 400, 600, and 800 units.

In terms of the earned income of the service technicians, the expectation is that it will depend on the work establishment, the training status of the technician and his access to tools and tackles for work. An ordered logistic regression model was constructed based on this understanding to quantify the effects of these variables on the income. The resulting coefficients are provided in the Annexures. In a logistic regression, the coefficients are calculated on a log scale. A negative coefficient implies that the probability that the event identified by the dependent variable happens decreases as the value of the explanatory variable increases.

The coefficients tell us the following:

- Formal training has a positive impact on the income status of service technicians. The odds of improvement in income category go up by 1.82 times if the technician is trained.
- Access to tools is extremely important to maintain income status as it helps technicians deliver satisfactorily on the job. The odds of belonging to a higher-income category are increased by almost 2 times if the technician possesses the tools.
- The coefficients for different work establishments are negative indicating that no matter where the technicians worked, odds to move to a higher-income group decrease. The lack of a positive relationship may help in ruling out a significant impact of the place of work (formal/informal) in deciding the income of a technician.

In terms of knowledge of and adherence to good servicing practices (GSPs), the survey questions led respondents to choose from a list of generally prescribed practices. Figure 9 tells us that few technicians reported to be recording the details of the service rendered and routine checking to ensure proper operation of the equipment. This data point should be interpreted with caution as it is prone to response bias. For instance, a service technician may not say honestly whether or not they follow all the prescribed GSPs.

Figure 9 List of GSPs followed by technicians

Source: Authors' analysis

The variation in responses can be explained by the nature of respondents, many of whom are not full-time technicians. Therefore, not everybody who responded to questions might be involved in regular servicing. This is consistent with an earlier observation that a lot of the technicians are not from this sector. They only see the opportunity to fill the supply gap in high-demand seasons to take up installation work.

4.2 Technicians' preferences about training and learning

Training and skilling are important pillars of government interventions in the RAC servicing sector. Several

initiatives have been advanced keeping in mind the need to build capacity within the service sector technicians to deal with ongoing technology transitions. This comprises not just improvement in training infrastructure, livelihood opportunities and training curriculum, but also exploring new modes of knowledge dissemination through online classes, content creation, etc.

Greater participation of room air-conditioning manufacturers is also sought to prepare service technicians for latest product upgrades. Owing to its central role in revamping the sector, it is crucial to understand what technicians feel about training initiatives and programmes.

Box 1 Training recommendations for RAC technicians

Training curricula standardisation for the servicing sector is an important area in the effort to make the sector transition-ready. Several training programmes cater to the RAC technician's need for skill building and know-how of cooling units. However, there is no standard skilling framework which is practiced across different programmes, which has resulted in technicians acquiring a differential set of skills. This has led to many issues including the mismanagement of refrigerant gases during servicing.

The CEEW analysis suggests that the National Occupation Standards (NOS) must be updated based on four priority areas (CEEW 2020). These priority areas have been identified on the basis of the perceived needs of the servicing sector. These are 1) awareness and compliance of GSPs; 2) knowledge and practical skills in handling alternative refrigerant gases; 3) implementation of measures to ensure occupational safety; and 4) employability skills and career development of servicing sector technicians.

Based on the priorities, four NOS for training curriculum across different government programmes have been recommended:

NOS 1: Adherence to GSPs

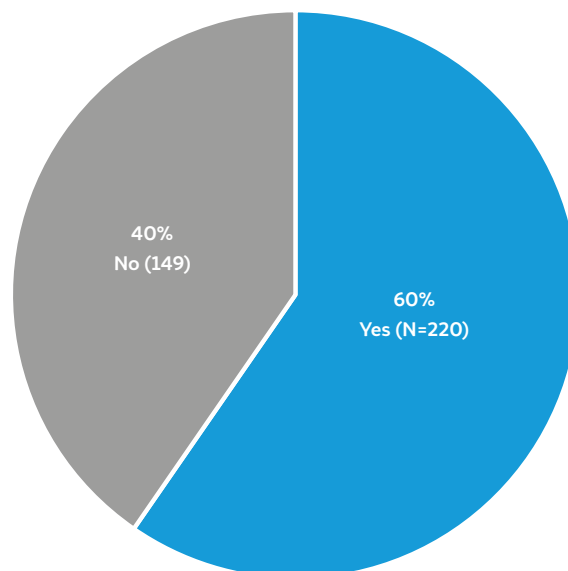
NOS 2: Awareness of and skill in handling flammable/toxic refrigerant gases

NOS 3: Perform installation, repair, and maintenance while strictly adhering to safety protocols

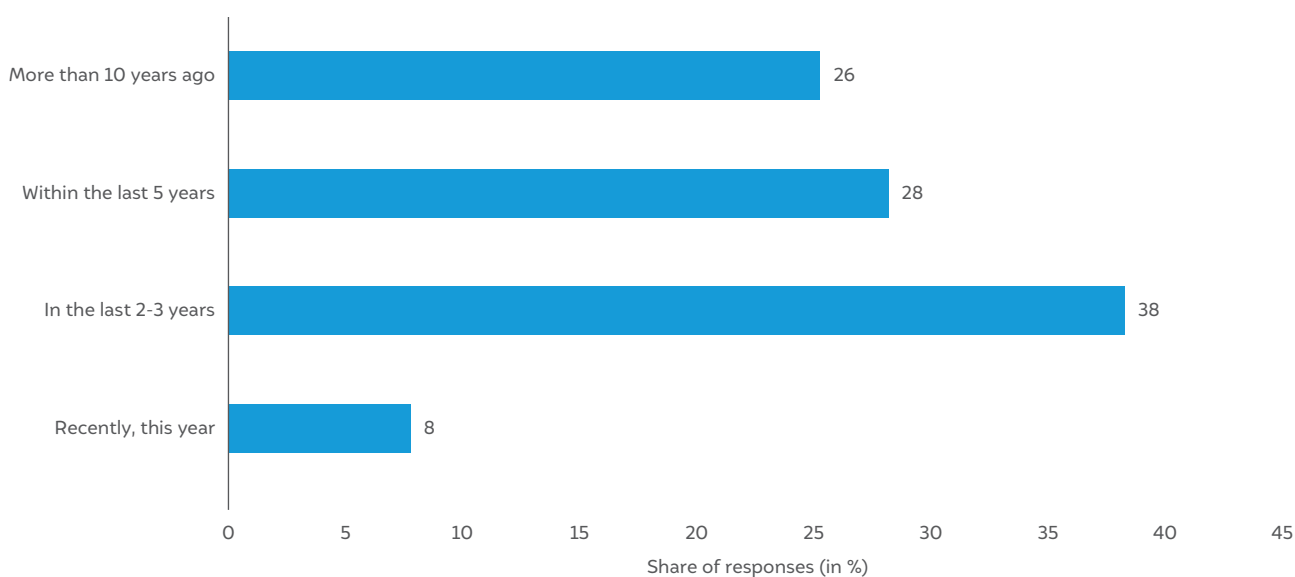
NOS 4: Employable by a formal sector enterprise

Source: Bhasin, Gorthi, and Chaturvedi, 2020a

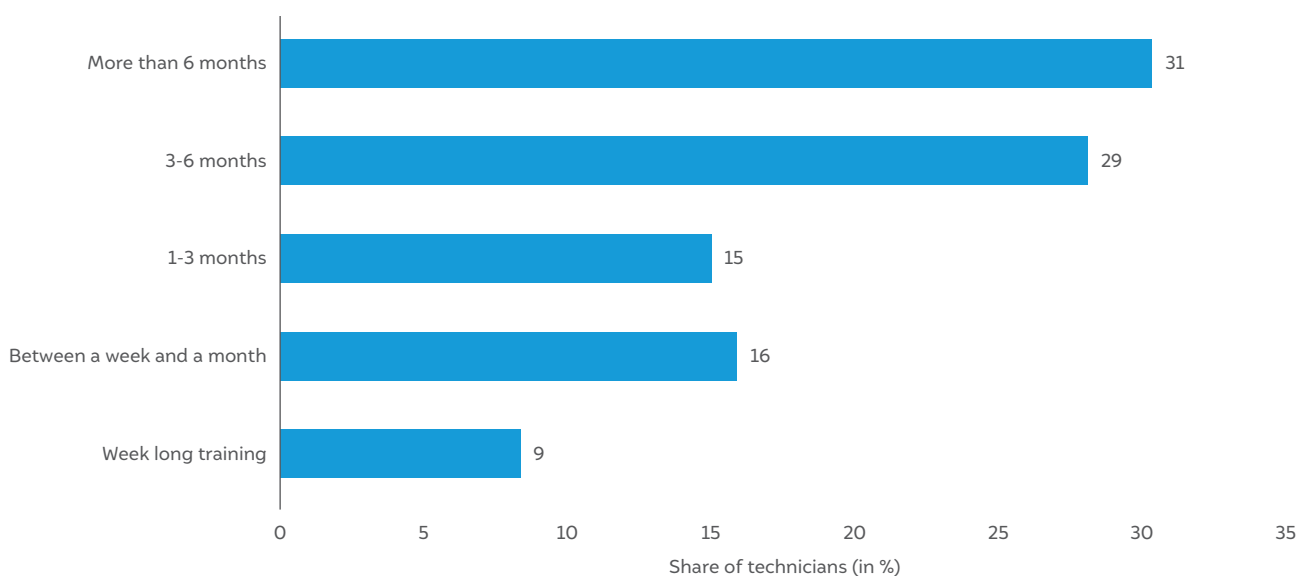
Figure 10 Just a little over half of service technicians are formally trained



Source: Authors' analysis

Figure 11 Most service technicians received their last training a while ago

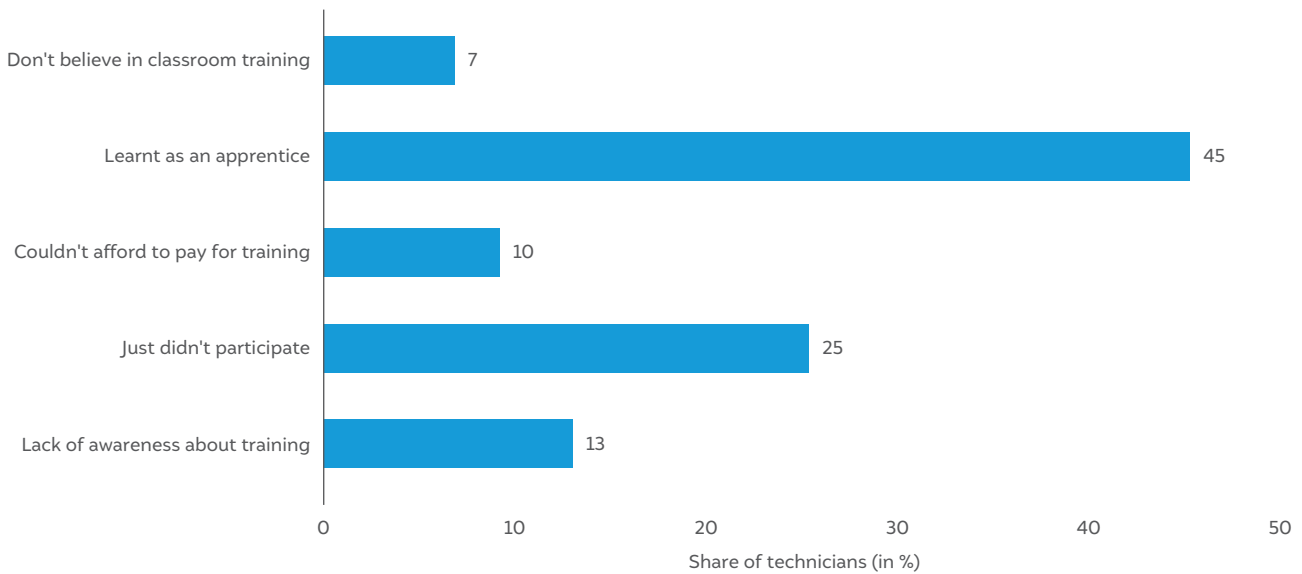
Source: Authors' analysis

Figure 12 The training duration for most service technicians is at least three months

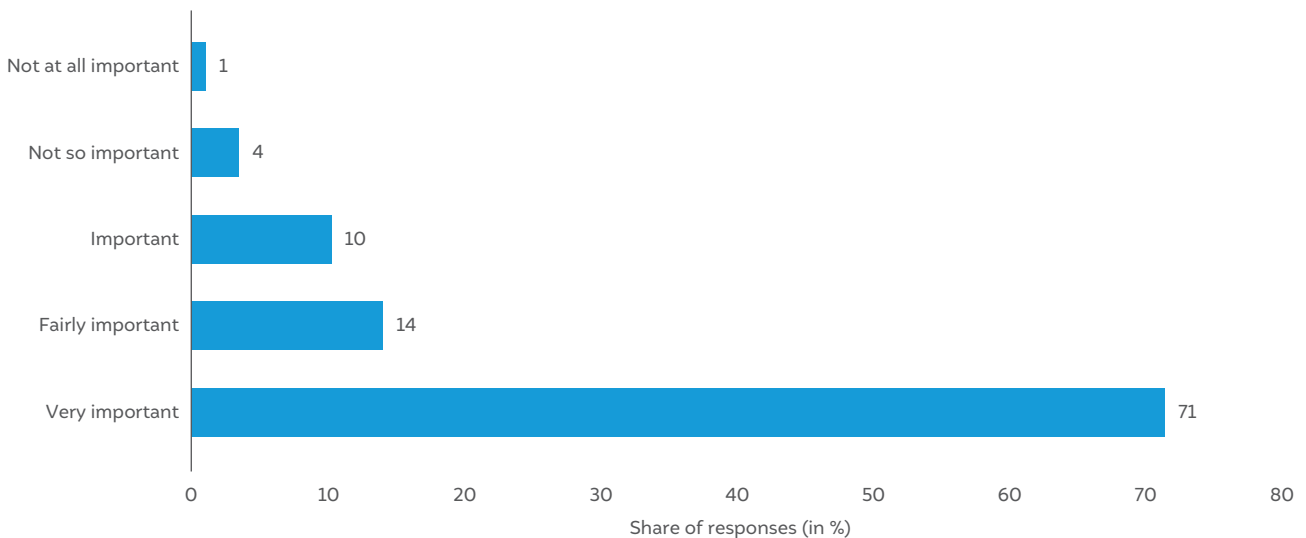
Source: Authors' analysis

First, the survey confirms the commonly perception about service sector technicians: that they are not formally trained. As Figure 10 shows, 40 per cent of the total respondents didn't get any formal training whatsoever. Although the actual level of specific training for air-conditioners might be even lower, it is a telling data point with regards to how 1 out of 2 technicians do not get any classroom education or training about the equipment. In focus group discussions, the technicians confessed to have learnt most of their skills in the workshop while working under a senior technician as a helper or an apprentice.

What about the technicians who did get some form of training? Is the training still valid? Interestingly, fewer technicians actually received a formal training or enrolled in an upskilling workshop in the last 2-3 years than those that received training in the last 5-10 years (see Figure 11). About 57 per cent technicians had their last training about 5-10 years ago. One preliminary conclusion that can be drawn from this data point is that the trainings taking place in recent times are not reaching too many technicians. It clearly points to the need to cover more technicians as HPMP III kicks off in 2023, and the Government of India drafts an HFC phase-down strategy.

Figure 13 Most service technicians didn't get formal training and trained as apprentices

Source: Authors' analysis

Figure 14 Formal training is very important as per most service technicians

Source: Authors' analysis

Also, as shown in Figure 12, the duration of training for most technicians is more than 6 months or between 3 to 6 months, which is consistent with the understanding that trained technicians enrol into industrial training institutes (ITIs) as their first initiation into the servicing sector.

The technicians who had no formal training gave a variety of responses as to why they didn't enrol into a course to understand the fundamentals of mechanical and electrical engineering. However, most respondents said that they turned to learning as an apprentice or helper with a senior technician to get hands-on training specific to the sector. This has an important ramification

for designing an effective training programme for young service technicians. Apart from the need to increase the enrolment in ITIs, efforts should be made to improve the apprentice system which is not linked with an ITI diploma course to ensure there is no skill deficit in the process.

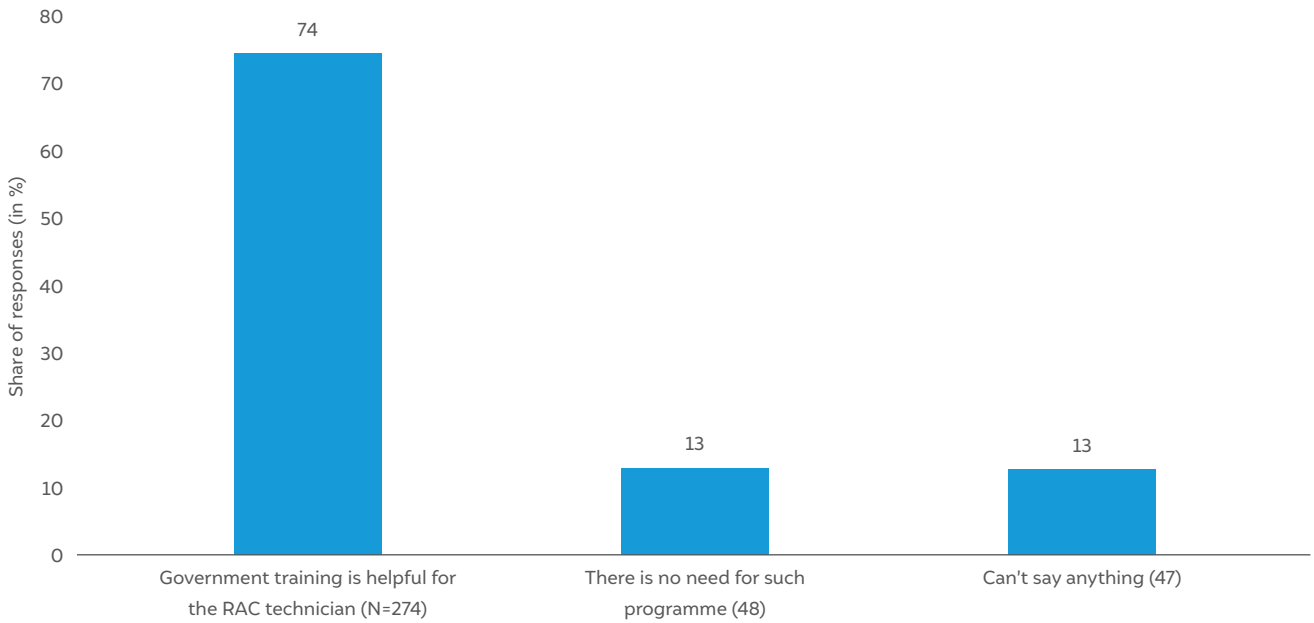
In terms of perceived importance of training, an overwhelming number of technicians responded in favour of formal training as a must for service technicians. In the FGDs, technicians explained that without formal training and education a lot of technicians lost out on important lessons one needs to internalise to render the job effectively and safely.

Although the initial training would not be sufficient and require constant upgradation, it was important to go through the process nonetheless.

Following on from the perceived importance of training, the survey also collected responses about a government-instituted training and upskilling programme for service technicians. An overwhelming number of technicians

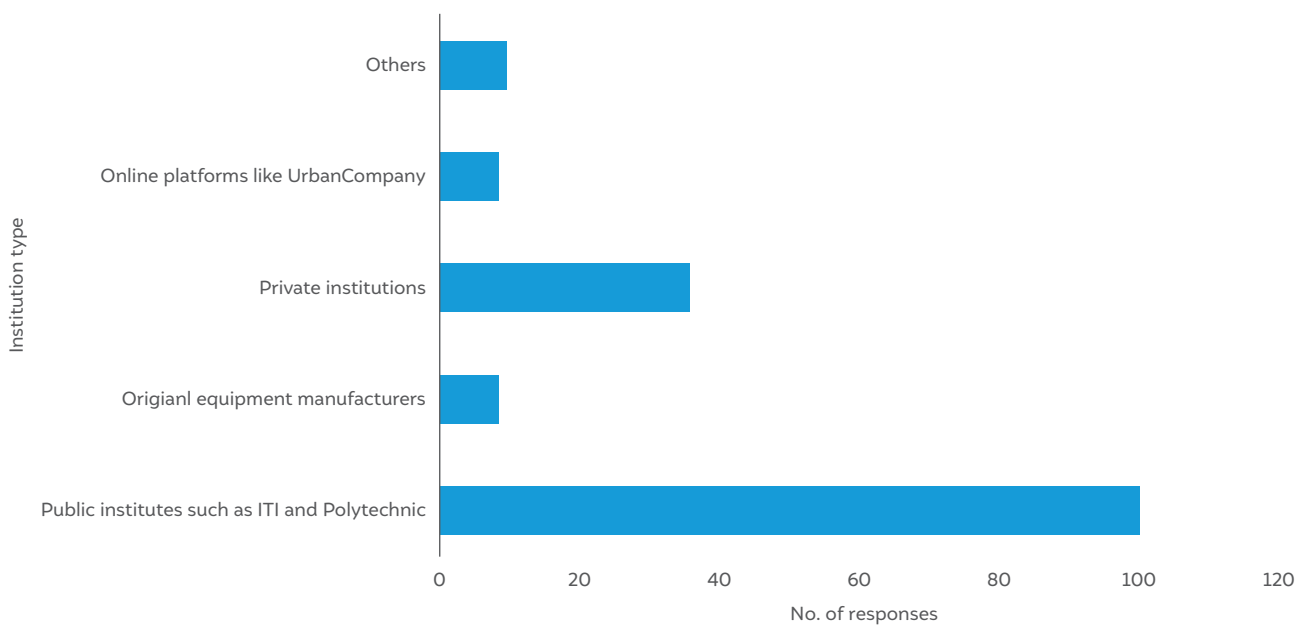
agreed that it would be helpful for the service technicians as the curriculum and skills will be very useful on the field. The respondents also related their experience of the trainings that were organised under HPMP I and HPMP II in collaboration with GIZ. These trainings were not only liked by the technicians, they thought that the trainings imparted important skills and lessons particularly with regards to dealing with new refrigerants.

Figure 15 Most technicians are in favour of a government training programme

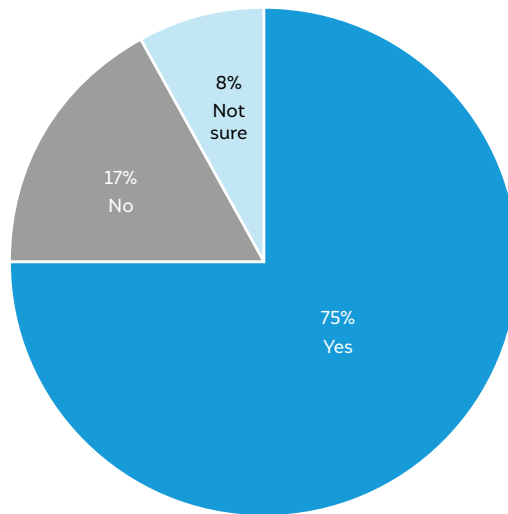


Source: Authors' analysis

Figure 16 Most technicians got their training certificates from ITIs and polytechnics



Source: Authors' analysis

Figure 17 Most technicians feel certification linked to skill level will be useful

Source: Authors' analysis

4.3 Technicians on certification

The survey tried to gauge how technicians view certification in their line of work. In terms of the kind of certificate that technicians already had, a bunch of responses were given. A large majority of technicians claimed to have got a certificate of training from ITIs. The second largest share belonged to private institutions which can include training centres operated by private and non-governmental organisations.

In a sector where formal training is scarce, it is important to understand the perceived importance of certification. It is only after proper training and testing of applicants that a certification exercise can be rolled out. More than two-thirds respondents were enthusiastic about certification, and viewed it as a useful addition to training and skilling.

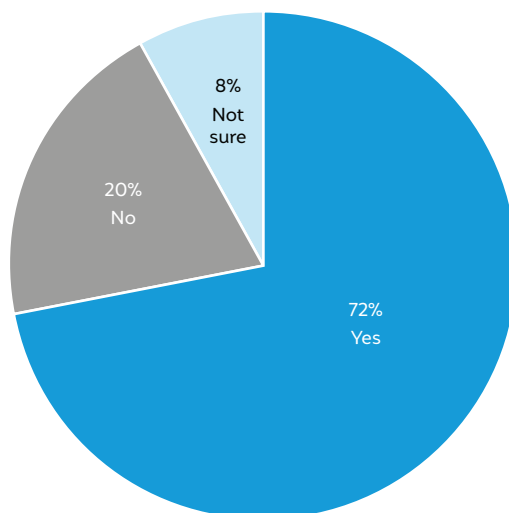
During FGDs, it was pointed out that a certificate will help service technicians distinguish themselves from 'seasonal labourers' that take up miscellaneous work like installation in the sector. It was the technicians' view that not having a mark of difference between untrained and trained technicians is not good for the long-term sustainability of the servicing market. With a certificate, not only will they be able to better communicate their credentials to the customer, it will also help them

in commanding and realising the true value of their services. Customers too will be able to trust a certified and licensed self-employed service technician, just the way they are confident about an authorised service dealership.

A graded approach to certification and licensing linked with the skill level of technicians, as suggested by Bhasin, Gorthi, and Chaturvedi (2020b), is one way of pushing the sector towards greater professionalisation. Technicians too seem to align with this view. About 75 per cent technicians responded positively to the idea that a certificate issued by a competent authority will raise the status of service technicians. Certification will play an important role in creating a perception about RAC servicing as a skilled service needing trained, educated and licensed individuals.

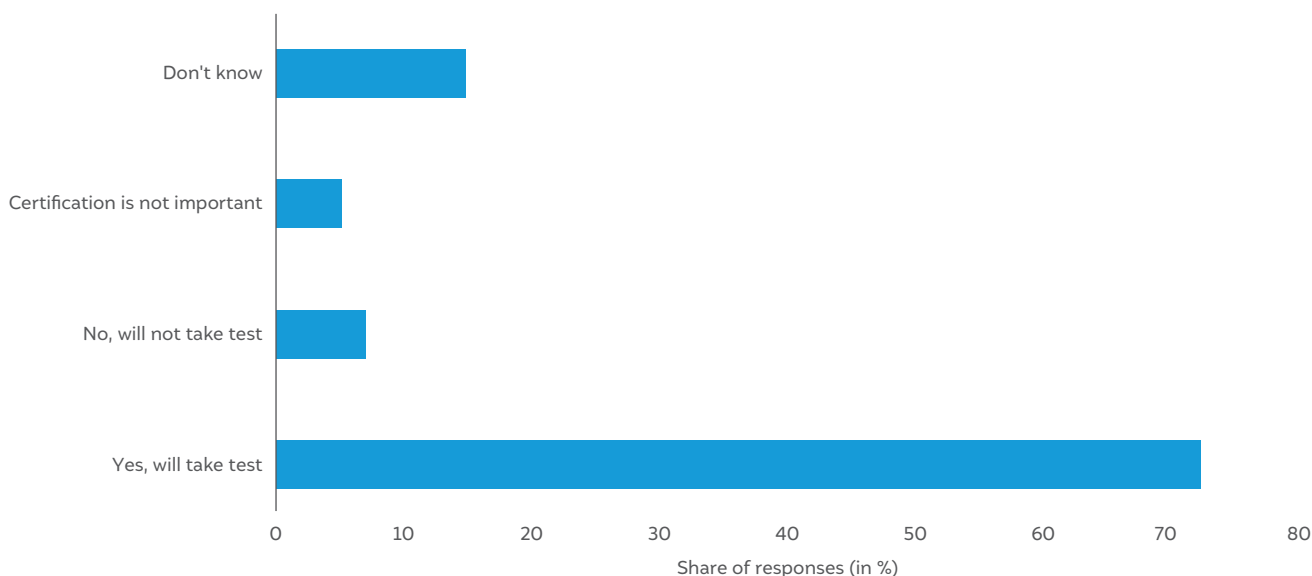
There is also some apprehension about service technicians not being interested in testing and evaluation of skills. However, this is not really true. Any certification exercise will have to be based on a robust testing mechanism which will involve a thorough checking of the knowledge of technicians. As can be seen in Figure 19, about 72 per cent technicians responding to the question on testing were willing to take the test in order to obtain a certificate. This speaks volumes about the acceptance of certification of service technicians as an idea within the servicing sector.

Figure 18 Most service technicians feel certification will enhance their professional status



Source: Authors' analysis

Figure 19 Most technicians are willing to take a test to obtain a certificate



Source: Authors' analysis

4.4 Service technicians on consumers

Good servicing and maintenance depend as much on technicians as they do on customers. Customers provide the necessary pull for good servicing which then creates a demand for aware and trained service technicians. Since service technicians share the primary interface with customers, it is important to learn about their perception of customers in order to improve the overall chain of the RAC servicing business.

A few studies in the past have looked at the consumer practice of not considering the need for regular servicing. A study done on consumer perceptions (CEEW 2020) found that only a third of households believed that there was any relationship between servicing the AC and the maintenance of energy efficiency. The study also found that, of those who knew of a linkage between good servicing and energy efficiency, only 26 per cent identified any specific aspect of servicing as having a direct impact on the performance of an AC unit. In addition, the same study reported that less than

10 per cent households had an annual maintenance contract (AMC) or had bought an extended warranty service, which could provide regular servicing.

However, the present study tries to gauge this through the observations of the technicians. In the survey, about 70 per cent technicians reported that customers call for servicing technicians only after the cooling unit breaks down. Going a step further, the study also tried to understand from service technicians about the level of awareness and knowledge customers exhibited about good servicing practices and preventive maintenance. About 55 per cent of the technicians surveyed in the study reported to have found customers not knowing or caring enough about the issue.

A chi-square test for the dependence between good servicing practices and perception about customer awareness was conducted. **This was done by assuming that if 50 per cent or more of the listed good servicing practices are followed, then GSPs are practiced.** In Table 2, the frequency table for the two variables is tabulated. Thereafter chi-square value and associated p-value are computed.

As p-value is less than 0.05, the null hypothesis is rejected. It means there is a relationship between practice of GSPs and perception about customer awareness. This validates the point about the demand pull required from the customer for good servicing. If the technicians perceive the customers to be aware, the quality of servicing will be better.

Inadequate compensation was also cited by the service technicians as the primary reason for not following proper servicing practices, which is time consuming and requires the use of more skills than business-as-usual. About **60 per cent technicians** reported that the customer's insistence on **low payment standards** affects their ability to perform all servicing activities. It creates a vicious cycle that allows untrained and unskilled service technicians to keep on working in the servicing market as they match the customer's cost expectation.

A certificate will help service technicians distinguish themselves from 'seasonal labourers' that take up miscellaneous work like installation in times of high demand.

In addition, the pattern of customer behaviour during cooling units' operational life continues to be reflected at the end of the lifecycle as well. The technicians survey for this reported that only 20 per cent customers properly disposed of installed cooling equipment when it reached the end of its lifecycle. This is important as all the gas escapes into the atmosphere due to improper handling of end-of-life air-conditioning units (Chaturvedi and Sharma 2015).

The customer apathy in matters related to servicing is a serious situation which can't be remedied just by improving the quality of servicing. Raising customer awareness about servicing and its relation with energy consumption of cooling appliances will have to become an important part of the policy agenda. Enhancing customer awareness, and educating them about good servicing so that it can be demanded of the service technicians have to go hand in hand with other measures to revamp the supply side of servicing.

4.5 Other insights

Apart from collecting data about service technicians' perception towards flagship government interventions for the sector, the survey also tried to gather information on other salient subjects such as their work preferences, level of knowledge about new refrigerant technologies, sources of information to understand new technologies, etc. The insights from the gathered data are shared below:

(1) Technicians' preference about type of establishment

Service technicians reportedly prefer to work with OEMs. About **65 per cent technicians** would prioritise working at an OEM servicing centre if given the opportunity. When probed deeper during FGDs, the technicians explained that as part of the OEM's in-house team of technicians, there is a certain level of job security which ensures a constant monthly income. Second, servicing technicians at OEMs get comprehensive theoretical and hands-on training about new and upcoming technologies, which is a valuable accessory in this trade. Third, the professional outlook that comes from working in a formal set-up is desirable and service technicians aspire to it.

Table 2 Perception about customer awareness and practice of GSPs

GSPs	Customer is aware	Customer is not aware	Can't say
Practiced	55	124	27
Not practiced	18	75	32

Source: Author's analysis

Note: This analysis utilised responses of (N=369) technicians.

Table 3 Frequency distribution of preference to work and not work for formal establishment

Training status	Preference for formal establishment	No preference for formal establishment
Trained	166	54
Untrained	90	59

Source: Authors' analysis

Table 4 Frequency distribution of preference to work informally and not work informally

Training status	Preference for informal work	No preference for informal work
Trained	83	137
Untrained	64	85

Source: Authors' analysis

A complicated reasoning was also offered to not work for OEMs, or work informally while being employed in an OEM. During FGDs, technicians opened up about their incomes. For certain technicians, working both formally and informally was a way to buttress their income. For a few others, working for OEMs was a loss-making proposition as fixed salary was not on par with the business they were doing on their own. However, the number of such technicians was small.

By drawing on the collected data, inferences were made about a relationship between preference about type of establishment and technician's training. When asked about their preferences, the technicians were given four options to choose from with freedom to pick multiple options if required: OEMs, multi-brand retail shops, own business, and somebody else's shop.

To find a linkage between training and work preference, two categories were created. One category included technicians who would work for formal establishments like OEMs and multi-brand retail. The other category captured the informal part of the servicing sector such as own shops and freelancing. Thereafter, chi-square

test was conducted to understand if there was any dependence between formal training and willingness to work for a formal establishment. The details are provided as follows:

Chi-square test 1

Null hypothesis: Preference to work for formal establishments is not linked with training.

Alternative hypothesis: Preference to work for formal establishments is linked with training.

The frequency distribution for the category is tabulated. Based on the frequency, chi-square value and associated probability (p-value) are calculated. The process to compute chi-square value is provided in the Annexures.

The chi-square test results are given in the Annexures. Since the p-value is less than 0.05, the null hypothesis is rejected, and the alternative hypothesis is accepted. This confirms that there is a linkage between formal training and preference to work for a formal establishment.

Another chi-square test was done to check if there was any linkage between preference for own business/

informal work and training. Although the chi-square test doesn't tell us about directionality, the two results together can help us make important observations.

Chi-square test 2

Null hypothesis: There is no linkage between preference for own business and formal training.

Alternative hypothesis: There is a linkage between preference for own business and formal training.

The results for chi-square test 2 are provided in the Annexures.

Notably, the p-value associated with the chi-square value for test 2 is greater than 0.05⁸, which renders it statistically insignificant. Therefore, the null hypothesis is accepted, i.e., there is no linkage between preference for own business and formal training.

The results of the two tests hold important lessons for policymakers. Formal training and preference to work for a formal establishment are linked, but not formal training and preference for informal work. It means that technicians will engage in informal work without getting the training or not. However, they will prefer to be in formal spaces of employment if they receive formal training, and can additionally choose to work informally as well.

(2) Knowledge about new refrigerants

More than 60 per cent technicians reported to have little to inadequate knowledge about the new refrigerants. In close interactions, this was one issue that technicians were most concerned about. Anecdotes about accidents and physical harm to service technicians due to failure to follow appropriate safety guidelines were also shared. Informal service technicians were reported to be the most affected due to this. The technicians were of the view that lack of hands-on training and little focus on the informal technicians training by OEMs were the major reasons for such mishaps.

On the flip side, when asked about the sources of learning about and handling of new technologies and refrigerants, the technicians cited online sources and materials to be very useful. In the FGDs, the technicians shared how they depend on their network to fill the gaps in their understanding of different technical aspects of servicing. According to them, the WhatsApp groups

of technicians are an immensely valuable source to learn and apply specific fixes when in the field. This includes sharing the problem with visual reference on these groups, which then invites responses from other technicians to provide solutions. Although this may not be the soundest way to learn about new technologies, the phenomenon of network approach to learning offers crucial takeaways for policymakers.

(3) Awareness about social security schemes

The ICAP has proposed to undertake a comprehensive approach to revamping the servicing sector. It is based on the understanding that the service technicians must be guaranteed social security in order to professionalise and have higher levels of service demanded of them. The two can't be pursued in isolation from each other.

The existing social safety schemes include, inter alia, provisions for health and accidental insurance, opportunities of upskilling and low-cost micro loans to spur entrepreneurship. More and more service technicians are expected to be covered as beneficiaries under such schemes. However, when asked to choose government schemes that service technicians could benefit from, **more than 65 per cent technicians** showed little to no knowledge about these schemes. This indicated that there was still a lot of scope to popularise the initiatives such as Pradhan Mantri Kaushal Vikas Yojana, Pradhan Mantri Jan Dhan Yojana, Recognition of Prior Learning, etc. among service technicians.

5. Key findings and policy recommendations

The results of the survey indicate a generally favourable disposition among RAC service technicians regarding the proposed recommendations in the ICAP. However, a closer inspection and knowledge of the ground realities help us understand the patterns that can henceforth be used in calibrating the recommendations and their roll-out strategies. Some of these lessons to chart a better way forward are discussed in this section.

Technicians think that online sources could be very useful to learn about new technologies and refrigerants.

8. P-values are provided in the annexures.

Box 2 A certification typology for India's servicing sector

A certification typology which achieves the goals of recognition, qualification check through testing, and skill upgradation has been recommended (CEEW 2020). Under this typology, the five different types of certifications are as follows:

Type 1. Basic certification for small units (refrigeration and air-conditioning units, including vehicles) having HFCs

Type 2. Basic certification for small units (refrigeration and air-conditioning units, including vehicles) using alternatives to HFCs (with clear markings of which refrigerant the technician is able to handle)

Type 3. Intermediate recycling certification for all small units

Type 4. High-level certification for servicing larger units based on charge size and pressure for different refrigerants, with clear markings of which refrigerant the technician is able to handle. Applications would include commercial refrigeration, reefer transport, and other larger vehicles/transportation modes.

Type 5. Universal certification for servicing and recycling of small and larger units based on charge size and pressure for different refrigerants, with clear markings of which refrigerant the technician is able to handle. Applications would include small refrigeration and air-conditioning units, including vehicles, commercial refrigeration, reefer transport, other larger vehicles/transportation modes.

5.1 Government plans and key insights

1. The ICAP lays a lot of emphasis on improving the training eco-system of service technicians. This is based on the correct identification of the problem, which is that a majority of the technicians are not formally trained. The lack of formal training reflects in the reported skills of technicians and practices on the field.

The idea that a large-scale training and skilling programme needs to be implemented is undisputed.

Key findings from the survey on training

A large majority of technicians laid emphasis on good training to do a good servicing job as well as to following the prescribed servicing practices.

- About **57 per cent technicians** received their last training/skill workshop more than five years ago.
- More than **70 per cent respondents** received some kind of certificate for the attended training.
- About **73 per cent of respondents** opined that a GoI training programme will be helpful for technicians.

Training also engenders a preference for working with formal establishments such as OEMs and online service platforms.

2. Certification of technicians is mainly a corollary of formal training. In other words, once the technicians are trained and tested, they can be issued a certificate that acknowledges the level of skills in the sector. As earlier studies have pointed out, a more segmented approach needs to be taken for making certification an enabler of efficient market functioning.

Key findings on certification

On certification, an overwhelming majority of surveyed service technicians show inclination to get a formal certificate approved by the government.

- About **75 per cent technicians** believe certification will be a useful addition.
- **73 per cent technicians** express willingness to take the test to earn the certificate, if need be.
- Further, **72 per cent technicians** also think that a skill certificate will improve their status as a service technician.

3. Customer behaviour and awareness about regular servicing and GSPs is a big part of the challenge. Implementation of customer-centric interventions can help in multiplying the mitigation benefits.

Key insights from the survey on customer behaviour

- **About 70 per cent technicians** reported that customers call for servicing and maintenance only after the unit breaks down.
 - **More than 55 per cent technicians** believed that very few customers care about training or know its importance.
 - Only **20 per cent technicians** reported that their customers actually cared to dispose their units properly after talking to them.
 - Perception about customer awareness is strongly linked with the practice of GSPs by service technicians.
4. Technicians exhibit little awareness about various social protection and financing schemes. More than **65 per cent technicians** had no idea about the government schemes. Social security schemes will play an important role in the livelihood enhancement of service technicians. It is a part of the big plan to revamp the sector in terms of mitigation outcomes by raising the standards and status of service technicians.
 5. Access to tools and tackles is found to be driving income improvement outcomes among service technicians. It is, therefore, important to prioritise ownership of tools and thereby leverage it to onboard technicians for other platforms.

5.2 Key recommendations

The following points ought to be incorporated based on the insights discussed in the earlier chapters.

Training

- 40 per cent technicians are without any formal training. It was also learnt during FGDs that a lot of technicians either don't attend the foundational training courses at ITIs and polytechnics or prematurely drop out of training schools. Since it is an important stage in training and learning, interventions should be made to decrease the drop-out rate at these institutions. This will have

to include: a) assessment of the current drop-out rate, b) understanding the reasons for drop-out and mitigating them, c) facilitating and incentivising the completion of training by providing campus opportunities.

- The apprentice system should reflect the complexities on the ground. An industrial apprentice programme for service technicians in partnership with OEMs and online platforms like Urban Company should be started. Moreover, opportunities to participate in such programmes should also be made available to technicians having no formal association with training schools. In such cases, remedial actions should be prioritised to assess and improve the current level of skills. It can be used as a basis to permit participation in the industrial apprentice programme.
- Training programmes should leverage the digital infrastructure and technicians' networks to deliver informative material, campaigns and outreach for knowledge camps. Going forward, an e-training platform should be developed to increase the reach of training initiatives. Ensuring participation through technicians' credentials (just like KYC) will also help in creating a large database for future targeting of relevant government programmes.

Certification

- Testing is not a hindrance as far as service technicians are concerned. However, the modalities of a testing process must be detailed out carefully. A combination of oral, written and hands-on testing modules should be prepared and widely socialised among the technicians' network through bodies like RASSS.
- An e-testing portal can be developed as an additional channel to encourage technicians to apply for certification. This will reduce the stress on the physical testing infrastructure.
- Certification has to be linked to various skill levels. Two criteria can be kept in mind for this: (1) type of servicing job, (2) type of cooling equipment. A clear typology of different kinds of servicing jobs such as installation, regular maintenance which includes dry and wet servicing, electronics repair, refrigerant recovery, etc. should be created. Standards of servicing for different cooling equipment segments should be developed and widely socialised.

Customer awareness

- The low awareness about GSPs among customers should be remedied. As a next step, a customer guidelines document should be prepared that includes important questions to be asked of the technician while servicing.
- Customers should be sensitised about the importance of adequate compensation and training of technicians. Campaigns to discourage them from choosing the lowest cost option should be undertaken.

Social security benefits

- Awareness campaigns to educate technicians about the existing social security schemes must be initiated. The e-network of service technicians should be leveraged in order to reach as many technicians as possible.
- As the next step, certification should be used as a criterion to provide access and benefits of other specific schemes such as accidental insurance, income support, etc.

Encouraging micro-entrepreneurship

- Credit support through micro loans for certified technicians can be provided through an appropriate mechanism.
- OEMs should be encouraged to support technicians in procuring the right tools and tackles through their CSR budgets and campaigns.

6. Conclusion

The RAC servicing sector in India stands at an interesting crossroad. The sector has the potential to generate significant income and livelihoods for skilled youth.

As demand for cooling grows, more technicians will be required in the market. However, given the state of the sector, there is a clear skill gap that needs to be bridged if sustainability goals are to be met. Structurally, too, the sector needs to become more formal and organised to ensure better quality of services. The expected growth in the sector, its potential to provide livelihoods, and the significant mitigation opportunity are compelling reasons to prioritise and deploy resources for its overhaul. From this crossroad, the sector has to follow the right course of action.

The focus of government ambitions and plans is in the right direction. There is a lot of emphasis on training infrastructure, capacity of trainers, content of modules to reflect the technology needs and certification of technicians to regulate the informal market. These should be enhanced with a proper understanding of service technicians' preferences to make roll-out of appropriate schemes and programmes more effective. This report is an effort in validating the plans with the technicians who will eventually be their beneficiaries.

As part of the next steps, a big priority for various national- and state-level policies should be ramping up the training programmes for both technicians who need reskilling and those who are just entering the servicing sector. Apart from standardising the curricula across different channels of training, the programmes must try to cover as many technicians from the informal sector as possible. On the other side, a certification system must be put in place without linking it to the training regime. A standalone certification system will cater to the servicing technicians who are ahead of the curve and have received trainings of multiple kinds. As the catchment of trained technicians increases in the market, the certification drive will pick up. The two processes in tandem can help professionalise the servicing sector in a way envisioned in the ICAP.

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Acronyms

AMC	annual maintenance contract
CFC	chlorofluorocarbons
FGD	focus group discussion
GSP	good servicing practices
GWP	global warming potential
HCFC	hydrochlorofluorocarbons
HFC	hydrofluorocarbons
ICAP	India Cooling Action Plan
ITI	Industrial Training Institute
MoEFCC	Ministry of Environment Forest and Climate Change
NOS	National Occupation Standards
PMKVY	Pradhan Mantri Kaushal Vikas Yojna
RAC	Refrigeration and Air-Conditioning
RPL	Recognition of Prior Learning
OEM	original equipment manufacturer
VRF	variable refrigerant flow

Annexures

Annexure 1: Ordered logistic model results

```

"""
## Coefficients:
##              Value Std. Error t value
## OEM_service_center -1.1339    0.2943  -3.853
## Multibrand_dealers -0.5259    0.2717  -1.935
## Own_shop           -0.5299    0.2499  -2.120
## Others_shop        -0.9124    0.2618  -3.486
## Freelancer         -0.8405    0.3502  -2.400
## Formal_training     0.6414    0.2138   3.000
## Access_to_tools     0.7077    0.2797   2.530
##
## Intercepts:
##      Value  Std. Error t value
## 1|2  0.0281  0.4421    0.0636
## 2|3  2.0052  0.4621    4.3394
## 3|4  3.0474  0.4811    6.3348
## 4|5  3.3627  0.4888    6.8797
##
## Residual Deviance: 913.7917
## AIC: 935.7917

```

Annexure 2: Chi-square test results

X2	12.14822
dF	2
p-value	0.002302

Annexure 3: Chi-square test 1 results

X2	9.473213
dF	1
p-value	0.002085

Annexure 4: Chi-square test 2 results

X2	1.01219
dF	1
P-value	0.314379

Annexure 5: Focus group discussion with service technicians in Ahmedabad

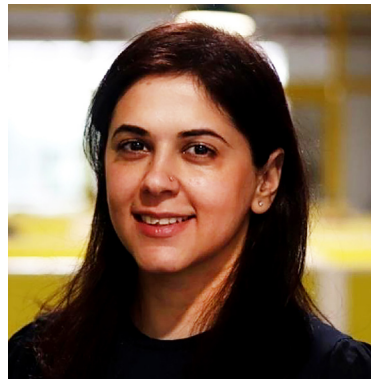


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Himanshu is a Programme Associate in the Technology, Finance and Trade team at The Council. He leads and supports The Council's ongoing work in the cooling programme on the implementation roadmap of the India Cooling Action Plan in the RAC servicing sector and R&D verticals. His research has been discussed on both national and international platforms such as Montreal Protocol meetings, ACREX, RATA conclave, among others.



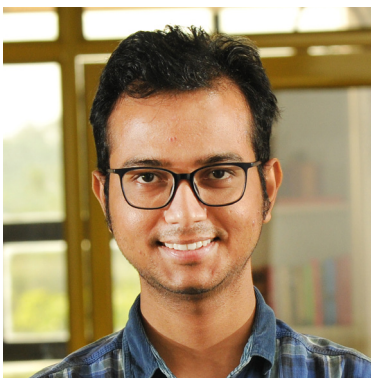
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Shikha is a researcher on climate change mitigation policies with a keen interest in innovation systems of low-carbon technologies. She is currently an adviser to The Council. She has previously worked on regulatory frameworks required to meet India's Kigali Amendment commitments, and the institutionalisation of an R&D platform for supporting the phase-out of HFCs in India. A co-author of the India Cooling Action Plan, she continues to represent CEEW as a member of the ICAP working groups to implement its R&D and servicing sector goals.



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Paras worked as a Research Analyst at The Council. He is inclined towards data analysis, machine learning, survey designing and primary data collection. His research is focused on uncovering complexities in electricity distribution, identifying solutions to reduce losses in electricity distribution and studying the importance of energy efficiency in electricity demand management in India.



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Sunil worked as a Programme Lead at CEEW. His work for the last six years has centred around collecting and using primary data to understand and improve the energy access situation at the household and community level in India. He holds a master's degree in economics from Shiv Nadar University, India.



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Prof. Laha is a faculty at Indian Institute of Management, Ahmedabad. His research deals with the creation of new methodologies for data analysis with a focus on non-Euclidean data. He was featured among India's best business school professors by Business Today in 2006 and Business India in 2012. He had advised The Council on several occasions for developing sample survey strategies and approach to data analytics.



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