



IS CHENNAI PREPARED FOR INDUCTION COOKING?

eCooking Readiness Assessment and Potential for Adoption

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1. Introduction

1.1. Background

In Chennai¹, the capital city of Tamil Nadu, India, liquefied petroleum gas (LPG) is a predominant energy source for cooking in both residential and commercial settings. LPG, derived from natural gas processing and crude oil refining, is favoured for its efficiency and convenience. Its ease of use, quick heating capabilities, generational long practice of using it, and relatively low cost make it the preferred choice for households across the city. The rapid urbanization and growth of Chennai have resulted in a substantial increase in LPG consumption, with the cooking sector representing a significant portion of this demand.

In addition to household use, LPG is extensively utilized in the commercial sector, including restaurants, hotels, and catering services. These establishments rely heavily on LPG for its high calorific value, which is essential for handling large-scale cooking operations efficiently. The commercial sector's dependence on LPG is driven by the fuel's ability to provide consistent heat and quick temperature adjustments, which are critical for both domestic and high-volume Indian cooking environments.

However, the environmental and health impacts of LPG are increasingly coming under scrutiny. While LPG is considered a cleaner alternative to traditional biomass fuels like wood and charcoal, it is still a fossil fuel. Its combustion emits greenhouse gases such as carbon dioxide (CO₂), contributing to global warming and climate change. Moreover, the extraction, processing, and distribution of LPG involve significant energy consumption and environmental degradation, including habitat disruption and pollution from drilling and transportation².

Health-wise, burning LPG produces pollutants like carbon monoxide (CO), nitrogen oxides (NO_x), and unburnt hydrocarbons. These pollutants degrade indoor air quality, potentially leading to respiratory issues and eye irritation, particularly in poorly ventilated areas³. Additionally, LPG's flammability poses risks of fires and explosions in the event of leaks, highlighting significant safety concerns⁴.

As the world shifts towards cleaner energy sources, the concept that "the future is electric" is gaining traction. This transition is evident in various sectors, including automotive and energy, which are moving towards electrification. The automotive sector is leading this transition with the rapid expansion of electric vehicles (EVs) and advancements in battery technologies, while the energy sector integrates renewable sources like solar, wind, and emerging technologies such as tidal and geothermal energy into the grid. The cooking sector is also undergoing a transformation.

¹ Chennai, the capital city of Tamil Nadu, India, is home to approximately 12.05 million people (as of 2024). Covering an area of about 426 square kilometers, it is one of the most densely populated cities in India. The city is a major hub for industry, commerce, and culture in South India. With a literacy rate of over 90%, Chennai has seen rapid urbanization and economic growth in recent decades. The climate is tropical, with hot and humid conditions prevailing for most of the year, influencing energy consumption patterns.

² <https://www.linkedin.com/pulse/environmental-impact-lng-lpg-morteza-hashemi-hos5f/>

³ <https://www.chemscape.com/resources/chemical-management/health-hazards/liquefied-petroleum-gas#:~:text=Side%20Effects%20of%20Inhaling%20Liquefied%20Petroleum%20Gas&text=Inhalation%20of%20LPG%20may%20cause,to%20white%20or%20grayish%20Dyellow.>

⁴ <https://www.sciencedirect.com/science/article/pii/S0379711279900225#:~:text=The%20properties%20of%20LPG%20that,quantities%20of%20the%20liquefied%20gas.>

The following are the various e-cooking technologies currently available in India and utilized in Chennai.

Type of Technology	Image ⁵	Description
Induction Cooktops		Induction cooktops use electromagnetic fields to directly heat pots and pans. They are highly efficient, fast, and have precise temperature control. They require compatible cookware (usually ferromagnetic, like cast iron or stainless steel).
Electric Coil Stoves		These stoves use metal coils that heat up when electricity passes through them. The coils transfer heat to the cookware placed on top of them. They are less efficient than induction cooktops but has a lower cost than an induction stove.
Infrared Induction Stove		Infrared cookers use infrared radiation to directly heat the food and may not require cookware to be magnetic. These cookers are efficient and provide uniform heating.
Electric Rice Cooker		Electric rice cookers are designed to cook rice automatically by steaming. They are popular in Indian households for their convenience and ability to keep rice warm after cooking.
Electric Pressure Cookers		Electric pressure cookers combine the functions of a pressure cooker with an electric heating element, allowing for set-and-forget cooking. They often include multiple cooking modes like slow cooking, steaming, and rice cooking.
Electric Mixer Grinder		An electric mixer grinder is a versatile kitchen appliance used in Indian households for grinding, mixing, and blending various ingredients. It typically comes with multiple jars and blades designed for different tasks, such as grinding spices, making chutneys, and blending smoothies. It is an essential tool in Indian cooking due to the wide variety of spices and pastes used in the cuisine.
Microwave Ovens		Microwave ovens use microwave radiation to heat food quickly. Indians usually prefer it for reheating purposes.
Electric Kettle		An electric kettle is a kitchen appliance used to boil water quickly. It is widely used in Indian households to make tea, coffee, instant noodles, and other hot beverages. The kettle heats these items by passing an electric current through a heating element at the base.

⁵ All the images have been utilized from the online retail sales site – Amazon (NOTE: There is no promotion or endorsement of any specific brand; any brand you see is for illustrative purposes only).

Drip Coffee Maker		A drip coffee maker is an electric appliance used to brew coffee by passing hot water through ground coffee beans and a filter. It is popular in Indian households and offices where freshly brewed coffee is preferred over instant coffee. The appliance allows users to brew multiple cups at a time and typically includes features like programmable timers and keep-warm functions.
Toaster Oven		A toaster oven is a compact, countertop appliance used for baking, toasting, grilling, and reheating food. It functions similarly to a traditional oven but is smaller and heats up more quickly. In Indian kitchens, toaster ovens are often used for making quick snacks, toasting bread, baking small batches of cookies, or grilling vegetables and meats.
Wet Grinder		A wet grinder is a kitchen appliance traditionally used in Indian households for grinding soaked grains, lentils, and other ingredients to make batters and pastes. It is particularly popular in South Indian cooking for preparing dishes like idli, dosa, and vada. Wet grinders use a large stone roller that rotates inside a drum to crush and grind the soaked ingredients to a fine consistency.

1.2. Global Sustainable Energy Initiatives

Globally, projects are leading the transition from LPG to induction stoves as part of a broader push for sustainable energy solutions. Understanding the underlying motivations behind this shift in both affluent and poorer nations is crucial and warrants further study. This concept can be broadened to explore the motivations and vested interests of various social classes—rich, middle class, and poor—in both developed, emerging, and least developed economies.

For instance:

- Netherlands: The "Goodbye Gas" project, a collaboration between the government and IKEA, removes gas hobs from stores, aligning with the national goal of phasing out natural gas to reduce CO₂ emissions from the built environment by 80% in 2050. The first steps are already being taken. 31 municipalities, including the largest cities like Amsterdam, Rotterdam and Utrecht, have signed a 'Green Deal' for 'gas-less neighbourhoods', which will lead to the first residential districts being disconnected from the grid over the next two years. Many more will follow in the coming decades⁶. The European Public Health Alliance (EPHA) Policy Manager, Cristina Pricop, said: "Gas cooking appliances emit invisible air pollutants that pose significant risks to human health and the environment, and studies are showing that over 700,000 children in the EU experience asthma symptoms due to cooking with gas. Moving away from gas cooking is a strong measure to protect public health and children's health"⁷
- Australia: Several organizations and governments in Australia are promoting the transition to induction cooktops. The Property Council of Australia has committed to eliminating gas installations in new developments starting in 2030⁸. The Global Cooksafe Coalition, launched in Australia in November 2022, aims to remove gas from kitchens⁹. Victorian Energy plans to offer discounts on select induction cooktop models in the second half of 2024¹⁰. The State of Victoria

⁶ <https://energypost.eu/a-revolution-the-netherlands-kisses-gas-goodbye-but-will-it-help-the-climate/>

⁷ <https://cooksafecoalition.org/ikea-netherlands-to-end-sales-of-gas-cooktops/#:~:text=The%20European%20Public%20Health%20Alliance,dueto%20cooking%20with%20gas.>

⁸ <https://www.smh.com.au/environment/sustainability/why-the-stove-top-is-the-last-front-in-the-war-on-household-gas-20240612-p5j172.html>

⁹ <https://www.abc.net.au/news/2022-11-22/doctors-climate-scientists-chefs-push-for-end-to-gas-in-kitchens/101678140>

¹⁰ <https://www.energy.vic.gov.au/victorian-energy-upgrades/products/induction-cooktop-discounts#:~:text=Discounts%20on%20energy%20efficient%20induction,induction%20cooktop%20over%20gas%20alternatives.>

ceased installing gas connections in new homes as of January 2024¹¹. Additionally, the Australian Capital Territory (ACT) government has announced plans to ditch fossil gas with the release of a paper modelling the transition to the full electrification of homes and businesses in the territory by 2045¹².

- United States:
 - ❖ The state of New York has set an ambitious target to achieve 100% zero-emission electricity by 2040, as part of its broader goal to reduce greenhouse gas emissions by 85% by 2050¹³. New York City's "Induction Stove Challenge" has expanded its pilot from 10 to 10,000 households in New York City Housing Authority buildings for low-income households¹⁴. Additionally, Local Law 97¹⁵, part of NYC's Climate Mobilization Act, which mandates significant cuts in building emissions by 2030, is pushing private property owners to shift from gas to induction cooking by imposing strict carbon emission limits on buildings over 25,000 square feet, with fines for non-compliance with plans to phase out natural gas in new constructions by 2027. To meet these limits and avoid penalties, property owners are encouraged to adopt cleaner technologies like induction cooktops. The law also promotes energy efficiency upgrades through incentives and financing options, making the transition more financially feasible¹⁶.
 - ❖ Massachusetts aims to achieve net-zero greenhouse gas emissions by 2050, with a significant milestone of a 50% reduction by 2030¹⁷. The "Mass Save" program which started in 2008 offers rebates and incentives for switching to induction cooktops. Residents can receive a \$500 rebate for replacing a natural gas or propane stove with an induction stove, making it more affordable to adopt this cleaner technology¹⁸.
 - ❖ Meanwhile, California is advancing this shift through several measures: California has committed to achieving carbon neutrality by 2045¹⁹, with an interim target of 60% renewable energy by 2030²⁰. As part of this effort, the state is aggressively pushing for the electrification of homes and businesses, particularly in cooking and heating. The California Energy Commission's Building Standards²¹ promote electric appliances, including induction cooktops. Berkeley was the first U.S. city to approve a ban on gas hookups in most new homes, in 2019. More than 70 other California cities and counties — including San Francisco, Los Angeles — have since followed suit and effectively banned new gas appliances²².

The transition extends beyond developed economies. In developing countries, similar trends are emerging:

- Ecuador: A program in Ecuador installed induction stoves in 750,000 households. Researchers have examined the impact of this program, and according to the study²³, greenhouse gas emissions and hospitalization rates at the national level likely declined “in lockstep” with increased adoption and use of induction stoves over the first six years (2015 to 2021) of the program²⁴.

¹¹ <https://henley.com.au/news/victoria-phasing-out-gas-in-new-homes-from-2024#:~:text=Victoria%20phasing%20out%20gas%20in%20new%20homes%20from%202024.-15th%20March%202024&text=The%20Victorian%20government%20has%20banned%20cooking%20for%20some%20new%20homes>.

¹² <https://www.pv-magazine-australia.com/2022/08/05/act-details-plan-to-ditch-gas-in-shift-to-electric-future/>

¹³ <https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Standard>

¹⁴ <https://www.nyserda.ny.gov/About/Newsroom/2023-Announcements/2023-11-3-Governor-Hochul-and-Mayor-Adams-Announce-Launch-of-Induction-Stove-Challenge>

¹⁵ https://www.nyc.gov/assets/dcas/downloads/pdf/energy/reportsandpublication/local_law_97_implementation_action_plan_2021_report.pdf

¹⁶ <https://sitecompli.com/blog/local-law-97-rules/>

¹⁷ <https://www.mass.gov/info-details/massachusetts-clean-energy-and-climate-plan-for-2050#:~:text=Energy%20Modeling%20Results-Development%20of%20the%20Clean%20Energy%20and%20Climate%20Plan%20for%202050,85%25%20below%20the%201990%20level>.

¹⁸ <https://www.masssave.com/residential/rebates-and-incentives/appliances-and-products/inductionstove#:~:text=Replace%20a%20natural%20gas%20or%20pans%2C%20instead%20of%20the%20cooktop>.

¹⁹ <https://opr.ca.gov/climate/carbon-neutrality.html>

²⁰ [https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/clean-energy-serving-california#:~:text=Senate%20Bill%20100%20\(2018\)%20set,2035%20and%2095%25%20for%202040](https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/clean-energy-serving-california#:~:text=Senate%20Bill%20100%20(2018)%20set,2035%20and%2095%25%20for%202040).

²¹ <https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2025-building-energy-efficiency>

²² <https://www.latimes.com/california/story/2024-03-27/berkeleys-scraps-landmark-natural-gas-ban-after-legal-fight#:~:text=Berkeley%20was%20the%20first%20U.S.,effectively%20banned%20new%20gas%20appliances>.

²³ <https://www.pnas.org/doi/10.1073/pnas.2301061120>

²⁴ <https://sustainability.stanford.edu/news/ecuador-emissions-and-hospitalizations-fell-lockstep-electric-stove-adoption>

- Nepal: Government of Nepal (GoN) is committed to achieving universal access to clean cooking by 2030. To reach this goal, the GoN has set ambitious targets, including ensuring that 25% of households nationwide adopt electric cooking by 2030. In service of these goals, Clean Cooking Alliance has worked closely with the GoN since 2018, providing tailored support²⁵.
- Indonesia: Facing rising state budget burdens from LPG subsidies and fluctuating crude oil prices, the Indonesian government is promoting a shift to induction stoves. With PLN (State owned electricity company) constructing new power plants and increasing reserve margins, induction stoves are seen as a solution to absorb excess electricity supply and reduce LPG subsidy costs.²⁶ The conversion program includes 300,000 units of free induction stove packages with the hope that the number of electric stove users can reach 15.3 million by 2025. The first phase of the program introduced a pilot project of the induction stove program in Bali and in Surakarta targeting 1,000 converted stoves each²⁷.

In India, Energy Efficiency Services Limited (EESL), a joint venture of Public Sector Undertakings under the Ministry of Power, has launched the National Efficient Cooking Programme (NECP). This program introduces induction-based cook stoves, which offer a cost advantage of 25-30% over traditional cooking methods. It aims to deploy 2 million induction cook stoves across India to reduce the environmental impact of cooking, improve air quality, and enhance public health²⁸. EESL's initiative is supported by a partnership with Modern Energy Cooking Services (MECS), a leading research and innovation program focused on accelerating the adoption of modern energy cooking solutions in developing regions. MECS, delivered through Loughborough University and the World Bank ESMAP, in collaboration with numerous regional and local partners, including 16 universities, is essential for the widespread adoption of induction cooktops. This collaboration is a major advancement for India.

Additionally, the Bureau of Energy Efficiency (BEE) launched the "Go Electric" campaign on February 19, 2021, in collaboration with the Ministry of Power and the Ministry of Road Transport and Highways. The campaign aims to educate the public about the benefits of electric vehicles (EVs) and electric cooking²⁹.

Furthermore, PM Narendra Modi's endorsement of Indian Oil Corporation's solar PV e-cookstove³⁰ in 2023 signifies the government's intention to adopt electric cooking (e-cooking) as part of its clean cooking strategy³¹.

These initiatives offer a promising path for modernizing cooking practices in India and advancing the country's goal of achieving net-zero emissions by 2070³². However, despite noteworthy progress at the policy level, tangible efforts to realize this transition are still needed. This study will evaluate the feasibility of this shift, beginning with a small-scale survey in the Chennai Metropolitan Region to assess household acceptance and technical feasibility of electric cooking transition. Additionally, the study will propose actionable next steps for the city to effectively implement these policies.

²⁵ <https://cleancooking.org/industry-development/nepal-project/>

²⁶ <file:///C:/Users/HP/Downloads/40+Economic+Simulation+of+Indonesia%E2%80%99s+Clean+Energy+Policy.pdf>

²⁷ <https://www.energyreview.in/post/indonesia-s-lpg-to-induction-stove-conversion-program-demands-careful-review>

²⁸ <https://pib.gov.in/PressReleaseframePage.aspx?PRID=1974191>

²⁹ <https://evyatra.beeindia.gov.in/go-electric-launch/>

³⁰ <https://www.businessinsider.in/sustainability/article/should-you-switch-to-indian-oils-surya-nutan-solar-cooker-that-modi-touted-at-india-energy-week/articleshow/97735556.cms>

³¹ <https://economictimes.indiatimes.com/industry/renewables/pm-modi-reveals-clean-cooking-plan-to-drive-growth-in-ev-solar-and-battery-storage-sectors/articleshow/107366044.cms?from=mdr>

³² <https://pib.gov.in/PressReleaseframePage.aspx?PRID=1961797>

1.3. Objective of the study

The objective of this study is to examine Chennai's readiness for the adoption of electric cooking, specifically Induction stoves.

On an average, each household spends around 3 hours a day cooking and preparing at least 2-to 3 meals daily, as demonstrated in my survey (*Table 1*).

Table 1: Survey Data - Hours Spent Using LPG Stove for Cooking by Income Level

Income Level	No of households	Total Hours per Day Spent Using LPG Stove	Average Hours per day per household
1. Less than Rs 6 Lakhs	2	6	3.0
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs	9	25	2.8
3. More than Rs 18 Lakhs	11	37	3.4
Grand Total	22	68	

This research is particularly timely given the urgent need to transition towards more sustainable cooking practices to support India's climate goals. This study will serve as a foundational piece in evaluating how households and restaurants can adapt to induction stove usage. It could provide data that can be useful for policy development, program implementation, and stakeholder engagement. The findings are expected to help shape future efforts to scale up induction cooking and support India's broader energy transition goals.

According to my survey, almost all the sample households in Chennai have either heard of or used at least a one-burner induction stove. Given the diverse range of electric cooking equipment available in Chennai—including induction stoves, electric stoves, microwave ovens, electric kettles, coffee makers, toaster ovens, rice cookers, mixer grinders, wet grinders, and instant pots—induction stoves stand out as a compelling option due to this widespread familiarity and usage, making them a more practical focus compared to electric stoves, which are still relatively unknown and in the preliminary stages of adoption in India.

Since this is an exploratory study, following research questions have been identified:

1. How do household composition, income levels, education, and occupation influence cooking practices and the adoption of modern cooking technologies in Chennai households?
2. What roles do household members play in purchasing cooking items, preparing meals, and managing fuel payments, and how do these roles impact the choice of cooking methods in Chennai?
3. What factors contribute to the current levels of satisfaction with LPG stove usage among households in Chennai?
4. How do Chennai households perceive the safety, efficiency, and cost-effectiveness of induction stoves compared to LPG stoves?
5. What are the primary barriers preventing the adoption of induction stoves in Chennai households?
6. What factors influence the willingness of Chennai households to pay for induction stoves and compatible cookware?
7. How do Chennai households perceive the environmental and health impacts of using LPG stoves, and how do these perceptions influence their cooking fuel choices?

1.4. Scope and significance of the research

This research explores the readiness and impact of transitioning from LPG to induction cooking in Chennai, focusing on both residential and commercial contexts. The scope includes assessing the practicalities of adopting induction stoves, understanding the current level of acceptance among households, and evaluating the potential advantages and challenges of this transition. By analyzing data from a survey of 22 Chennai households from three income groups and examining existing usage patterns, the research aims to provide a comprehensive overview of the readiness to shift to induction cooking.

The significance of this study lies in its potential to inform policy development and program implementation under initiatives like the NECP. Successful implementation of such programs requires effective collaboration between the public and private sectors and extensive extension activities to ensure acceptance and, therefore, broad deployment. By offering practical insights into both household and commercial adoption of induction stoves, this research will contribute valuable data to inform policy development, program implementation, and stakeholder engagement.

1.5. Limitations of the research

This study is an exploratory qualitative investigation, serving as a precursor to more detailed research. As such, a comprehensive research instrument was not developed at this stage. The primary goal was to gain an understanding of the current status based on a sample, to inform and facilitate more in-depth future studies on the subject.

A limitation of the study was the unequal distribution of samples across different economic levels. Additionally, as a first-time researcher in field data collection and analysis, my inexperience may have impacted the study. Furthermore, conducting the survey remotely introduced its own set of challenges and restrictions.

This survey focused solely on stable income earners to assess their readiness for induction cooking. However, inputs from wage earners and migrant workers, who may not have a stable place of stay, are also crucial for a comprehensive assessment. These groups were not covered in this survey.

2. Literature Review

2.1. Overview of Existing Studies on Induction Stoves vs. LPG

The transition from Liquefied Petroleum Gas (LPG) to induction stoves has been explored in the literature primarily from environmental, economic, and health perspectives. Studies consistently demonstrate that induction stoves are more energy-efficient and environmentally friendly compared to LPG stoves. For instance, a study led by scientists at Columbia University's Mailman School of Public Health and the Columbia Climate School evaluated the feasibility and benefits of transitioning from gas to induction stoves for a pilot program called "Induction Stove Challenge," in affordable housing in New York City. The study highlights that induction stoves **significantly reduce carbon emissions and improve indoor air quality**³³. Similarly, Kritika Roy conducted a cost analysis revealing the long-term economic advantages of using electricity for cooking despite their higher initial costs. The findings suggest that electricity is a cheaper alternative to LPG in rural India at the household level³⁴. This aspect should be further investigated in subsequent research on Chennai.

³³ <https://news.climate.columbia.edu/2024/07/26/study-finds-switching-from-gas-to-electric-stoves-cuts-indoor-air-pollution/>

³⁴ <https://ecoinsee.org/journal/ojs/index.php/ees/article/download/998/296/7167>

A study conducted in 2014³⁵ found that Induction stoves offer **superior energy efficiency**, with up to 90% of the energy consumed transferred to the food, compared to 40% for gas. This means that more than half of the energy from a gas range is wasted. Induction ranges are the most efficient option by far. This high efficiency translates to **lower energy consumption and reduced cooking times**. Additionally, induction cooking generates less residual heat, contributing to cooler kitchen environments³⁶, which is particularly beneficial in hot climates like Chennai.

Health and safety benefits are also notable. Short-term exposure to NO₂ released by LPG is linked to the worsening of respiratory diseases, increased hospital admissions, emergency room visits, and premature mortality. Long-term exposure to NO₂ is also associated with the onset of asthma and premature death. These findings from Daouda et al., 2024 study titled “Out of Gas, In with Justice” indicate that energy transitions aimed at decarbonization can **enhance health** by reducing indoor nitrogen dioxide levels. The absence of open flames in induction stoves **reduces the risk of kitchen fires and burns**³⁷.

A policy brief by the Council on Energy, Environment and Water titled “Are Indian Homes Ready for Electric Cooking?³⁸” highlights the limited knowledge about the current adoption and usage of eCooking in India, its cost-effectiveness compared to other clean alternatives, and households’ perceptions of switching to eCooking from their prevalent cooking fuels. Data and insights gathered from the India Residential Energy Survey (IRES) 2020, which covered 14,850 urban and rural households across 152 districts in the 21 most populous states of India, shed light on this issue. According to IRES, 5% of Indian households (10.3% in urban areas and 2.7% in rural areas) use eCooking devices, with induction cookstoves and rice cookers being the most popular, followed by microwave ovens. The choice of eCooking devices varies across states, with rice cookers being predominant in Andhra Pradesh, induction plates in Tamil Nadu, and microwave ovens in Delhi. This further supports my study's assessment of induction stove feasibility in Chennai, Tamil Nadu.

The study also revealed that 60% of eCooking users believe it is feasible to transition entirely to eCooking. Regarding recurring expenses, eCooking would be more cost-effective than LPG for households with access to cheap electricity³⁹.

It is evident from previous studies that the adoption of eCooking is a significant consideration for an electric future, particularly in India. In the first quarter of 2024, coal's share in India's total power generation capacity dropped below 50% for the first time in several decades. Additionally, a record 69+ gigawatts (GW) of renewable energy tenders were issued across India in fiscal year 2024, exceeding the central government's target of 50 GW. India is becoming a global leader in renewable energy, with solar power generation being the most common source; as of 2023, India ranks third in the world for solar power capacity⁴⁰. This opens up the possibility of adopting renewable electricity for cooking in the future.

Given the benefits of eCooking and its potential in India, the next step is to assess feasibility at the ground level, starting in smaller areas and especially in metropolitan regions where progressive households can adopt new technologies more rapidly. Tamil Nadu, known for its reliable electricity supply, has been chosen for this study. This research will explore the readiness and feasibility of households in the Chennai metropolitan region adopting induction cooking.

³⁵ <https://www.aceee.org/files/proceedings/2014/data/papers/9-702.pdf>

³⁶ <https://redhousecustombuilding.com/induction-cooktop-7-reasons-to-switch-an-induction-cooktop/#:~:text=Energy%20efficiency,goes%20into%20the%20heated%20food.>

³⁷ <https://www.pcrichard.com/induction-cooktops-safer-for-you-and-the-environment/Blog-16113.html#:~:text=Since%20there%20are%20also%20no,whatever%20cookware%20you're%20using.>

³⁸ <https://www.ceew.in/sites/default/files/ceew-study-on-clean-electric-cooking-transition-in-indian-homes.pdf>

³⁹ <https://www.downtoearth.org.in/renewable-energy/clean-er-cooking-in-india-country-should-explore-e-cooking-but-address-these-challenges-before-switching-90914>

⁴⁰ <https://ieefa.org/articles/surge-indias-renewables-tendering-set-keep-coals-share-below-50-total-installed-capacity>

2.2. Theoretical Frameworks and Models Relevant to the Study

This study employs static preference methods through surveys to assess user acceptance, cultural preferences, and practical challenges related to transitioning from LPG to induction stoves. It focuses on evaluating household readiness for the switch rather than providing numerical assessments of economic, environmental, and social impacts.

2.3. Gaps in Current Research That This Paper Addresses

Although existing literature highlights the advantages of induction stoves over LPG, several research gaps remain. Most studies have concentrated on household adoption, leaving a significant gap in understanding the feasibility of this transition in commercial settings, such as restaurants. Given that restaurants are among the highest consumers of LPG in terms of aggregate usage in India, exploring their readiness to adopt induction stoves is crucial. While this study includes only one sample restaurant, it serves as an exploratory step to initiate this investigation.

Existing studies on the adoption of induction stoves have predominantly concentrated on quantitative Cost-Benefit Analysis (CBA). However, there is a notable lack of ground-level, qualitative research that explores the perceptions of beneficiaries such as households and restaurant owners who will directly take part in the transition. This gap is particularly significant in a large and diverse country like India. My study addresses this shortfall by focusing on Chennai city, conducting a pioneering, localized examination of induction stove adoption. Although it involves a small sample of 22 households plus one restaurant, it is valuable as it represents a novel and first-time effort to understand the practical, regional dynamics of technology adoption.

3. Methodology

3.1. Sample for the survey

The survey was conducted with a sample of 22 households and one restaurant in Chennai, carefully selected to represent various income levels. The households were categorized into three income groups: with an annual income of less than Rs 6 Lakhs (\$7,200 approx.), with an annual income between Rs 6 Lakhs and Rs 18 Lakhs (\$21,600 approx.), and those with an annual income exceeding Rs 18 Lakhs. This stratification ensures the representation of diverse economic levels of the city's residents. Additionally, the inclusion of one restaurant provides insights from a commercial viewpoint, highlighting the unique challenges faced by high-volume cooking operations.

As the study is exploratory in nature, a discretionary sampling approach was used due to the lack of available base data (population). Initially, the plan was to collect 9 to 12 samples, ensuring at least three samples from each income level, as the focus was exploratory. However, due to respondents' interest and their efforts to circulate the questionnaires among their networks, the final sample size increased to 22 households and one commercial establishment.

3.2. Survey Instrument

The survey was conducted using a questionnaire designed to collect both quantitative and qualitative data essential for the study. The questionnaire was distributed via Google Forms, and the survey data was

subsequently collected. The data was then transferred to MS Excel for further analysis. Appropriate methodologies were applied, and specific tables were created to facilitate the analysis. The instrument included the following categories of information:

Table 2: Survey Instrument Categories and Research Objectives

Category	Title	Research Objective
1	Household composition, income levels, education, and occupation	To understand the target sample
2	Roles in purchasing cooking items, preparing meals, and managing fuel payments	To understand how cooking is approached and who the decision-maker is.
3	Current LPG stove usage, cost, and satisfaction	To understand the current level of LPG consumption by households and assess how easily they could transition to induction cooking.
4	Awareness and perceptions of induction stoves regarding safety, efficiency, and cost	To understand the current exposure to induction cooking and feedback about its affordability.
5	Barriers to adopting induction stoves and interest in potential incentives	To understand the key issues that need to be addressed to move to induction cooking
6	Willingness to pay for induction stoves and cookware, as well as interest in potential incentives	To understand the key economic factors involved in transitioning to induction cooking
7	Views on environmental impacts and health issues related to LPG	To understand the respondents' awareness of the long-term environmental and health risks associated with LPG.

The questionnaire included 30 data points and also allowed for the collection of qualitative information.

Respondents were provided with a sample model of an often-purchased induction stove available in Chennai, along with information on its overall cost and payment installment options. This was intended to clarify the survey's focus and provide realistic cost information, allowing respondents to answer cost-related questions.

4. Key Findings from the Household Survey

Survey Findings

Although the survey analysis yielded some straightforward findings, there is a need to expand the study with a larger sample to better understand the relationships between various factors and their impact on readiness and the decision to transition to induction cooking. The following first discusses practical and definitive findings, then lists points that emerged from the survey observations as factors requiring further investigation due to the limited sample size and the need for a more extensive on-the-ground study.

Category 2: Roles in purchasing cooking items, preparing meals, and managing fuel payments

- Practical concerns were frequently mentioned here. For instance, the requirement for induction-compatible cookware, and the current limitations of induction stoves, such as their **inability to handle deep frying** and the **need for flat-bottomed vessels**, were significant deterrents. The **inconvenience of needing to overhaul existing cookware** and adapt to new cooking methods was highlighted as a major barrier. For starters, consumer **awareness and acceptance of new forms of cooking are low**, especially in a country where cooking patterns, foods, and cultures change every 40 kilometres⁴¹.
- The survey clearly shows that **in most Chennai households, women are the primary cooks**.

Category 3: Current LPG stove usage and satisfaction

- Some Level 1 households also own induction stoves, indicating that it is **not exclusively a premium product** for higher-income households in Chennai.
- Since households are currently satisfied with LPG stoves, convincing them to make a decision about the induction switch **requires a detailed cost-benefit analysis comparing LPG and induction**. As one respondent noted: “No, I wouldn’t switch completely. The Tamil Nadu Government increased the power tariff by 4.83% for all users starting July 1, 2024. This inflation-influenced factor is a major deterrent to making the switch. If I find a comparison between the annual cost of cooking with LPG versus using an induction stove for three hours per day over a year, and if that study shows that induction is cheaper, then I might consider switching.”

Category 4: Awareness and perceptions of induction stoves regarding safety, efficiency, and cost

- There is a high level of awareness about induction stoves, with the majority of this knowledge coming from peer influence, specifically **through friends and family**.
- Some feedback revealed that while induction cooking is seen as a **useful supplement to LPG**, it has not yet gained full acceptance. This is due to the learning curve involved, occasional operational issues such as **difficulties with understanding power settings** and ensuring cookware compatibility every time, and the **additional upfront costs for both the stoves and compatible cookware**, particularly those from lower-income categories.
- Some households found the current single-burner induction stoves insufficient for cooking multiple dishes simultaneously. This concern arises from a **lack of awareness about the availability of multi-burner induction stoves** on the market.
- Households are **not yet fully aware of the ease of cleaning induction stoves**, which contributes to greater efficiency while cooking.

⁴¹ <https://www.downtoearth.org.in/renewable-energy/clean-er-cooking-in-india-country-should-explore-e-cooking-but-address-these-challenges-before-switching-90914>

- Households lack clarity regarding the practical adoption of induction stoves, including **the potential impact of government subsidies and changes in electricity costs** resulting from this transition.

Category 5: Barriers to adopting induction stoves

- A common theme among the responses is the **need for increased education about the benefits** of induction stoves. Many respondents noted that LPG is deeply ingrained in current cooking practices in Chennai and that the benefits of induction cooking need to be communicated more effectively to encourage a shift. This can also eliminate the **apprehensions about the taste of food** cooked on modern appliances compared to their usual methods.
- Several respondents noted concerns about the **cost of electricity**, potential voltage fluctuations especially during the summer when air conditioners are heavily used, and the **need for a reliable power supply** as factors that could discourage a full transition to induction cooking.
- Another barrier noted is that, given when the female cook is old, the **steep learning curve associated** with switching to induction cooking is not practically feasible for them to adapt to.
- Improved infrastructure, such as **more suitable electrical setups**, was also mentioned as a necessary step for broader adoption. With the availability of plug-in induction stoves in Chennai, as opposed to the installation models common in the West, this issue should not be very significant.

Category 7: Views on environmental impacts and health issues related to LPG

- In addition to cost and convenience, **households value environmental, health, and safety benefits.**

Factors Requiring Further Investigation:

Category 1: Household Composition, Income Levels, Education, and Occupation

- **Family Size and Readiness to Switch:** The relationship between family size and the willingness to switch to induction stoves varies.
- **Age of Household Members and Readiness to Switch:** Among the three households with elderly members, none showed readiness to switch to induction stoves completely; two were strongly reluctant, and one preferred to continue stacking. Further study is needed to investigate correlations, such as specific food requirements for elderly citizens that are difficult or impossible to prepare with an induction stove. Another consideration is whether elderly citizens require attention from other household members, preventing them from adopting and learning to use new technology.
- **Households with Children:** Households with children show mixed responses regarding the switch to induction stoves. Additional analysis is needed to emphasize the safety and health benefits of induction stoves for children compared to LPG.
- **Education Level and Readiness to Switch:** Households with the highest education levels, such as PhD holders (14% of respondents), showed varied responses: two were resistant, two would consider switching if electricity costs were addressed, and one preferred to continue using their current stove. In contrast, households with minimal education (bachelor's degree holders) exhibited clear resistance. This suggests a need to investigate whether economic conditions are linked to readiness for switching to induction stoves.

Category 2: Roles in purchasing cooking items, preparing meals, and managing fuel payments

- **Income Level and Fuel Bill Management:** In households with an income level below Rs 6 lakhs, fuel bills are exclusively managed by males. This could lead to resistance from female heads of households who might otherwise benefit from the convenience of induction cooking, as financial decisions are primarily influenced by male family members.

Category 3: Current LPG stove usage and satisfaction

- **Income Level and Induction Stove Usage:** The majority of households with induction stoves (67%) fall into the Level 3 income category, suggesting they have the means to afford innovative technologies. Despite owning a higher number of induction stoves, these households do not use them proportionately more than LPG stoves or other income groups. Notably, the two households with the highest usage of induction stoves (50% and 40% of the time) are also from Level 3, indicating their capacity to progressively adopt modern technologies.
- **Cooking Time and LPG Spending:** Household cooking time ranges from 1 to 6 hours, with no clear link to LPG spending. For example, two households in Level 1 with the same cooking time and family size had significantly different LPG expenditures (Rs 10,800 vs. Rs 6,300). This suggests that factors beyond income level, cooking time, and household size influence LPG spending. Diverse cooking patterns and the cook's age may also affect spending and cooking dynamics.

Category 4: Awareness and perceptions of induction stoves regarding safety, efficiency, and cost

- **Cost Perceptions:** Only one household considered the initial and operating costs of induction stoves to be 'extremely unaffordable' and belonged to Income Level 3. This indicates that even top-income households in Chennai may not be fully convinced of the cost benefits of switching to induction cooking.
- **Plans for LPG Stove Replacement:** Households with worn-out LPG stoves are not planning immediate replacement with induction stoves. Among those expecting their LPG stoves to wear out within five years, responses varied: some are ready to switch to induction, some plan to continue stacking, and others would only consider switching if LPG stoves were banned.

5. Key Findings from the Restaurant Survey

Restaurant Overview and Current Operations

The restaurant surveyed requested anonymity. This prominent vegetarian establishment, with four locations in Chennai, operates an outlet in Velacherry. The managing partner of this outlet was interviewed for the survey.

With an average of 1,000 daily customers and 150 employees working 16-hour shifts, this high-volume restaurant generates an annual revenue exceeding Rs 2 crore (approximately \$240,000). Currently, the restaurant relies entirely on LPG stoves, using approximately 450 cylinders of 47.5 Kg each per month. This results in a monthly expenditure of Rs 8 lakhs (around \$9,550) or approximately \$120,000 per year, which constitutes about half of the restaurant's revenue. The LPG stoves are used for approximately 20 hours daily.

Electricity Supply and Usage

The restaurant's monthly electricity consumption is 28,500 kWh, leading to an electricity bill of approximately Rs 3.5 lakhs (\$4,200) or approximately \$50,000 per year. Although the electricity supply is somewhat unreliable, it is deemed sufficiently dependable. The peak usage hours align with the restaurant's busy lunch and dinner periods. The electricity consumption during these times is attributed to non-cooking operations, including lighting, refrigeration, ventilation systems, POS systems, display TVs, and miscellaneous small appliances. These factors collectively contribute to the restaurant's overall electricity consumption, with peak usage periods reflecting the high traffic times of the day.

Interest in Induction Stove adoption

The restaurant's respondent was initially unaware of induction stoves' application in commercial kitchens and expressed a neutral stance on transitioning. While interested in adopting two induction cooktops as a trial, the respondent raised concerns about the high initial costs, efficiency, maintenance requirements, and staff training needs. Additionally, the respondent anticipated a potential 50% increase in electricity costs.

The respondent is willing to invest Rs 2 Lakhs (\$2,400) for the initial cost of induction stoves and Rs 10,000 (\$120) for compatible cookware. Despite acknowledging benefits such as faster cooking, energy efficiency, safety, and ease of cleaning, the respondent indicated that a government subsidy of at least 40% would be necessary to influence their decision to transition to induction stoves.

Environmental and health considerations

The restaurant values minimizing indoor environmental impact. The respondent acknowledged the potential respiratory issues associated with LPG but does not believe any staff members are currently affected.

Overall, with a stable power supply and financial support, the respondent is open to considering the shift to induction stoves.

The commercial environment may present distinct challenges and opportunities for induction initiatives, including different policy incentives and technologies for commercial induction stoves.

6. Conclusion and Suggestions

Suggestions from the Survey Analysis:

Policy:

- Assessing the readiness of Chennai residents based on income levels is essential for implementing subsidy schemes fairly, according to affordability.
- In response to households' requests for a cost-benefit analysis comparing LPG and induction stoves, such an analysis should be conducted at the policy level and shared with households. This will enable them to make informed decisions about switching to induction cooking based on a thorough comparison.

Extension activities:

- Extension activities should focus more on households with minimal education, as they may struggle more to understand the implications of transitioning to induction stoves compared to more educated groups.
- Although future extension activities should focus on training and raising awareness for everyone, special attention should be given to practical demonstrations and detailed training for women, as they are the primary cooks in most Chennai households. This will help enhance their comfort and efficiency when using induction stoves.
- In households earning less than Rs 6 lakhs, men often handle fuel bills and may resist switching to induction stoves, despite the benefits they offer for female cooks by improving cooking efficiency. Extension activities should focus on sensitizing male family members to the advantages of induction stoves, allowing for informed decisions that benefit the entire household. Additionally, potential government subsidies could help alleviate financial constraints for this income group.
- The majority of induction stove owners identified in the survey are from Level 3 income households. This suggests that initiatives promoting induction stoves could be initiated with Level 3 households, as their quicker acceptance and adaptation might encourage other income groups to follow suit. An expanded study should investigate whether the increased adoption among Level 3 income households is driven by aspirations or a marker of social status.
- Awareness of induction stoves largely stems from peer influence, particularly through friends and family. Therefore, peer usage is the most effective way to raise awareness in Chennai, although marketing also plays a role. The primary focus should be on ensuring the pilot program's success, as word-of-mouth will naturally spread to other households. Offering usage training in stores, conducting door-to-door demonstrations, and leveraging online social media marketing could further enhance awareness and adoption.
- Many basic dishes commonly prepared by Chennai households still need to be tested with induction stoves. This experimentation should be conducted, and the results effectively communicated to households. A promising approach is to integrate induction stoves into popular cooking shows, such as "*Cooku with Comali*". Given that these shows are watched by millions in Chennai and feature top chefs from the city, showcasing induction stoves in this context—with various dishes prepared using them—would enhance customer awareness about the versatility and effectiveness of induction cooking.

Public-private partnerships:

- Since none of the participants were aware that induction stoves are easier to clean due to their flat surface burners, it is crucial to highlight this benefit in extension activities by policymakers and technology providers. This time-saving advantage could make the technology more appealing to those considering a switch, serving as a strong selling point.
- Another compelling selling point for policymakers, technology providers, and extension players is the survey's finding that Chennai households highly value the environmental and health benefits of using induction stoves. Highlighting these benefits presents a significant opportunity for promoting the adoption of induction stoves.

Other Suggestions:**Policy:**

Overall, LPG is provided at a subsidised rate in India, and without any existing subsidies in electricity, it makes the switch nearly impossible at present.

- Addressing Power Tariff Rates and Payment Discipline: Targeted policies for subsidies should be implemented to address power tariff rates and payment discipline that influence the adoption of e-cooking.
- Load Flow Analysis and Grid Capacity: Data from DISCOM (distribution company) for two feeders (urban and rural) to perform a load flow analysis and create sample load profiles based on multiple future scenarios. Three of those scenarios were: If e-cooking was adopted by 30 percent, 70 percent, or 100 percent of the population. Based on their simulations, the researchers found urban feeders were almost fully loaded (base load was at 97 percent). These feeders could not accommodate additional loads from e-cooking adoption unless the grid capacity were increased significantly or paired with solar and battery energy storage systems (BESS)⁴². Therefore, there is a need for:
 - Grid capacity expansion for immediate use of induction as the extension activities are getting carried out, and people may be interested or convinced to at least give it a try to increase their induction use.
 - There is also a need for battery energy storage systems that can provide a reliable backup, ensuring that cooking can continue uninterrupted during power cuts, storing excess energy during off-peak hours and supplying it during peak demand; BESS can help stabilize the grid, reducing the risk of blackouts.
- Decentralized Renewable Energy Integration: While promoting the reliability of electricity for induction stoves through grid expansion, the government should also advocate for decentralized renewable energy sources, such as rooftop solar, to reduce long-term dependency on the grid.
- Avoiding Overlap with Piped Natural Gas (PNG) Initiatives: The Government of India's initiative to connect 50 million homes to PNG⁴³ should not overlap with e-cooking efforts. In Chennai specifically, a trial has recently begun with 55 houses in Annanagar receiving PNG, marking the first batch of domestic gas connections in the city⁴⁴. To ensure the best long-term solution for Chennai, a comprehensive cost-benefit analysis considering economic, social, and environmental factors must be conducted. This analysis will determine whether PNG or e-cooking is more

⁴² <https://www.downtoearth.org.in/renewable-energy/clean-er-cooking-in-india-country-should-explore-e-cooking-but-address-these-challenges-before-switching-90914>

⁴³ <https://www.indiaspend.com/earthcheckindia/how-electric-cooking-can-help-indian-families-transition-to-cleaner-fuels-916525#:~:text=Further%2C%20the%20CEE%20paper%20shows,pricing%20of%20approximately%20Rs%201%20C100>

⁴⁴ <https://www.thehindu.com/news/cities/chennai/trials-on-for-chennai-first-batch-of-piped-natural-gas-connections-to-an-apartment/article67042377.ece>

beneficial for the city. Both efforts should not overlap to avoid resource inefficiencies and ensure a focused, effective transition to a sustainable cooking energy source. Coordination is necessary to ensure these initiatives complement rather than compete with each other. For example, focus on installing PNGs only in areas where e-cooking is practically impossible, such as the outskirts of Chennai like Avadi and Manali, where frequent power outages occur. Further study is required to evaluate whether improving the existing weak grid infrastructure in these areas would be more feasible than installing a new gas network.

- Decarbonizing Power Generation: India's power generation must be decarbonized by advocating for government policies that support renewable energy integration for e-cooking. This includes subsidies for renewable energy systems, tax incentives, and support for research and development. For instance, the PM Surya Ghar: Muft Bijli Yojana⁴⁵, which provides subsidies for installing rooftop solar panels for residential houses to use solar energy and save on electricity bills, should be further enhanced.
- Subsidies for High-Volume Commercial Restaurants: Governments should prioritize substantial subsidies for high-volume commercial restaurants to support their transition to induction stoves. Additionally, offering support through energy audits, credit schemes, and government-backed risk-sharing mechanisms, such as guarantees or subsidies that reduce the financial burden or potential losses for businesses making the switch, could further incentivize this shift. Larger commercial establishments, with access to relevant information and financial support, should, in theory, be able to afford the transition to induction stoves. Focusing on these commercial entities will maximize the initiative's impact and reach while extending similar support to residential households.
- Awareness and Monitoring of Energy Use: A two-year research project in Nepal found that households switching from LPG to induction cooking saved money, but many were unaware of this due to a lack of information on electricity consumption and costs. In response, to correct the information market failure, the project developed the "Smart Bhanchha App" (Smart Kitchen App) to monitor energy consumption and cooking costs in real-time⁴⁶. India should adopt a similar approach, akin to the successful Swachh Bharat Mission App, PM-KISAN, to increase awareness and encourage e-cooking adoption.

Extension activities:

- Outreach, Education, Training, Capacity Building: To facilitate the adoption of induction stoves in Chennai, extension activities should amplify the transition's impact through education, support, and stakeholder engagement. The government can partner with local self-help groups, which have proven effective in India, as well as NGOs and community-based organizations. Each major zone or community in Chennai, for instance, Adambakkam - a residential locality in South Chennai where the Shanthi Nagar Welfare Association operates - has local associations run by volunteers who manage community funds and represent residents to the local government. These associations are ideal for initiating extension activities for induction stoves. By educating volunteers and leveraging these organizations to reach a wider public within each community, the government can effectively organize training sessions and workshops to familiarize households with induction stove technology and highlight its benefits and efficiency. Funding these groups for such activities can enhance the skills and knowledge of those involved in the transition, including successful

⁴⁵ <https://cleartax.in/s/rooftop-solar-scheme>

⁴⁶ <https://cleancooking.org/news/11-30-2020-moving-toward-cleaner-cooking-in-nepal-results-from-a-two-year-research-project/>

adopters who can share their experiences and motivate the community rather than relying solely on policy-driven efforts.

- Leveraging social media: Social media can play a crucial role by sharing success stories, instructional videos, and testimonials from early adopters, leveraging peer influence to reach a wider audience. Awareness campaigns should educate the public about the advantages of renewable energy and induction cooking, and online training programs should be implemented for technicians and end-users on installation, maintenance, and efficient use of solar PV systems and induction stoves.
- Pilot Projects and Data Utilization: Pilot projects can demonstrate the feasibility and benefits of integrating renewable energy with induction stoves. Data from these projects should be used to showcase success rates and encourage broader adoption.
- Phased Transition Approach: Extension activities should aim for at least a 50% transition to induction cooking, with continued use of LPG until confidence in the new technology is established. It will be more practical to encourage households to use induction stoves for specific types of cooking while retaining LPG for other needs. Additionally, households could be encouraged to begin purchasing ferrous cookware, which is durable and compatible with both LPG and induction stoves. This approach will gradually prepare households for a full transition to induction cooking.

The survey indicates a clear lack of these initiatives in Chennai. For instance, from my survey experience, many households are confused about the differences between electric coil stoves and induction stoves and unaware that they are distinct technologies.

Public-Private-partnership:

- Combine Rooftop Solar with Induction Cooking: E-cooking combined with rooftop solar could be a quick and healthy way to transition people to clean cooking⁴⁷. Partnerships with private-sector solar manufacturers and installers are essential. Extension activities should promote rooftop solar during community engagement and training. Therefore, policies must support this integration, the private sector must implement it, and extension players must reinforce it within the community.
- Develop Local Manufacturing: A strong local manufacturing environment is crucial. Domestic research should focus on developing e-cooking solutions, and local manufacturers must be supported. Producing affordable, energy-efficient stoves that are better suited to each region in Indian cities is essential.
- Leverage Private Sector Bids: Earlier this year, Energy Efficient Services Limited (EESL) issued a bid to procure 100,000 induction stoves⁴⁸. As technology production scales up and economies of scale improve, costs are anticipated to decrease, fostering long-term adoption. This will be achievable through partnerships with local and high-quality induction stove manufacturers.
- Expand Market Access: It is essential to ensure that induction-compatible utensils are readily available in local markets and to collaborate with local retailers to offer a variety of options.
- Enhance Standards and After-Sales Service: Introduce or enhance standards and labelling programs for induction stoves to ensure quality and performance. Establish robust service networks for installation, maintenance, and repairs.

⁴⁷ <https://www.indiaspend.com/earthcheckindia/how-electric-cooking-can-help-indian-families-transition-to-cleaner-fuels-916525#:~:text=Further%2C%20the%20CEE%20paper%20shows,pricing%20of%20approximately%20Rs%201%20C100>

⁴⁸ <https://www.thehindubusinessline.com/companies/eesl-calls-for-bids-to-procure-1-lakh-induction-cookstoves-for-national-efficient-cooking-programme/article67759052.ece>

Concluding remarks

- In the cooking sector of Chennai, the transition from LPG (liquefied petroleum gas) to electric cooking methods is still in its nascent stages.
- Chennai's hot climate and the need to reduce indoor heat make induction stoves particularly attractive. Induction cooking's superior energy efficiency has the potential to translate to lower electricity bills, a notable advantage in a city reliant on air conditioning. The faster cooking times and cooler kitchens due to less heat generation further enhance its appeal. Although some cookware might need to be replaced, the widespread use of stainless steel in South Indian kitchens facilitates a smoother transition for many households. Despite the higher initial cost, the long-term energy savings and overall benefits of induction stoves make them a strong contender for Chennai's kitchens. With this in mind, the above suggestions should be considered to improve the policy framework, social awareness, and technical ecosystem surrounding induction cooking.
- As the technology matures and the benefits become more apparent, there is potential for accelerated adoption, particularly as innovations in electric cooking technology and supportive policies make the transition more economically viable and accessible. Economies of scale can also play a crucial role in reducing the costs of these appliances over time, further encouraging their adoption.
- Tamil Nadu presents ideal cases for the adoption of e-cooking due to the state's highest e-cooking adoption rates in the country⁴⁹. For this reason, Chennai, as a metropolitan region in Tamil Nadu, is particularly suitable for piloting and adopting e-cooking initiatives.
- As the solar infrastructure in the country expands rapidly, integrating induction cooking with rooftop solar presents a viable solution. While a complete transition to induction cooking within the next few years may not be feasible, it is advisable to promote the use of LPG alongside induction stoves (fuel stacking). Households should be encouraged to increase their use of induction cooking while continuing to rely on LPG.

⁴⁹ <https://www.downtoearth.org.in/renewable-energy/clean-er-cooking-in-india-country-should-explore-e-cooking-but-address-these-challenges-before-switching-90914>

APPENDICES

7. Household survey results:

Households included in the survey predominantly use LPG stoves for cooking, even though some also own induction stoves that are not used extensively. Therefore, **it is safe to assume that no household in Chennai has fully transitioned to 100% electric cooking.**

7.1. Category 1: Household composition, income levels, age, education and occupation

7.1.1. Income Levels

Table 3: Survey Data - Household Count and % of Total Annual Income by Income Level

Income Levels	No. of households	No. of households (in %)
1. Less than Rs 6 Lakhs	2	9%
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs	9	41%
3. More than Rs 18 Lakhs	11	50%
Grand Total	22	100%

Level 1: Less than Rs 6 Lakhs: 9% of the surveyed households fall into this lower-income category (2 households). Surveying households in this lower-income bracket was crucial to understanding whether this income group owns any induction stoves at all, their willingness and readiness to make a significant investment in induction stoves, and their affordability perceptions on the operating cost of electricity. This group's feedback is essential to gauge the feasibility of adoption among those with limited financial resources

Level 2: Rs 6 Lakhs to Rs 18 Lakhs: 41% of the households are within this mid-income range (9 households). This middle-income group represents a significant portion of the population in Chennai. This group's feedback is essential to investigate how a progressive income level impacts the decision to transition to induction stoves.

Level 3: More than Rs 18 Lakhs: 50% of the households belong to this higher-income bracket (11 households). This group's feedback is essential in understanding if the advantageous economic position of households alone influences the adoption of new cooking technologies in Chennai.

7.1.2. Household Composition

Table 4: Survey Data - Household Count by Income Level and Family Size

Income Level	2 members	3 members	4 members	5 members	6 members	Total Households
1			2			2
2	2	4	3			9
3	3	2	3	2	1	11
Grand Total						22

Households vary in size, ranging from 2 to 6 members. The majority of the surveyed households consist of 4 members (8 households), followed by 3-member households (6 households), and 2-member households (5 households). Fewer households have 5 or 6 members, with 2 and 1 household(s) respectively.

7.1.3. Age

Table 5: Survey Data - Household Income Levels by Age Distribution

Income Levels	Ages of household members									
	0 to 10	11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 70	71 to 80	81 to 90	91 to 100
1		1	2		2	1				
2	1	3		1	2	4	5			1
3		4	5		5	6	4		2	

The ages of households varied widely across the three income levels, which is useful for assessing any potential relationship between age and readiness to adopt induction cooking. Specifically, households with elderly members (defined as those over 70 years old) and children (defined as those under 20 years old) may have different preferences for cooking methods compared to households without these age groups.

7.1.4.Education

Table 6: Survey Data - Education Qualification Data Collection Summary

Level	Education	Male	Male %	Female	Female %	Total	Total %
1	School	2	100.00%	2	100.00%	4	11.43%
	Graduates	0		0		0	
	Post Graduates	0		0		0	
	Professional	0		0		0	
	Doctorate	0		0		0	
	Subtotal 1	2	11.76%	2		4	11.43%
2	School	0		0		0	0.00%
	Graduates	1	12.50%	3	37.50%	4	11.43%
	Post Graduates	2	25.00%	3	37.50%	5	14.29%
	Professional	4	50.00%	1	12.50%	5	14.29%
	Doctorate	1	12.50%	1	12.50%	2	5.71%
	Subtotal 2	8	47.06%	8	44.44%	16	45.71%
3	School	0		0		0	
	Graduates	0		2	25.00%	2	5.71%
	Post Graduates	4	44.44%	4	50.00%	8	22.86%
	Professional	4	44.44%	0		4	11.43%
	Doctorate	1	11.11%	2	25.00%	3	8.57%
	Subtotal 3	9	52.94%	8	44.44%	17	48.57%
Grand Total	School	2	11.76%	2	11.11%	4	11.43%
	Graduates	1	5.88%	5	27.78%	6	17.14%
	Post Graduates	6	35.29%	7	38.89%	13	37.14%
	Professional	8	47.06%	1	5.56%	9	25.71%
	Doctorate	2	11.76%	3	16.67%	5	14.29%
	Grand Total	17	77.27%	18	81.82%	35	79.55%

The educational qualifications of three male and five female members were not recorded due to missing information. Consequently, only 80% of the educational qualification details for all members were collected. Data was gathered only for the heads of the households, both female and male.

For income Level 1, the highest qualification was only school education. Level 2 showed a diverse range of qualifications, with the majority being graduates and post-graduates, and included two PhD holders. Level 3 had a majority of post-graduates and three PhD holders.

Notably, there were no illiterate respondents, all of whom demonstrated the ability to understand the survey's purpose and the topic of transitioning to induction cooking when it was explained.

7.1.5.Occupation

Table 7: Survey data - Employment Type and Distribution by Income Level and Gender

Level of Income	Employment type	Male	Male (in %)	Female	Female (in %)	Total	Total (in %)
1	Unemployed	0		2	100.00%	2	50.00%
	Self employed	0		0		0	0.00%
	Service (employed)	2	100.00%	0		2	50.00%
	Retired	0		0		0	0.00%
	Subtotal 1	2	9.52%	2	11.11%	4	10.26%
2	Unemployed	1	10.00%	4	44.44%	5	26.32%
	Self employed	5	50.00%	2	22.22%	7	36.84%
	Service (employed)	4	40.00%	2	22.22%	6	31.58%
	Retired	0		1		1	5.26%
	Subtotal 2	10	47.62%	9	50.00%	19	48.72%
3	Unemployed	0		2		2	12.50%
	Self employed	2	22.22%	0	0.00%	2	12.50%
	Service (employed)	7	77.78%	5	71.43%	12	75.00%
	Retired	0		0		0	0.00%
	Subtotal 3	9	42.86%	7	38.89%	16	41.03%
Grand Total	Unemployed	1	4.76%	8	44.44%	9	23.08%
	Self employed	7	33.33%	2	11.11%	9	23.08%
	Service (employed)	13	61.90%	7	38.89%	20	51.28%
	Retired	0	0.00%	1	5.56%	1	2.56%
	Grand Total	21	95.45%	18	81.82%	39	88.64%

The employment qualifications of one male and four female members were not recorded due to missing information. As a result, only 88.64% of the occupation details for all members were collected. Data was collected only for the heads of the households, both female and male.

At Income Level 1, the unemployment rate was 50%, with all unemployed individuals being female from the surveyed households. At Income Level 2, the unemployment rate was 26.32%, including four female and one male member. At Income Level 3, the unemployment rate was 12.5%, with two female members.

7.2. Category 2: Roles in purchasing cooking items, preparing meals, and managing fuel payments

7.2.1. Purchase of Major Cooking items such as vegetables, milk, etc. on a regular basis:

Table 8: Survey Data - Primary Purchaser Count of Major Cooking Items by Income Level and Gender

Income Levels	Male/Female depending on the situation	Male/Female depending on the situation (in %)	Female	Female (in %)	Male	Male (in %)	Total Count	Total Count in %
1		0.00%	1	11.11%	1	33.33%	2	9.09%
2	3	30.00%	5	55.56%	1	33.33%	9	40.91%
3	7	70.00%	3	33.33%	1	33.33%	11	50.00%
Grand Total	10	45.45%	9	40.90%	3	13.67%	22	100.00%

Of the 22 households surveyed, 45% share the responsibility for purchasing major cooking items such as vegetables and milk between the male or female head. In 41% of the households, the female head is primarily responsible, while in 14% of the households, the male head takes on this task.

7.2.2. Major Cooking Tasks:

Table 9: Survey Data - Count of Individuals Responsible for Major Cooking Tasks by Income Level and Gender

Row Labels	Female	Female (in %)	Male	Male (in %)	Total Count	Total Count (in %)
1. Less than Rs 6 Lakhs	2	10.00%		0.00%	2	9.09%
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs	9	45.00%		0.00%	9	40.91%
3. More than Rs 18 Lakhs	9	45.00%	2	100.00%	11	50.00%
Grand Total	20	90.90%	2	9.09%	22	100.00%

91% (20 households) have the major cooking tasks carried out by the female, while 9% (2 households) share the tasks equally between male and female. This suggests that in most households in Chennai, the female is the primary cook.

7.2.3. Settlement of Cooking Fuel Bills:

Table 10: Survey Data - Count of Fuel Payment Responsibilities for Cooking (LPG Bills) by Income Level and Gender

Row Labels	Male/Female depending on the situation	Male/Female depending on the situation (in %)	Female	Female (in %)	Male	Male (in %)	Total Count	Total Count in %
1. Less than Rs 6 Lakhs		0.00%		0.00%	2	25.00%	2	9.09%
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs	3	42.86%	4	57.14%	2	25.00%	9	40.91%
3. More than Rs 18 Lakhs	4	57.14%	3	42.86%	4	50.00%	11	50.00%
Grand Total	7	31.82%	7	31.82%	8	36.36%	22	100.00%

37% (8 households) reported that the male head handles it, 32% (7 households) said the female head does, and 32% (7 households) said it depends on the circumstances.

7.3. Category 3: Current LPG stove usage and satisfaction

7.3.1.Type of stove currently in use by the households

Table 11: Survey Data - Household Stove Usage by Income Level and Stove Type

Level of Income	Stove type	Use in % by different households											Count of 100% LPG	Count of Mix
		1	2	3	4	5	6	7	8	9	10	11		
1	LPG	100%	90%											
	Induction		10%											
	Subtotal 1	100%	100%										1	1
2	LPG	100%	100%	100%	90%	90%	90%	20%	70%	100%				
	Induction				10%	10%			30%					
	Microwave						10%							
	Electric stove/rice cooker							80%						
	Subtotal 2	100%	100%	100%	100%	100%	100%	100%	100%	100%			4	5
3	LPG	100%	95%	100%	100%	60%	75%	90%	80%	90%	95%	50%		
	Induction		5%			40%	5%	10%	20%	10%	5%	50%		
	Microwave						10%							
	Electric stove/rice cooker						10%							
	Subtotal 3	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	3	8
	Grand Total												8 (36.36%)	14 (63.67%)

Eight households (36.36%) rely solely on LPG stoves, while the majority, 14 households (63.64%), use a combination of LPG and other electric equipment. Of these 14 households, 12 (86%) use induction stoves. This is encouraging, especially given the small sample size.

In the Level 1 income category, one of the two households owns an induction stove but uses it only 10% of the time, with LPG being used 90% of the time, while the other household relies entirely on LPG.

In Level 2- and 3-income categories, most households practice fuel stacking, combining the use of LPG with induction stoves, microwaves, and electric rice cookers for boiling rice.

7.3.2.Satisfaction with the current LPG stove

Table 12: Survey Data – Count of Satisfaction/Dissatisfaction Levels with Current LPG Cooking Stove Usage by Income Level

Note: 5 highest, 1 lowest.

Row Labels	Dissatisfaction	Dissatisfaction (in %)	Satisfaction	Satisfaction (in %)	High Satisfaction	High Satisfaction (in %)	Total Count	Total Count (in %)
1. Less than Rs 6 Lakhs		0.00%		0.00%	2	100%	2	9.09%
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs		0.00%	5	55.56%	4	44.44%	9	40.91%
3. More than Rs 18 Lakhs	1	9.09%	4	36.36%	6	54.55%	11	50.00%
Grand Total	1	4.55%	9	40.91%	12	54.55%	22	100.00%

Out of 22 households, 55% (12 households) are very satisfied with their current LPG stove, 41% (9 households) are satisfied, and 4% (1 household) are dissatisfied.

7.3.3.Other electrical appliances owned in the kitchen (other than induction)

Table 13: Survey Data - Household Ownership of Electric Cooking Equipment by Income Level

Note: Full forms are: WH - Water Heater, CM - Coffee Maker, MW - Microwave, RC - Rice Cooker, TO - Toaster Oven, ES - Electric Stove, MG - Mixer Grinder.

Level of Income	Type of Appliance	1 ⁵⁰	2	3	4	5	6	7	8	9	10	11	Total households with electric equipment	Total households by Income Level	% Households with Electric Equipment (by Income Level)	% Households with Electric Equipment (Overall)
1	WH	0														
	CM	0														
	MW	0														
	RC	1														
	TO	0														
	ES	0														
	MG	0														
	Subtotal - 1												1	2	50.00%	4.55%
2	WH	0	0	1	1		0	0		1						
	CM	0	0	1	1		0	0		0						
	MW	1	1	0	0		0	1		0						
	RC	1	1	0	0		1	1		1						
	TO	0	0	0	1		1	0		0						
	ES	0	0	0	0		0	0		0						
	MG	0	0	1	0		0	0		0						
	Subtotal - 2												7	9	77.78%	31.82%
3	WH	1	1	1		0	1	1	1	1	0	0				
	CM	0	0	0		0	0	0	0	1	0	0				
	MW	1	1	0		0	1	0	0	1	0	1				
	RC	1	0	0		0	0	0	0	1	0	1				
	TO	0	0	0		0	0	0	0	0	1	0				
	ES	0	1	0		0	1	0	0	0	0	0				
	MG	0	0	0		1	1	0	0	0	0	0				
	Subtotal - 2												10	11	90.91%	45.45%
	Grand Total												18	22	81.82%	

⁵⁰ Numbers 1 to 11 indicate the households.

81.82% of households own some form of electric cooking equipment. In Level 1, 50% of households within this category own electric cooking equipment, representing 4.55% of all households. In Level 2, 78% of households own electric equipment, accounting for 32% of the total. In Level 3, 91% of households use electric cooking equipment, making up 45% of all households.

7.3.4. Average annual expenditure on LPG for cooking

Table 14: Survey Data - Count of Average Annual Expenditure on LPG for Cooking by Income Level

Income Level	0-5000	5000-10000	More than 10000	Total
1	0	1	1	2
2	1	7	1	9
3	1	8	2	11
Grand Total	2	16	4	22

The current price of an LPG cylinder in Chennai at Rs 819⁵¹ (\$9.83). When households were asked about their annual LPG spending, amounts ranged from Rs 3,200 (\$38.40) to Rs 12,000 (\$144) annually.

7.4. Category 4: Awareness and perceptions of induction stoves regarding safety, efficiency, and cost

7.4.1. Awareness about induction

Table 15: Survey Data - Count of Awareness about Induction Stoves by Income Level

Income Level	Total Households by Income Level	Count of awareness about induction stoves
1. Less than Rs 6 Lakhs	2	2 (100%)
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs	9	9 (100%)
3. More than Rs 18 Lakhs	11	11 (100%)
Grand Total	22	22 (100%)

⁵¹ <https://www.goodreturns.in/lpg-price-in-chennai.html>

Table 16: Survey Data - Sources of Awareness for Induction Stoves by Income Level

Level of Income	Awareness source	Count of households	Count of households (in %)
1	Friends and Family		
	Advertisements	1	50.00%
	Social media		
	Sold in a shop		
	From work place	1	50.00%
	Subtotal - 1	2	100.00%
2	Friends and Family	8	80.00%
	Advertisements		
	Social media		
	Sold in a shop	2	20.00%
	From work place		
	Subtotal - 2	10	100.00%
3	Friends and Family	11	78.57%
	Advertisements	2	14.29%
	Social media	1	7.14%
	Sold in a shop		
	From work place		
	Subtotal - 3	14	100.00%

Every household surveyed is aware of induction stoves. Most learned about them from friends and family, while some saw advertisements or discovered them in shops. One respondent mentioned seeing an induction stove for the first time at their office.

7.4.2. Induction stove and safety

Table 17: Count of Households' Perceptions of Induction Stove Safety

Note: 5 highest, 1 lowest.

Income Levels	3	4	5	Grand Total
1. Less than Rs 6 Lakhs				
Perception of Induction Stove Safety (Count)			2	2
Perception of Induction Stove Safety (Count) in %	0.00%	0.00%	100.00%	9.09%
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs				
Perception of Induction Stove Safety (Count)	3	3	3	9
Perception of Induction Stove Safety (Count) in %	33.33%	33.33%	33.33%	40.91%
3. More than Rs 18 Lakhs				
Perception of Induction Stove Safety (Count)	1	2	8	11
Perception of Induction Stove Safety (Count) in %	9.09%	18.18%	72.73%	50.00%
Total Count of Perceptions on Induction Stove Safety	4	5	13	22
Total Count of Perceptions on Induction Stove Safety in %	18.18%	22.72%	59.09%	100.00%

Regarding the safety of induction stoves, 59% of participants rated them as "very safe" (score of 5), 23% as "safe" (score of 4), and 18% as "average" (score of 3). Among different income levels, 100% of those in Level 1 considered them "very safe." In Level 2, opinions were more varied, with 33.33% of participants each rating the safety as scores of 3, 4, and 5. In Level 3, a substantial majority of 73% rated induction stoves as "very safe."

7.4.3. Induction stove and efficiency

Table 18: Count of Households' Perceptions of Induction Stove Efficiency

Note: 5 highest, 1 lowest.

Income Levels	2	3	4	5	Grand Total
1. Less than Rs 6 Lakhs					
Count of Perceptions on Induction Stove Efficiency		1	1		2
Count of Perceptions on Induction Stove Efficiency (in %)	0.00%	50%	50%	0.00%	9.09%
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs					
Count of Perceptions on Induction Stove Efficiency	2	3	2	2	9
Count of Perceptions on Induction Stove Efficiency (in %)	22.22%	33.33%	22.22%	22.22%	40.91%
3. More than Rs 18 Lakhs					
Count of Perceptions on Induction Stove Efficiency	1	1	6	3	11
Count of Perceptions on Induction Stove Efficiency (in %)	9.09%	9.09%	54.55%	27.27%	50.00%
Total Count of Perceptions on Induction Stove Efficiency	3	5	9	5	22
Total Count of Perceptions on Induction Stove Efficiency (in %)	13.64%	22.73%	40.91%	22.73%	100.00%

When evaluating the efficiency of induction stoves in terms of ease of cooking and cooking time, only 22.73% of participants rated them as "very efficient" (score of 5), while 40.91% rated them as "efficient" (score of 4). Additionally, 22.73% gave a score of 3, and 13.64% rated them as 2. In Level 1, the ratings were evenly split, with 50% of participants giving scores of 3 and 4. In Level 2, the ratings ranged from scores of 2 to 5. For Level 3, 54.55% rated the stoves as "efficient" (score of 4), 27.27% as "very efficient" (score of 5), and 9.09% each gave scores of 2 and 3.

7.4.4. Induction stove and cost (initial and operational)

Table 19: Count and Perception of Induction Stove Cost by Income Levels

Note: 5 highest, 1 lowest.

Income Levels	1	2	3	4	5	Grand Total
1. Less than Rs 6 Lakhs						
Count of perceptions on induction stove cost		1			1	2
Count of perceptions on induction stove cost (in %)	0.00%	50.00%	0.00%	0.00%	20.00%	9.09%
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs						
Count of perceptions on induction stove cost		1	5	1	2	9
Count of perceptions on induction stove cost (in %)	0.00%	50.00%	62.50%	16.67%	40.00%	40.91%
3. More than Rs 18 Lakhs						
Count of perceptions on induction stove cost	1		3	5	2	11
Count of perceptions on induction stove cost (in %)	100.00%	0.00%	37.50%	83.33%	40.00%	50.00%
Total Count of Perceived Cost of Induction Stoves	1	2	8	6	5	22
Total Count of Perceived Cost of Induction Stoves (in %)	4.55%	9.09%	36.36%	27.27%	22.73%	100.00%

Households were shown a sample popular induction stove model from a sales website to gauge their perception of its initial cost. However, no information was provided on potential increases in electricity costs due to fluctuating tariffs and uncertainties about future changes. When asked to rate the affordability of the induction stove on a scale of 1 to 5, 23% rated it a 5, indicating they find it very affordable, and 28% rated it a 4, finding it quite affordable. A majority of 36% rated it a 3, expressing uncertainty about its affordability. Nine percent (score 2) did not find it affordable, and only 1 household rated it extremely unaffordable, from the Level 3 category.

7.4.5. Main motivation to shift to induction

Subsidies:

Table 20: Count of Household Interest in Switching to Induction Stoves with Incentives by Income Level

Income Levels	Uninterested in Switching	Uninterested in Switching (in %)	Unsure About Switching	Unsure About Switching (in %)	Interested in Switching	Interested in Switching (in %)	Total count	Total count (in)
1. Less than Rs 6 Lakhs	2	22.22%		0.00%		0.00%	2	9.09%
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs	2	22.22%	4	57.14%	3	50.00%	9	40.91%
3. More than Rs 18 Lakhs	5	55.56%	3	42.86%	3	50.00%	11	50%
Grand Total	9	40.91%	7	31.82%	6	27.27%	22	100%

When asked if financial subsidies for the initial cost of induction stoves, cookware, and electricity tariffs would motivate them to switch entirely to induction cooking, the responses were mixed. 41% of participants were uninterested in switching even with subsidies, 32% were unsure, and only 27% expressed willingness to consider the change.

Other motivation factors:

Table 21: Motivation Factors for Switching to Induction Stoves by Income Level and households

Level of Income	Motivation factors	1	2	3	4	5	6	7	8	9	10	11	Total	Total households in the Income Level	Total % for each motivation
1	Environmental benefits	0											0	2	0.00%
	Convenience	0											0	2	0.00%
	Safety	0											0	2	0.00%
	Cost savings	0											0	2	0.00%
	Health benefits	0											0	2	0.00%
	No motivation to change	1	1										2	2	100.00%
2	Environmental benefits	1	1	1	0	0	1	0	0	1			5	9	55.56%
	Convenience	1	1	0	0	1	1	0	0	1			5	9	55.56%
	Safety	1	1	0	0	0	1	0	0	1			4	9	44.44%
	Cost savings	0	0	0	0	0	1	0	0	1			2	9	22.22%
	Health benefits	0	0	1	0	0	1	0	0	1			3	9	33.33%
	No motivation to change	0	0	0	1	0	0	1	1	0			3	9	33.33%
3	Environmental benefits	1	0	0	0	0	1	0	0	1	0	0	3	11	27.27%
	Convenience	0	0	0	0	1	1	1	0	0	1	1	5	11	45.45%
	Safety	1	0	0	0	0	1	0	1	1	0	0	4	11	36.36%
	Cost savings	0	1	0	0	1	0	1	0	0	1	0	4	11	36.36%
	Health benefits	1	0	0	0	0	1	0	0	1	0	0	3	11	27.27%
	No motivation to change	0	1	1	1	0	0	0	0	0	0	0	3	11	27.27%

Following mixed responses on subsidies, which indicated they are not a decisive factor for switching, 22 households highlighted various motivations for adopting induction stoves over LPG.

In Level 1, both households (100%) showed no motivation and expressed a strong intention not to switch. In Level 2, the primary motivations were environmental benefits and the convenience of using induction stoves, with 33% of participants having no motivation to change. Level 3 had a very mixed response, with motivations spread almost evenly, and 27% of participants reporting no motivation to switch.

7.4.6. Dishes prepared with induction, if used

When respondents who currently use induction stoves were asked what they typically prepare with them, their responses revealed a variety of common uses.

- ❖ **Boiling milk:** This was a frequently mentioned use, indicating its importance in daily routines.
- ❖ **Tea and Coffee:** Many households reported using induction stoves to make tea and coffee, appreciating the quick heating capabilities.
- ❖ **Boiling water:** This was another common task, highlighting the efficiency of induction stoves for basic cooking needs.
- ❖ **Boiling vegetables:** Several respondents used induction stoves for boiling vegetables, benefiting from precise temperature control.
- ❖ **Rice:** Cooking rice was also a common use, even though rice cookers are very common in Chennai.
- ❖ **Side dishes such as curry and gravy varieties:** Many households prepared these dishes, emphasizing the convenience of consistent heat.
- ❖ **Heating porridge:** A few respondents mentioned this as part of their breakfast routine.
- ❖ **Dosa and Idly:** These traditional tiffin items were also prepared using induction stoves, demonstrating their suitability for a variety of cooking styles.
- ❖ **Bread varieties such as roti:** Some households used induction stoves to make bread varieties, highlighting their versatility.
- ❖ **Snacks:** A few respondents mentioned using induction stoves to prepare snacks, enjoying the quick heating and ease of use.

7.5. Category 5: Barriers to adopting induction stoves

7.5.1. Main barriers to adoption

Table 22: Survey Data - Main Barriers to Adoption of Induction Stoves by Income Level and Households

Level of Income	Main Barriers	1	2	3	4	5	6	7	8	9	10	11	Total	Total % by Income Level
1	Cost of electricity	0	1										1	20%
	Cost of stove	0	1										1	20%
	Need to purchase ferrous cookware	0	1										1	20%
	Got used to LPG	1	1										2	40%
	Lack of knowledge	0	0										0	0%
	Others	0	0										0	0%
	Subtotal - 1												5	100%
2	Cost of electricity	1	0	0	1	0	0	0	0	1			3	21.43%
	Cost of stove	0	0	0	0	0	0	0	0	0			0	0.00%
	Need to purchase ferrous cookware	0	0	1	0	0	0	0	0	1			2	14.29%
	Got used to LPG	0	0	0	1	1	1	1	1	1			6	42.86%
	Lack of knowledge	0	0	0	0	0	1	0	0				1	7.14%
	Others	0	1	0	0	0	0	0	0	1			2	14.29%
	Subtotal - 2												14	100.00%
3	Cost of electricity	0	0	0	1	1	1	0	1	0	0	0	4	23.53%
	Cost of stove	0	0	0	0	1	0	0	1	0	0	0	2	11.76%
	Need to purchase ferrous cookware	1	0	0	0	0	1	0	1	0	1	0	4	23.53%
	Got used to LPG	1	1	1	0	0	0	1	0	1	0	1	6	35.29%
	Lack of knowledge	0	0	0	0	0	0	0	0	0	0	0	0	0.00%
	Others	0	1	0	0	0	0	0	0	0	0	0	1	5.88%
	Subtotal - 3												17	100.00%

Among all three income levels, the primary barriers to switching were convenience and being accustomed to LPG, affecting 40% of Level 1 participants, 43% of Level 2 participants, and 35% of Level 3 participants.

In Level 1, the next significant barriers were the cost of the stove, electricity, and the need to purchase new cookware. In Level 2, the main additional barriers included the cost of electricity, the expense of buying ferrous cookware, and a lack of knowledge, with one household citing "others" without specific reasons. In Level 3, the next major barriers were the cost of the stove, cookware, the need to buy new cookware, and "others" with no specific reasons provided.

7.5.2.Expectation of electricity spend increasing

Table 23: Estimated Increase in Electricity Spend with Full Use of Induction Stove for Cooking by Income Level

Level of Income	% increase in electricity cost expected	Count of Households Expressing Increase	% of Total Households
1	10%	2	100.00%
	20%	0	0.00%
	30%	0	0.00%
	40%	0	0.00%
	50%	0	0.00%
	More than 50%	0	0.00%
	Unsure	0	0.00%
	Subtotal - 1	2	9.09%
2	10%	1	11.11%
	20%	1	11.11%
	30%	1	11.11%
	40%	1	11.11%
	50%		0.00%
	More than 50%		0.00%
	Unsure	5	55.56%
	Subtotal - 2	9	40.91%
3	10%	3	27.27%
	20%	0	0.00%
	30%	2	18.18%
	40%	0	0.00%
	50%	0	0.00%
	More than 50%	2	18.18%
	Unsure	4	36.36%
	Subtotal - 3	11	50.00%
	Grant Total	22	100%

Households had diverse concerns about the potential increase in electricity costs associated with switching to induction cooking. In Level 1, 100% of participants anticipated a 10% increase in their electricity costs. In Level 2, the majority (56%) were unsure of the impact, while the remaining participants were evenly split between expecting a 10% and a 40% increase. In Level 3, 36% were unsure, with the rest anticipating increases of 10%, 30%, or more than 50%.

7.6. Category 6: Willingness to pay for induction stoves and cookware

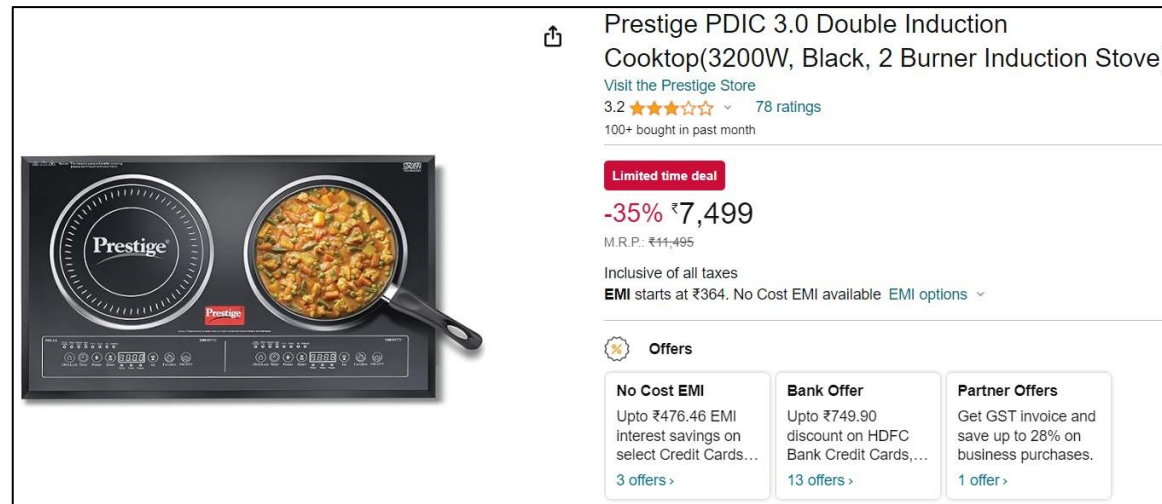
7.6.1. Willingness to Pay for Induction Stoves

Table 24: Survey data - Willingness to Pay for Induction Stoves by Income Level

Income Level	Rs 0- Rs 5000	Rs 5000- Rs 10000	More than Rs 10000	Unsure	Total
1	2 (100%)				2
2	6 (66.67%)	2 (22.22%)	1 (11.11%)		9
3	9 (81.82%)		1 (9.09%)	1 (9.09%)	11
Grand Total	17 (77.27%)	2 (9.09%)	2 (9.09%)	1 (4.54%)	22

The illustrative induction stove model (*Figure 1*), priced at ₹7,500, provided households with a realistic view of the cost. When asked how much they would be willing to pay for an induction stove, the responses varied across the three levels of income. A majority of 68.18% of all households were willing to pay up to ₹5,000 (approximately \$60). Additionally, 13.64% were prepared to pay between ₹5,000 and ₹10,000, another 13.64% were willing to pay more than ₹10,000, and 4.55% were unsure about their willingness to pay for the upfront cost.

In Level 1, 100% of the households were willing to pay less than ₹5,000. In Level 2, 88.89% of the households were willing to pay less than ₹5,000, while 11.11% were ready to pay more than ₹10,000. Level 3 exhibited more diverse responses: 53.85% of households preferred to pay less than ₹5,000, 23.08% were ready to pay between ₹5,000 and ₹10,000, 15.38% were willing to pay more than ₹10,000, and 7.69% were unsure about the cost they would be willing to pay.

Figure 1: Induction Stove Model Presented to Households, Including Link to Retail Sales Website⁵²

7.6.2. Willingness to Pay for Induction Stove Cookware

Table 25: Survey Data - Willingness to Pay for Induction Stove Cookware by Income Level

Level of Income	0- Rs 5000	Rs 5000- Rs 10000	More than Rs 10000	Unsure	Total
1	2 (100%)				2
2	8 (88.89%)		1 (11.11%)		9
3	7 (63.64%)	2 (18.18%)	1 (9.09%)	1 (9.09%)	11
Grand Total	15 (68.18%)	3 (13.64%)	3 (13.64%)	1 (4.55%)	22

⁵² <https://www.amazon.in/Prestige-PDIC-Double-Induction-Cooktop/dp/B0BY956ZX3> (NOTE: There is no promotion or endorsement of any specific brand; any brand you see is for illustrative purposes only).

Many Chennai households already own flat-bottomed cookware, but the quantity is limited. A larger number of such cookware would be required to support a full transition to induction cooking.

When asked how much they would be willing to pay for an induction stove, the responses varied across the three levels of income. A majority of 68.18% of all households were willing to pay up to ₹5,000 (approximately \$60). Additionally, 13.64% were prepared to pay between ₹5,000 and ₹10,000, another 13.64% were willing to pay more than ₹10,000, and 4.55% were unsure about their willingness to pay for the upfront cost.

In Level 1, 100% of the households were willing to pay less than ₹5,000. In Level 2, 88.89% of the households were willing to pay less than ₹5,000, while 11.11% were ready to pay more than ₹10,000. Level 3 exhibited more diverse responses: 53.85% of households preferred to pay less than ₹5,000, 23.08% were ready to pay between ₹5,000 and ₹10,000, 15.38% were willing to pay more than ₹10,000, and 7.69% were unsure about the cost they would be willing to pay.

7.6.3. Impact of a Government Subsidy on initial costs to switch to induction

Table 26: Survey Data – Expected Subsidies for Initial Induction Costs by Income Level

Level of Income	% subsidies expected on initial cost	Count of households	Count of households (in %)
1	10%		0.00%
	20%		0.00%
	30%		0.00%
	40%		0.00%
	50%		0.00%
	More than 50%	1	50.00%
	Unsure		0.00%
	Never switching	1	50.00%
	Subtotal - 1	1	4.76%
2	10%	1	11.11%
	20%	3	33.33%
	30%	1	11.11%
	40%	1	11.11%
	50%		0.00%
	More than 50%		0.00%
	Unsure	3	33.33%
	Subtotal - 2	9	42.86%
3	10%		0.00%
	20%		0.00%
	30%	1	9.09%
	40%	4	36.36%
	50%		0.00%
	More than 50%	4	36.36%
	Unsure	2	18.18%
	Subtotal - 3	11	52.38%
	Grant Total	21	100%

Respondents were asked what % of government support in the form of a subsidy would make the switch attractive.

In Level 1, half of the households (50%) expected a subsidy covering more than 50% of the initial cost, while the remaining 50% expressed a strong intention not to switch, regardless of subsidy availability.

In Level 2, a third (33.33%) were unsure about the subsidy needed, while another 33.33% anticipated requiring a 20% subsidy. Additionally, 11.11% of households expected subsidies of 10%, 30%, or 40%, reflecting a range of needs and uncertainty in this income group.

In Level 3, the majority, at 36.36%, expected a 40% subsidy, with another 36.36% looking for a subsidy of more than 50%. Meanwhile, 18.18% were unsure, and 9.09% expected a 30% subsidy.

7.6.4. Preferred Payment Methods for Induction Stoves

Table 27: Survey data - Preferred Payment Methods for Induction Stoves by Income Level

Income Level	Installment	Installment (%)	Never prepared to buy	Never prepared to buy (%)	Upfront	Upfront (%)	Grand Total
1. Less than Rs 6 Lakhs	1	50.00%			1	50.00%	2
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs	2	22.22%	1	11.11%	6	66.67%	9
3. More than Rs 18 Lakhs	0	0.00%	3	27.27%	8	72.73%	11
Grand Total	3	13.64%	4	18.18%	15	68.18%	22

A significant 68% majority preferred an upfront payment method for the initial cost of an induction stove, while 14% preferred installment payments, and 18% were not prepared to purchase at all.

In Level 1, 50% (1 household) preferred upfront payments, with another household also choosing to pay upfront. In Level 2, 87% of respondents preferred upfront payments, while 22% chose installments, and 11% were not prepared to buy. At Level 3, 73% preferred upfront payments, with the remaining 27% not prepared to purchase at all.

7.6.5. Timing of Installments

Table 28: Survey Data - Timing Preferences for Installment Payments by Income Level

Income Level	1 year	1 year (in %)	6 months	6 months (in %)	Monthly	Monthly (in %)	Never prepared to buy	Never prepared to buy (in %)	Total
1. Less than Rs 6 Lakhs			2	100.00%					2
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs	1	11.11%	2	22.22%	3	33.33%	3	33.33%	9
3. More than Rs 18 Lakhs	1	9.09%			6	54.55%	4	36.36%	11
Grand Total	2	9.09%	4	18.18%	9	40.91%	7	31.82%	22

A significant 41% of respondents preferred paying in monthly installments, while 18% favored biannual payments, and 9% opted for yearly payments. The remaining respondents, who were not prepared to buy an induction stove, did not provide an answer regarding payment preferences.

7.6.6.Intention to Switch to Induction Stoves (immediately & future) Based on the Condition of LPG Stoves

Immediate Transition Readiness to Induction Stove

Table 29: Survey Data - Immediate Transition Readiness to Induction Stove by Income Level

Income Level	Responses to "Would you switch immediately to full-induction cooking?"	No. of households	Income wise %	Total %
1	No	2	100%	9.09%
2	Yes	2	22.22%	9.09%
	No	4	44.44%	18.18%
	If electricity charges are reduced, I will use an induction stove extensively	1	11.11%	4.55%
	Unsure	1	11.11%	4.55%
	I will continue to stack	1	11.11%	4.55%
		9	100%	
3	Yes	2	18.18%	9.09%
	No	3	27.27%	13.64%
	No, I find it too complicated to use.	1	9.09%	4.55%
	I will continue to stack	3	27.27%	13.64%
	No mood to change	1	9.09%	4.55%
	Why not?	1	9.09%	4.55%
		11	100%	
Grand Total		22		1

Overall, 18% of respondents indicated an immediate readiness to switch to induction cooking, while 41% were not ready at all. Among those ready to switch, 9% were from Level 2 income and 9% from Level 3, with no respondents from Level 1 expressing immediate readiness.

Among the 41% resistant to switching, 9% were from Level 1 (representing 100% of Level 1 respondents), 18% from Level 2, and 14% from Level 3.

Additionally, 24.75% of respondents indicated that they would consider stacking both LPG and induction stoves simultaneously. One respondent expressed a strong willingness to switch immediately if electricity prices were reduced, while another strongly opposed switching due to the perceived complications of using an induction stove.

The remaining respondents were unsure and lacked confidence in their decision.

Future Transition Readiness to Induction Stoves

Table 30: Survey Data - Future Transition Readiness to Induction Stoves by Income Level

Income Level	Responses to "Would you switch to full-induction cooking in the future?"	No. of households	Income wise %	Total %
1	No	2	100%	9.09%
2	Yes	3	33.33%	13.64%
	No	2	22.22%	9.09%
	Unsure	2	22.22%	9.09%
	I will continue to stack	1	11.11%	4.55%
	Maybe	1	11.11%	4.55%
		9	100%	
3	Yes	1	9.09%	4.55%
	No	2	18.18%	9.09%
	In absence of gas, we may consider	1	9.09%	4.55%
	Unsure	2	18.18%	9.09%
	I will continue to stack	2	18.18%	9.09%
	Maybe	2	18.18%	9.09%
	Not applicable	1	9.09%	4.55%
		11	100%	
		22		100%

If not immediately, when respondents were asked if they would be willing to consider the shift to 100% induction use in the future, 18.19% indicated an immediate readiness—almost the same rate as in the previous questionnaire when asked about transitioning immediately.

Level 1 respondents remained firm in their decision not to consider switching at all. Level 2 had the highest percentage, with 33.33% ready to consider the shift in the future, an increase from their immediate readiness in the previous questionnaire. However, Level 3 respondents showed only 9.09% willingness to switch in the future, a decrease from their immediate readiness.

Overall, 27.27% of respondents expressed no interest in switching, even in the future. While all Level 1 respondents remained opposed to switching (consistent with their immediate decision in the previous questionnaire), 9.09% each from Levels 2 and 3 were against future switching, a decrease from their immediate readiness.

Additionally, 13.64% of respondents indicated they would consider using both LPG and induction stoves simultaneously, a reduction from the immediate readiness in the previous questionnaire. One respondent mentioned they might consider switching if gas-based cooking were completely abolished, while others were generally unsure about their decision.

7.7. Category 7: Views on environmental impacts and health issues related to LPG

7.7.1.Environmental considerations

Table 31: Survey Data - Environmental Considerations for Induction Stove Adoption by Income Level

Income Level	Very Important	in %	Important	in %	Neutral	in %	Not Important	in %	Not at all Important	in %	Total
1	0	0.00%	2	9.09%	0	0.00%	0	0.00%	0	0.00%	2
2	6	27.27%	2	9.09%	1	4.55%	0	0.00%	0	0.00%	9
3	6	27.27%	1	4.55%	3	13.64%	0	0.00%	1	4.55%	11
Grand	12	54.55%	5	22.73%	4	18.18%	0	0.00%	1	4.55%	22

Respondents expressed a range of opinions on the importance of reducing their household's environmental impact. A majority, 55%, considered it very important, 23% deemed it important, 18% were neutral, and 4.6% considered it not important at all.

Among those who found it very important, 27% were from Level 2 and 27% from Level 3. Level 1 households generally considered it important, but not very important. Only one household in Level 3 considered it not important at all, making up the 4.6%.

7.7.2. Health Considerations

Table 32: Survey Data - Health Considerations for Induction Stove Adoption by Income Level

Level of Income	No	in %	Yes	in %	Total
1. Less than Rs 6 Lakhs	1	50.00%	1	50.00%	2
2. More than Rs 6 Lakhs and less than Rs 18 Lakhs	7	77.78%	2	22.22%	9
3. More than Rs 18 Lakhs	10	90.91%	1	9.09%	11
Grand Total	18	81.82%	4	18.18%	22

Overall, 82% of respondents were unaware that LPG can cause severe respiratory issues, and only 18% knew about this risk.

When broken down by income level, awareness was highest in Level 1, where 50% of households (1 household) were aware of the risks. In contrast, awareness dropped to 22.22% in Level 2 and just 9% in Level 3.

None of the households reported experiencing respiratory issues or asthma due to LPG use. The only health concerns mentioned were eye irritation and heat, which were reported by a single household.

8. Other Benefits of the Survey:

Benefits that arise as a result of undertaking this survey:

- The inclusion of a realistic model and cost details likely heightened awareness and encouraged some households to consider transitioning to induction cooking more seriously.
- The survey has served as a tool for sensitization, fostering thoughtful consideration and awareness among the 22 participating households.
- It enabled them to reflect on various factors before deciding whether to transition immediately or in the future, as assessed at the end of the questionnaire.
- Majority of the participants also provided additional feedback on their perceptions of the change, even though it was only an optional part of the survey. These were incorporated within the key study findings section.
- As awareness grows and pilot initiatives are implemented, there is potential for increased sensitivity to this transition among households, though other technical challenges will need to be addressed.

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