



Ministry of Environment, Forest and Climate Change
Government of India

INDIA COOLING ACTION PLAN

Operationalizing Cold-Chain
Recommendations





मंत्री
पर्यावरण, वन एवं जलवायु परिवर्तन
और
श्रम एवं रोजगार
भारत सरकार



MINISTER
ENVIRONMENT, FOREST AND CLIMATE CHANGE
AND
LABOUR AND EMPLOYMENT
GOVERNMENT OF INDIA

भूपेन्द्र यादव
BHUPENDER YADAV



MESSAGE

The development of the India Cooling Action Plan (ICAP) has been a multi-stakeholder, integrated and consultative process to synergize actions for addressing the cooling demand across all sectors. The ICAP gives recommendations to provide access to sustainable cooling across sectors.

Cold Chain sector is one of the thematic areas in the ICAP, which proposes development of integrated cold chain infrastructure with appropriate market linkages, supported by adequate training and up-skilling of farmers and professionals. India has a large inventory of cold storages, or refrigerated warehouses, but the other elements that form an uninterrupted cold chain like pack-houses, reefer transport and ripening chambers – are not in adequate numbers. The co-benefits include economic well-being of farmers in direct support of the Doubling Farmers Income initiative, reducing food losses, strengthening food security and alleviating hunger leading to healthy citizens with nutritious and affordable fruits and vegetables.

While the cold-chain sector represents a small portion of the aggregated cooling demand, it is poised for significant growth and opportunities for increase in farmers income in the country. The key challenges for the cold chain are high operating cost, establishment of the infrastructure required for the effective integration at various stages, standards and protocols and human resources who lacks understanding on the low global warming potential technology options.

The action points are finalised for implementation of recommendations for the cold Chain thematic area in the ICAP after mapping of various programmes and schemes of the government and after close consultation with all the line Ministries/Departments. These action points will lead to development of the cold chain sector in the country.

I congratulate all team members for finalising the action points and bringing out this Booklet.

With best wishes.

Date: 09.09.2022

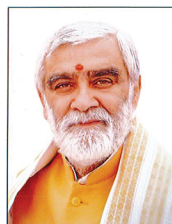
(Bhupender Yadav)





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अश्विनी कुमार चौबे
Ashwini Kumar Choubey



MESSAGE

Over the past few decades, the quantum and type of agricultural produce has changed. The extent of processing of agro-products has increased considerably. This along with the increasing urbanization has led to the need for a robust cold-chain infrastructure, spurring both growth and innovation, to impart storage and distribution services for products that must be maintained at a given temperature to maintain its quality of agriculture produce. The co-benefits of an effective and sustainable cold chain infrastructure include economic well-being of farmers in direct support of the Government's goal of Doubling Farmers' Income, besides minimizing food wastage and strengthening food security.

Interventions in cold chain provides for securing both Environmental and Sustainable Development Goals and offers tremendous opportunity for reducing cooling, refrigerant requirement and energy consumption through improved designs including proper insulation and use of energy efficiency cooling equipment.

The India Cooling Action Plan (ICAP) includes cold chain as one of the thematic areas, which proposes development of cold chain infrastructure with use of low-global warming potential refrigerant-based energy efficient cooling systems, besides standardization of design of the cold chain infrastructure.

The thematic group on Cold Chain after extensive deliberations, has come out with specific action points along with proposed actions by different Ministries/Departments/Agencies, which have been detailed in the Booklet. The Booklet would serve as an important resource material and should be disseminated widely amongst all concerned stakeholders.

(ASHWINI KUMAR CHOUBEY)

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Overview of ICAP

India currently has low penetration to cooling, but its population growth, economic progress, and rapid urbanisation, coupled with global warming trends, will drive an 8X increase in the cooling demand in the next two decades. While India's projected cooling growth is in step with its development needs, this growth, under a business-as-usual scenario, portends adverse power systems and environmental impacts. Against this backdrop, the Ozone Cell of the Ministry of Environment, Forest and Climate Change, Government of India proactively led the development of the India Cooling Action Plan (ICAP) 2019 – an essential macro-level policy tool to manage India's cooling growth while neutralising the potential harmful impacts and securing critical socio-economic benefits for the population. ICAP is the first-of-its-kind initiative in the cooling sector to be taken by any country in the world, which exemplifies integrated policy making and underscores the urgency of proactively and collaboratively addressing its cooling growth.

The ICAP development process demonstrated high inter-ministerial and cross-sectoral collaboration in laying out actionable pathways to provide sustainable cooling over the next 20 years (2017-18 to 2037-38) to meet cooling needs while neutralising its negative impacts. It strikes a balanced approach to goal-setting by establishing high-level nationwide targets but allowing the line ministries flexibility in setting their targets within a directional framework of recommendations.

ICAP's overall goals are:



Reduction of cooling demand across sectors by
20-25%, by 2037-38



Reduction of refrigerant demand by
25-30%, by 2037-38



reduction of cooling energy requirements by
25-40%, all by 2037-38



Training and certification of
1,00,000 service technicians by 2022-23



Recognizing
"cooling and related areas"
as a thrust area of research under the national science and technology programme.



Development Framework

For the development of the ICAP, working groups were constituted for mapping the following thematic areas:

- a) space cooling in buildings, air-conditioning technology,
- b) cold-chain and refrigeration,
- c) transport air-conditioning,
- d) refrigeration and air-conditioning service sector,
- e) indigenous production of refrigerants, and
- f) research and development.

It was ensured that every working group had adequate representation from the Government (Ministries and related government entities), Industries (manufacturers, refrigerant producers, and industry associations), and the Knowledge sector (research institutions, academia and civil society organisations) to obtain triple-sector alignment, right from the start.



Inter-ministerial coordination

A Steering Committee with representatives of various ministries was constituted for guiding and reviewing the documentation, reports, and recommendations developed by the ICAP thematic working groups. An Inter-ministerial committee comprising subject matter experts, eminent representatives of think tanks, and industry representatives was also formed under the chairmanship of the Environment Secretary to oversee the development process. These Committees helped dovetail the recommendations of the ICAP with ongoing and planned policies and programmes residing with different ministries.



Dovetailing existing policies and priorities

The ICAP recommendations were deeply embedded within the context of the Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, i.e., harmonising the energy efficiency of cooling equipments with the refrigerant transition towards more climate-friendly refrigerants. ICAP also highlighted cold-chain as an excellent opportunity to reduce cooling demand, refrigerant requirement, and energy consumption through improved designs, cold chain components and equipment including proper insulation and energy-efficient cooling equipment. Further, ICAP recommendations also synergise with the national missions launched by the **Ministry of Agriculture and Farmers Welfare** and the **Ministry of Food Processing Industries** and others to bring about a positive change and transform the agricultural sector in India.

Overview of Cold-Chain

Cold-Chain is increasingly becoming important to reduce wastage of food and pharmaceutical products including vaccines. While this sector represents a small portion of the aggregated cooling demand, it is poised for significant growth, with substantial implications with an increase in farmers' income in the country. India has a large inventory of cold storage or refrigerated warehouses. Still, the other elements that make up an uninterrupted cold-chain – pack houses, reefer transport and ripening chambers – needs to be developed. The projected development of a robust infrastructure to provide important market linkages and create an uninterrupted cold-chain will not only help in reducing food loss across the country and ensure food security but will also be a major driver in supporting the objectives of the Government of India's Doubling Farmers' Income initiative (DFI).

With around 500 pack-houses in India at present, the number is likely to grow to 55,000 in the next decade and to 1,25,000 in the subsequent decade attributing to the energy consumption of 2.4 TWh and 5.2 TWh, respectively. The growth of reefer vehicles is related to the increase in the pack-houses; their estimated numbers are 1,35,000 units in the next decade and 4,00,000 units in the subsequent decades from the present 15,000 units. Cold storage would grow at a marginal rate from the existing 35 Million Metric Tonne (MMT) to 40 MMT in 2028 and to about 48 MMT in 2038. There would be steady growth in ripening chambers from the current 1000 units to 9,000 units in the next decade and to 14,000 units in the subsequent decade. These

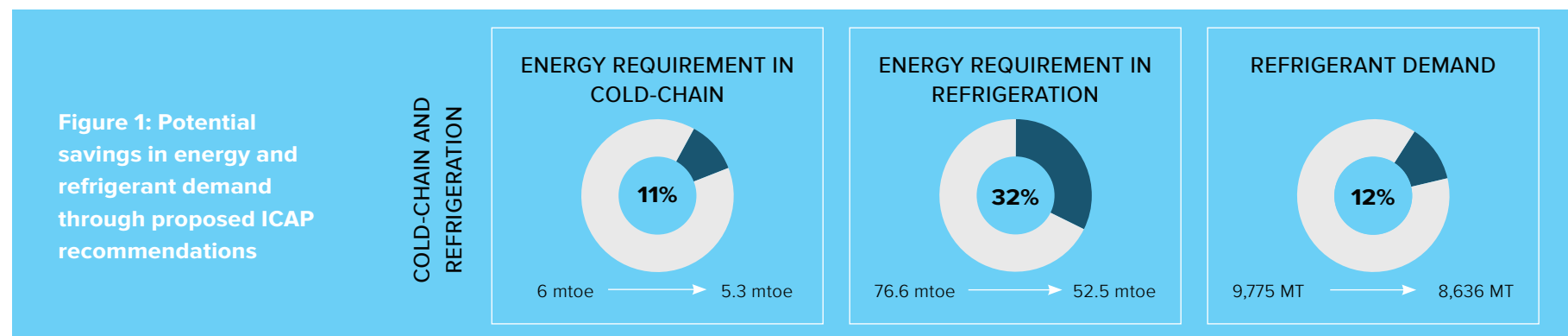
growth factors align well with the Gol's current and ongoing initiatives like DFI and will help plug the gaps in the immediate and near-term infrastructure requirements. The Intervention scenario would help obviate 12% of refrigerant usage and around 8-12% of associated energy consumption by deploying efficient compressors, improved insulation, optimised operations, and retro-commissioning practices.

Domestic refrigeration predominantly consists of frost-free (FF) and direct-cool (DC) refrigerators, with DC refrigerators being the most preferred customer choice. The domestic refrigerator sales would grow by 1.7-fold in the coming decade and 3-fold in the subsequent decade attributing to about 2.6-times and 4-times increase in the associated energy consumption. Commercial refrigeration primarily consists of deep freezers, visi-coolers, remote condensing units, water coolers, and super and hypermarkets. This sector is poised to grow 2-fold in the next decade and 6-fold in the subsequent decade, with energy implications in the range of 2.2-times and 6-times increase. The refrigerant demand in the intervention scenario can be reduced by 20-25% in the next two decades owing to technological advancements, improved servicing practices, and enhanced insulation translating to up to 30% savings in the associated energy consumption.



Saving Potential of ICAP's Recommendations

The projected saving potential in energy requirement for cold-chain and refrigeration is 11% and 32% respectively; and refrigerant demand through the identified set of recommendations is around 12% by 2037.



Operationalization of Recommendations

To operationalize the recommendations of ICAP, MoEF&CC has decided to constitute six thematic working groups.



Towards operationalizing the recommendations for each thematic area, thematic working groups comprising representatives from line ministries/departments, industry and industry associations, think tanks and experts have been constituted by the Ministry to develop an implementation framework for the recommendations given in the ICAP for each thematic area. A Steering Committee under the Chairmanship of Additional Secretary (Ozone Cell), MoEF&CC has also been constituted to guide and oversee the implementation framework and finalize the action points identified by the Thematic Working Groups for operationalizing the recommendations.

The thematic working group on cold-chain during its meetings has identified a list of action points for operationalizing the recommendations of the ICAP. The action points have been identified after mapping the recommendations given in the ICAP with the on-going government programmes/schemes handled by different ministries/departments/agencies of the Government and inputs provided by the members during the meeting.

Further, the action points were discussed in the meeting of the Steering Committee and were adopted during the meeting, which are tabulated below.

Action points for operationalizing the recommendations of India Cooling Action Plan (ICAP) for the thematic area on Cold-Chain sector

Sr. No.	Recommendations on Cold-Chain as per ICAP	Synergies with existing Framework/ governmental schemes/ programmes	Agency/ Department	Agreed Action	Highlights
1	2	3	4	5	
1	Encourage development of cold chain infrastructure with use of non-ODS, low- GWP refrigerant based energy efficient cooling systems.	i. Capital Investment subsidy scheme for construction/expansion/ modernization of cold storage and storages for Horticulture Product by National Horticulture Board (NHB). <ul style="list-style-type: none"> Assistance for setting up of new Cold Storage infrastructure will be available only to Multi-Chamber cold Storage units with technologies which are energy efficient with provision of thermal insulation, humidity controlled, advance cooling systems, automation, etc. 	Ministry of Agriculture and Farmers Welfare	Use of non-ODS, low/ lower GWP refrigerants and energy efficient cooling technologies should be incorporated in the existing Government schemes of the Cold Chain sector	BEE has recently launched a report on ' <i>Cold-Chain Energy Efficiency in India: Analysis of Energy Efficiency Opportunities in Pack-Houses</i> '.
2	Link the incentives being provided for development of cold-chain infrastructure with adoption of energy-efficient design, construction and maintenance practices and low GWP refrigerant and renewable technologies.	ii. Cold storage (long term storage and distribution hubs) up to 5000 MT capacity are eligible for assistance under the open ended scheme of National Horticulture Mission (NHM)/ Horticulture Mission for North East & Himalayan States (HMNEH) (a sub scheme of Mission for Integrated Development of Horticulture (MIDH)). The assistance is extended as subsidies to credit linked projects @ 35% of capital cost of project in general area and 50% in case of Hilly & Scheduled area.		-do-	Ozone Cell, MoEF&CC has developed and launched a study report on "Cold-Chain sector in India for promoting non-ODS, low GWP refrigerants".
3	Develop programme for retrofitting of existing cold storages to reduce cooling, refrigerant demand and energy consumption.				Ozone Cell, MoEF&CC to carry out a study on "Good Management Practices for Cold Storage (warehouse) infrastructure used in e-commerce business highlighting application of non-HCFC and low GWP refrigerant based energy efficient cooling system.

Sr. No.	Recommendations on Cold-Chain as per ICAP	Synergies with existing Framework/ governmental schemes/ programmes	Agency/ Department	Agreed Action	Highlights
4	Retrofit cold storage buildings (refrigerated warehouses) by installing insulation and replacing inefficient cooling and refrigerating equipment, and install improved controls to significantly improve the EPI	iii Small Farmer Agri-Business Consortium (SFAC) assistance to cold storage: Setting up of cold storage as a part of an integrated value chain project are eligible for subsidy provided the cold storage component is not more than 75% of Total Financial Outlay (TFO). The scale of assistance as subsidy to projects is @ 25% of capital cost and maximum ceiling to Rs 2.25 crores in general area and 33.33% and maximum ceiling up to Rs 4 crores in case of NE, Hilly & Scheduled area. Integrated Scheme for Agricultural Marketing (ISAM)-Operational Guidelines.	Ministry of Agriculture and Farmers Welfare	-do-	
		<i>Agricultural and Processed food Products Export Development Authority (APEDA):</i> Development of Export Infrastructure: i Infrastructure such as pack house facilities with packing/grading lines ii Pre- cooling units with cold storages and refrigerated transportation etc. iii Cable system for handling of crops like banana iv Common infrastructure facilities Up to 40% of the total cost subject to a ceiling of INR100 lakhs	Ministry of Commerce and Industry	Use of non-ODS, low/ lower GWP refrigerants and energy efficient cooling technologies should be incorporated in the existing Government schemes of the Cold-Chain sector	
		(i) <i>Pradhan Mantri Sampada Kisan Yojana:</i> • Mega Food Park Scheme: facilitate establishment of a strong food processing industry backed by an efficient supply chain Collection Centers, Primary Processing Centers (PPC), Central Processing Center (CPC) and Cold-Chain infrastructure. (ii) <i>Integrated food chain and Value Addition Infrastructure:</i> i. Pack houses, pre-cooling units, ripening chamber and transport infrastructure	Ministry of Food Processing Industries (MoFPI)	Use of non-ODS, low/ lower GWP refrigerants and energy efficient cooling technologies should be incorporated in the existing Government schemes of the Cold-Chain sector	

Sr. No.	Recommendations on Cold-Chain as per ICAP	Synergies with existing Framework/ governmental schemes/ programmes	Agency/ Department	Agreed Action	Highlights
5	Development of safety standards for flammable and toxic refrigerants for cold storage and other segments of the cold-chain.	<p>Existing standards of BIS:</p> <ul style="list-style-type: none"> i IS 16656:2017/ ISO 817: 2014 Refrigerants – Designation and Safety Classification ii IS 16678 (part 2): 2018/ ISO 5149 Pt 2: 2014 Refrigerating Systems and Heat Pumps- Safety and Environmental Requirements Part 2 Design, Construction, Testing, Marking and Documentation iii IS16678 (Part 3): 2018/ ISO 5149-3: 2014 Refrigerating Systems and Heat Pumps – Safety and Environmental Requirements Part 3 Installation Site iv IS16678 (Part 4): 2018/ ISO 5149-4: 2014: Refrigerating Systems and Heat Pumps- Safety and Environmental Requirements Part 4 Operation, Maintenance, Repair and Recovery. v IS/ IEC 60335-2-89: 2010 – Household and similar electrical appliances – Safety Part 2-89: Particular requirements for Commercial Refrigerating appliances with an incorporated or remote Refrigerant Unit or Compressor. vi IS/ IEC 60335-2-40: 2018 – Household and similar electrical appliances – Safety Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers <p>New standards under development</p> <p>Standard on ‘Closed-circuit Ammonia Refrigeration System — Code of Practice for Design and Installation’</p>	Bureau of Indian Standards (BIS)	<p>Implementing agencies may refer the existing codes, standards while implementing the Cold-Chain infrastructure projects.</p> <p>BIS to finalize the draft standard on ‘Closed-circuit Ammonia Refrigeration System — Code of Practice for Design and Installation’.</p>	<p>BIS Inputs: <i>The draft standard on ‘Closed-circuit Ammonia Refrigeration System — Code of Practice for Design and Installation’ is under publication stage.</i></p>

Sr. No.	Recommendations on Cold-Chain as per ICAP	Synergies with existing Framework/ governmental schemes/ programmes	Agency/ Department	Agreed Action	Highlights
6	Commercial refrigeration equipment like display cabinets, freezers, etc. to be brought under BEE star rating.	<i>Star and labelling Programme</i> Under S&L programme, 30 appliances are covered out of which 20 are under voluntary phase and 10 are under the mandatory phase. Refrigerators are covered under mandatory list whereas Deep Freezers are under voluntary list.	Bureau of Energy Efficiency (BEE)	Inclusion of additional appliances related to Cold-Chain, if any, for star labelling as per the provision of S&L programme of BEE.	
7	Periodic review and enhancement of energy efficiency norms of refrigerators.		Bureau of Energy Efficiency (BEE)	Periodic review and enhancement of energy efficiency norms for refrigerators as per the provision of S&L programme of BEE.	
8	Standardise all design, construction and associated specifications for small, medium and large cold-chain infrastructure components.	Existing Codes/ guidelines: I National Building Code of India (NBC 2016) provides general guidelines for the following: i Refrigeration heat load considerations ii Temperature sensing and monitoring iii Installation and maintenance of cold room iv Cold room safety II Walk in Cold Rooms- IS 2370: 2014: Freight Containers: Specification and Testing- IS 13288 Part-2 (Thermal Containers)	Bureau of Indian Standards (BIS)	Implementing agencies may refer the existing codes, standards while implementing the Cold-Chain infrastructure projects.	BEE has constituted a technical committee for "Promoting Energy Efficiency in the Cold-Chain sector"
		Existing guidelines: MIDH Guidelines & Minimum System Standards for Implementation in Cold – Chain Components for the following: i Modernization of refrigeration systems in cold storage. ii Non-ODS blowing agents for insulation: Alternate energy options.	Mission for Integrated Development of Horticulture (MIDH), Ministry of Agriculture and Farmers Welfare	Implementing agencies may refer the existing codes, standards while implementing the Cold-Chain infrastructure projects.	BEE has developed a draft framework for 'Design and Operational Guidelines for pack-houses'
		Framework under finalization: Development of framework for 'Design and Operational Guidelines for pack-houses' is in progress by BEE	Bureau of Energy Efficiency (BEE)	BEE to finalize the framework for 'Design and Operational Guidelines for pack-houses'	

Sr. No.	Recommendations on Cold-Chain as per ICAP	Synergies with existing Framework/ governmental schemes/ programmes	Agency/ Department	Agreed Action	Highlights
9	Provide specialized training facilities for cold chain professionals and technicians to promote proper utilization and operation of technology, as well as energy efficiency.	<i>The International Organization for Standardization (ISO)</i> is preparing a guiding document on ' Refrigerating systems and heat pumps — Competence of personnel '.	Bureau of Indian Standards (BIS)	BIS to finalize guiding document on ' Refrigerating systems and heat pumps — Competence of personnel '. This guiding document could be referred for training and capacity building	
		<i>Pradhan Mantri Kaushal Vikas Yojana (PMKVY)</i> is the flagship outcome-based skill training scheme of the new Ministry of Skill Development & Entrepreneurship (MSDE). The objective of this skill certification and reward scheme is to enable and mobilise a large number of Indian youth to take up outcome based skill training and become employable and earn their livelihood. Under the scheme, the monetary reward would be provided to trainees who are successfully trained, assessed and certified in skill courses run by affiliated training providers. The scheme will be implemented through the National Skill Development Corporation (NSDC).	Ministry of Skill Development and Entrepreneurship (MSDE)	MSDE to develop upskilling and certification-programme for the technicians and other personnel involved in the Cold-Chain sector. Training module should include prompting use of non-ODS, low GWP and energy efficient refrigerants as well as safety aspect of handling of flammable and toxic refrigerants.	
10	Provide training to farmers so that they can better manage their produce both pre-harvest and post-harvest.	Doubling Farmers' Income (DFI) initiative	Ministry of Agriculture & Farmers' Welfare	Non-ODS, low GWP and energy efficient based technologies to be incorporated in the curriculum of training programme.	NCCD has done around 241 capacity building and training programmes at the cost of 488.53 lakhs involving 7321 participants. These training programmes includes 15 batches of 5 day training programmes.
		Agriculture Skill Council of India (ASCI) in agriculture & allied areas in compliance with the National Skill Qualification Framework	Ministry of Skill Development and Entrepreneurship	Non-ODS, low GWP and energy efficient based technologies to be incorporated in the curriculum of training programme.	



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