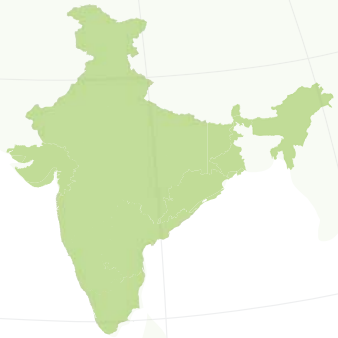
WWF

REPORT

IND

2015



People's Perception Study

Renewable Energy in India 2014

Published by WWF-India

Acknowledgments

WWF-India is extremely grateful to all the respondents who have provided useful inputs during the course of the survey. WWF-India expresses its gratitude and acknowledges the effort put in by several team members and individuals in the production of this report. The efforts put in by the communications team are also appreciated. Special thanks are due to Mr Rafael Senga from WWF International for his valuable feedback. The support by WWF- Sweden is thankfully acknowledged.

Project Team

WWF-India: Jincy Joy, Divya Joy, T.S. Panwar

Disclaimer

This report has been prepared by WWF-India with inputs and literature based on publicly available information and responses received during the survey from different organizations/ individuals. WWF-India disclaims any and all liability for the use that may be made of the information contained in this report. Further, the views in the document do not necessarily reflect those of WWF-Sweden.

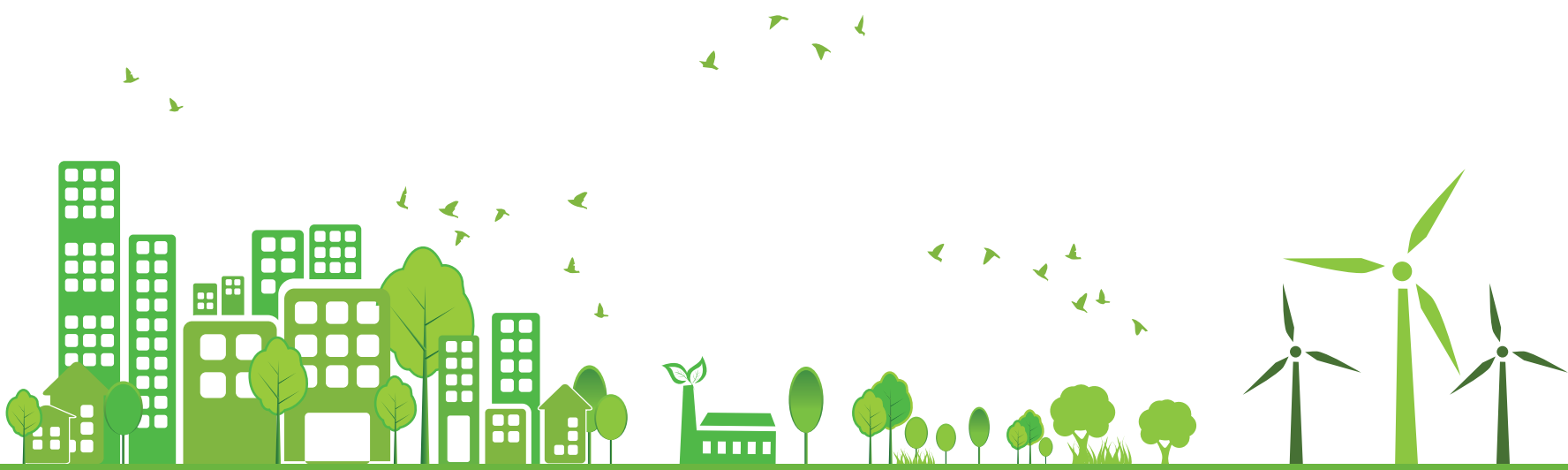
PEOPLE'S PERCEPTION STUDY

Renewable Energy in India 2014

Table of Contents

Chapter 1

INTRODUCTION



All the world's energy needs could be provided cleanly, sustainably and economically by the year 2050. Renewable energy is the way ahead.

Such a transition is not only possible but also cost-effective, providing energy that is affordable for all and producing it in ways that can be sustained by the global economy and the planet." (The Energy Report: 100% Renewable Energy by 2050)[1]

1.1 Introduction

Currently, climate change is recognized as a serious global environmental concern. 'Climate Change' as defined by the United Nations Framework Convention on Climate Change (UNFCCC), refers to a *"change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods"*.[2] Human induced (anthropogenic) changes, occur due to greenhouse gases (GHGs), emitted by various activities like deforestation, energy usage, changes in land use and vehicular usage.

Globally, there has been a marked increase in emission of carbon dioxide, methane and nitrous oxide since 1750 mainly due to anthropogenic activities. Emission of such harmful gases far exceeds the pre-industrial values, determined mainly from the ice cores spanning many thousands of years. The atmospheric concentration of carbon dioxide has increased globally from the pre-industrial value of about 280 ppm to 395.4 ppm in 2014.[3] This global increase in carbon dioxide is attributed primarily to use of fossil fuel and changes in land use.

Concerns about climatic change have been growing over the years. These have led countries around the world to adopt 'low carbon pathways', which reduce carbon emissions and thus contribute to reduce climate change. In recent years, India's emerging economic growth and rising energy consumption have led to increase in GHG emissions, which also makes India the fourth largest emitter of GHGs after China, USA and EU. However, India's emission intensity has been declining with 66.8 g of CO_2e per rupee of GDP in 1994 to 56.2 g of CO_2e per rupee of GDP in 2007. Further, in 2009, India announced reduction of emission intensity of its GDP by 20–25 per cent over the 2005 levels by 2020. Several other initiatives with respect to meeting this objective have also been undertaken in order to tackle climate change and reduce energy consumption without compromising the country's development agenda.

Studies have shown that India's energy sector has had a major share in the country's GHG emission profile. Emissions from the energy sector were 1,625.79 million tonnes of carbon dioxide equivalent (MTCDE) in 2010.[4] Emissions from the energy sector are attributed to two broad categories: fossil fuel combustion, and biomass and fugitive emissions.[5] Fossil fuel combustion emissions contribute to more than 90 per cent of the total emissions from the energy sector in India.

Renewable energy (RE) has been an important component of India's energy planning process for more than four decades. The importance of renewable energy sources in the transition to a sustainable energy base was recognized way back in the early 1970s. It started with the establishment of the Department of Non-Conventional Energy Sources in 1982, which later became the Ministry of Non-Conventional Energy Sources (MNES) in 1992, and subsequently renamed as the Ministry of New and Renewable Energy (MNRE) in 2006.

Over the years, there has been implementation of broad spectrum programmes harnessing renewable power and energy. In the rural areas, the focus was on use of renewable sources for lighting, cooking and motive power, while in urban areas, the emphasis was on industrial and commercial applications and development of alternate fuels and applications. Along with initiatives like The National Action Plan on Climate Change (NAPCC) (2008), the Twelfth Five Year Plan, the National Policy on Biofuels and Renewable Purchase Obligation (RPO), the government has formulated various schemes and programmes, to promote use of renewable energy sources in the country.

India is currently ranked fifth in the world with 15,691.4 MW grid-connected and 367.9 MW off-grid renewable energy based power capacity. India is one of the most developed renewable energy markets in South Asia, with annual revenues of about USD 185 billion. According to the latest Ernst & Young report, India is among the top seven countries in the world in terms of the renewable energy attractiveness index.[6] Several estimates have shown that India has a high potential of generating renewable energy from various sources like solar, biomass, wind, small hydro and bagasse based cogeneration, etc. As on 31 May 2014, the total grid interactive power capacity sourced by renewables was 31,833 MW (see Table 1.1). This includes wind with a capacity of 21,262 MW, solar (2,647 MW), small hydropower (SHP) (3,803 MW), biomass power & gasification potential (1,365 MW), bagasse cogeneration (2,648 MW) and waste to power (106 MW).[7]

An effective and planned utilization of the available RE potential can thus pave the way for a sustainable growth of renewable energy in the country. India has the vision, potential and policies to scale up the use of renewable energy sources. India is fast embracing renewable energy and has made substantial progress in increasing the share of RE in the country. Most importantly, there is an increase in public awareness about clean energy and an eagerness to adopt a green lifestyle. With vox pop playing a crucial role in almost every facet of the society, it has become very important to reach out to more and more people for adopting renewable energy sources, to discuss its larger benefits, and explain to them the difference that renewables can make in reducing environmental hazards in the world.

TABLE 1.1:Renewable Energy Capacity in the Country as on 31 May 2014[8]

Sector	Target		Achievements during the Year (up to March 2013)		Cumulative Achievements	
	2013-14	2014-15	2013–14 (% of Target)	2014–15 (% of Target)	(as on 31 May 2013)	(as on 31 May 2014)
I. Grid-Interactive Power (Capacities in MW)						
Wind Power	2,500.00	2,000.00	264.10 (10.56)	130.15 (6.51)	19,317.05	21,262.23
Small Hydropower	300.00	250.00	39.00 (13.0)	- (-)	3,671.25	3,803.65
Biomass Power & Gasification	105.00	100.00	- (-)	- (-)	1,264.80	1,365.20
Bagasse Cogeneration	300.00	300.00	- (-)	- (-)	2,337.43	2,648.35
Waste to Power	20.00	20.00	- (-)	- (-)	96.08	106.58
Solar Power	1,100.00	1,100.00	73.00 (-)	- (-)	1,759.44	2,647.00
TOTAL	**4,325.00**	**3,770.00**	**376.10 (8.7)**	**130.15 (3.45)**	**28,446.05**	**31,833.01**
II. Off-Grid/ Captive Power (Capacities in MW_{eq})						
Waste to Energy	10.00	10.00	- (-)	- (-)	115.57	132.73
Biomass (non-bagasse) Cogeneration	80.00	80.00	2.8 (3.5)	- (-)	473.95	531.82
Biomass Gasifiers						
- Rural	1.00	0.80	- (-)	- (-)	16.79	17.48
- Industrial	9.00	8.00	0.5 (5.6)	- (-)	142.08	147.20
Aero-Genrators/Hybrid systems	1.00	0.05	- (-)	- (-)	2.11	2.25
SPV Systems	40.00	60.00	- (-)	- (-)	124.67	174.35
Water mills/micro hydel	2.00 (500 nos)	4.00 (500 nos)	- (-)	- (-)	10.65 (2,131 nos)	13.21 (2,643 nos)
Bio-gas based energy system	2.00	-	- (-)	- (-)	-	3.77
TOTAL	**143.00**	**158.85.00**	**3.30 (9.06)**	**- (-)**	**885.82**	**1,022.81**

1.2 Background to the Perception Study

The advent of renewables is very timely as more and more individuals are becoming curious and engaging in the increasing role of renewables in the country. What general masses know, think and talk about renewables is viewed as absolutely essential in determining the level of acceptability of renewable energy among Indian citizens.

Accordingly, WWF-India conducted a Renewable Energy Survey to understand people's perception on renewable energy and determine the level of acceptability among Indian citizens of the use of renewable energy sources. The survey deployed an online platform, targeting the general internet users. The respondents were targeted through bulk e-mailing and social media platforms. The duration of the survey was one month. The questionnaire consisted of a total of 28 simple questions, which were a combination of both open-ended and close-ended questions.

The total sample size of the survey is 901, with more than 50 per cent of the respondents falling in the age bracket of 22 to 32. There were also a substantial number of respondents in the age group of 32 to 42 years, followed by individuals under 21, and in the age group of 43 to 52 years. Most of the responses received were from the metros and other big cities of the country, with Delhi, Bangalore and Mumbai leading the bandwagon.

Along with individual's perception, it was felt essential to tap into the minds of RE manufacturers and understand the market dynamics. In order to complete the circle, a similar survey was designed for renewable energy manufacturers/suppliers/implementers. The total sample size is 48 in this case. While majority of them were manufacturers (28), the respondents also comprised project implementers, retailers/distributers and technology implementing NGOs. Most of the surveyed respondents promoted solar technologies (36) followed by biomass-based technologies, biogas technologies and wind energy technology. Some of the other products that they dealt with included biomass cookstoves and biogas upgradation.

The questionnaire consisted of a total of 14 simple questions, which were a combination of both open-ended and close-ended questions. The survey for manufacturers also deployed an online platform, targeting some of the key players in the RE market. These manufacturers were targeted through emails and telephonic interaction.

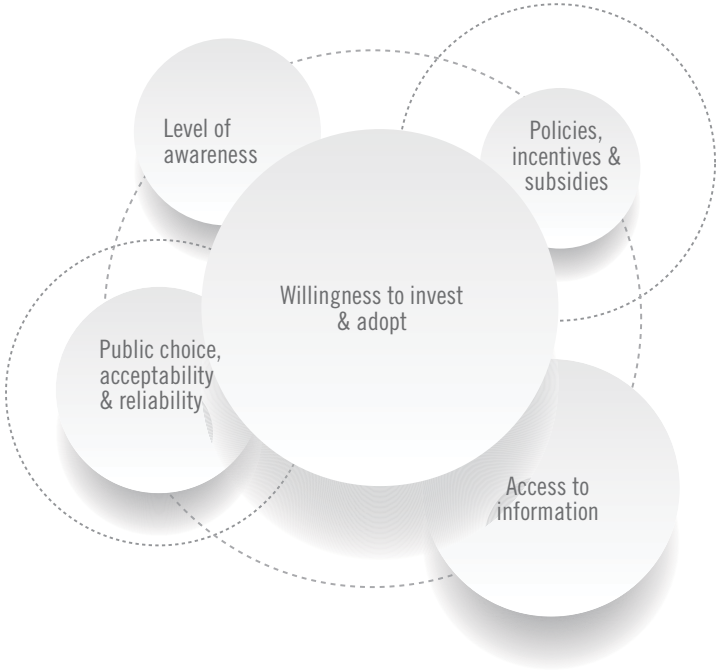
The most common target customers of RE products were found to be industries and institutes (educational, office complexes, hospitals), followed by government organizations and individual household users. The remaining section of target customers included residential society users/community and commercial user (shops, malls, market places).

These surveys dealt with various aspects such as policies and incentives available, awareness levels, knowledge platforms, existing technologies and products, cost/finance options, innovations on business models & technology, and the likely solutions. The surveys also attempt to assess some of the crucial components associated with renewable energy such as its acceptance, reliability, access to relevant information, existing knowledge gaps and other barriers related to finance and technology.

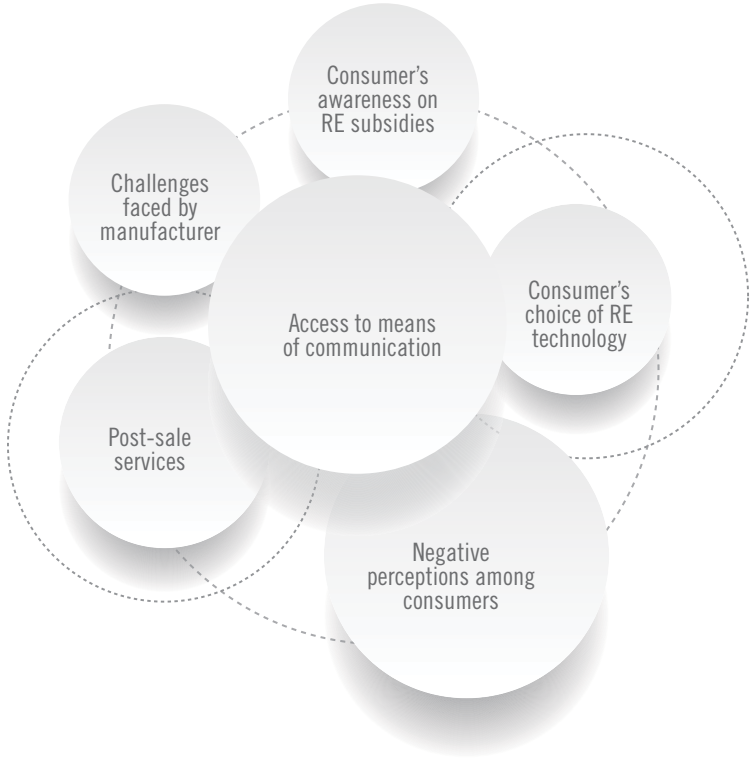
1.3 Themes of the Study

The broad themes that the study aims to explore are depicted in the chart below:

Individual's Survey



Manufacturer's Survey



Chapter 2

INDIVIDUAL'S PERCEPTION OF RENEWABLES IN INDIA

2.1 Individual's Awareness Level

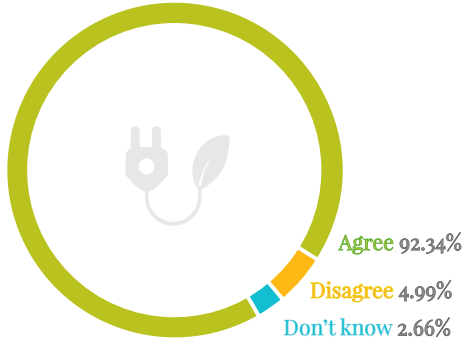
Research has shown that interest and support for renewables can be increased by informed dialogue and information sharing; also some assessments focusing on this idea have helped rank renewables (so as to estimate wide penetration/popularity of a specific technology).[9] Some studies have also shown that if people 'agree' on a specific technology, it means they have 'knowledge of how the potential for renewable energy can be utilized' which is crucial for its application.[10] Therefore, it is very important to determine the level of awareness on RE among the general public.

The survey questions to assess the awareness among Indian citizens about the potential of RE to replace use of fossil fuel show very positive response, with 92.34 per cent (832 respondents) agreeing to the proposition that RE will replace use of conventional fuel in the near future. This leads to the conclusion that 'Indian citizens have a positive outlook about the role that RE can play in the near future and its potential to gradually replace dependence on fossil fuel usage. Very few respondents disagreed (4.99 per cent or 45 respondents) to the proposition. This could be a result of sheer unawareness related to RE potential as well as scepticism about renewable energy. The 'don't know' option was used by 2.66 per cent or 24 respondents. They may be unaware or less aware of RE technologies usage due to lack of information sharing and dissemination.

Further analysis of the respondents (92.34 per cent) in the 'agree' category was done to estimate the perception about the *'time-frame'*

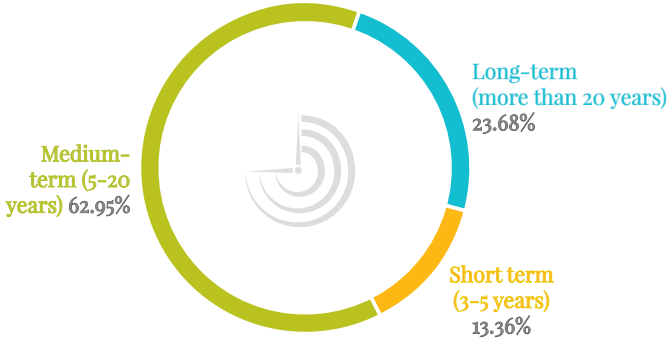
2.1.1 Awareness about the potential of renewables to replace use of fossil fuel

Q **Do you agree that the energy generated from renewable technologies can replace the use of conventional fuels (like oil/coal/gas etc.)**



Almost 92 per cent Indians feel that renewables can replace use of fossil fuel in the near future. Of this, 63 per cent think that such a transition can occur in the medium term, i.e., 5–20 years.

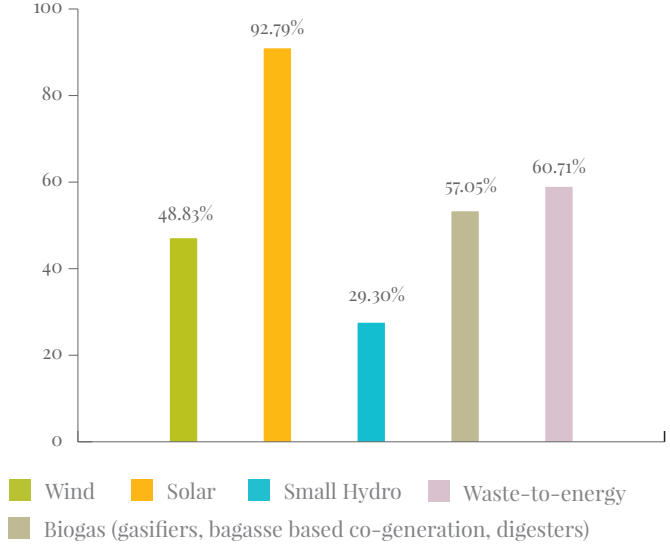
Q If you agree that renewable energy will replace conventional fuel, what is the likely time frame in which this can be achieved?



required for such a transformation. For this, the respondents were provided with three options: short-term (3–5 years), medium-term (5–20 years) and long-term (more than 20 years). *Medium-term received the maximum support of 62.95 per cent (537 respondents), which looks like a very realistic assumption on the part of the respondents, as policies and programmes on renewables will surely take some time to get implemented and regulated in order to have a wider penetration.* Of the respondents, 23.68 per cent (202 respondents) believe that it will take more than 20 years for RE to replace fossil fuels. It clearly shows that this section of the respondents understand that a wider adoption of RE is a long-term process. On the other hand, the 'short-term' category received a very low response (13.36 per cent or 114 respondents). This shows that there are people who can envision a fast transformation happening. This could also reflect the high rising motivation and expectation that people have from the government on the RE front.

2.1.2. Awareness on the current status of renewable energy technologies in India

Q Which renewable energy sources, according to you, has a high potential in India?



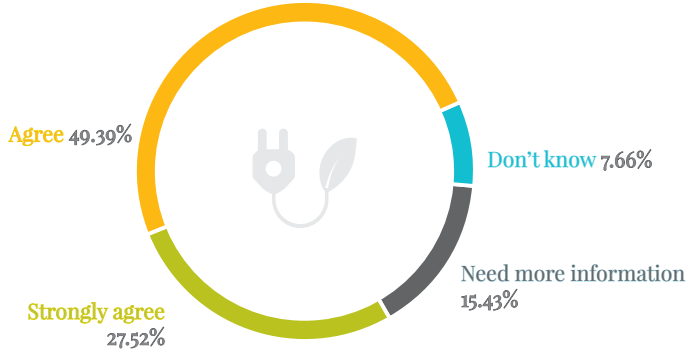
More than 92 per cent of the respondents are of the view that solar energy has a high potential in India. About 60 per cent of the total respondents think that waste-to-energy has a high potential, followed by biomass (~57 per cent of the total), wind (~49 per cent of the total) and small hydropower (~29 per cent of the total).

An important aspect to check the awareness of people on renewables is to test their understanding on the current scenario of RE technologies. With this objective in mind, the respondents were asked to choose from a set of RE sources which in their view has a 'higher potential in India'. This question tries to identify which specific RE source has a noticeable presence in people's mind and has been promoted by the government.

Out of the five most widely used sources – wind, solar, small hydro, biomass (gasifiers, bagasse based co-generation, digesters) and waste-to-energy – solar energy got the highest response. This awareness can be attributed to the coverage of the initiatives taken by the Indian government for solar energy policy and programme promotions in the media. Also waste-to-energy and biomass got a moderate response, followed by wind and small hydro. Therefore, 'solar energy' emerges as one of the most popular renewable energy options in India.

2.1.3 Perception on whether prices of renewables will reduce to a considerable level

Q **Do you think renewable energy will match the price of conventional energy and will eventually become cheaper?**



About 77 per cent of the respondents agree that prices of renewables will reduce to a considerable level and will eventually become cheaper than conventional energy.

To determine people's awareness of prices of renewables, the following question was put forward: 'Do you think renewable energy will match the price of conventional energy and will eventually become cheaper'?

- Almost half of the respondents, i.e., 49.39 per cent (445 respondents) 'agreed' with this assumption. This clearly shows that people have a positive inclination and understanding on RE investment.
- Of the respondents, 27.52 per cent (248 respondents) 'strongly agree' with the view that renewables will replace conventional fuel sources in the future. This clearly shows a positive inclination and a clear understanding on the part of the respondents about the long-term benefits and knowledge of RE investment. They are perhaps the set of people who have already invested/ready to invest in RE technology in the country.
- While a small number, i.e., 7.66 per cent (69 respondents) 'don't agree' with the question posed. This shows that some sections are still not convinced about investing in RE technology. Also, their understanding seems to be influenced by the perception that RE technology is expensive.
- The category of 'need more information', received 15.43 per cent or 139 responses. They do not have any idea about the cost of RE technology.

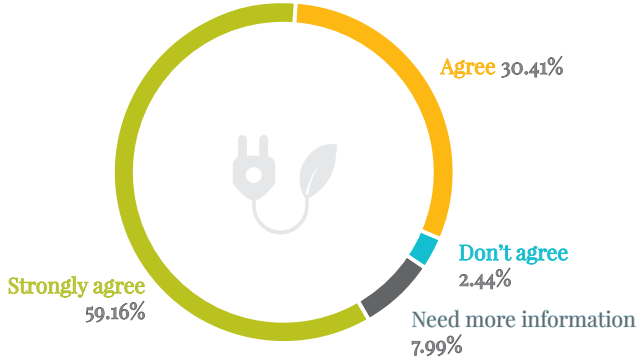
Apart from the options provided, a section was given in the questionnaire for any specific comments. The respondents were free to share their views on 'whether RE prices will match the price of fossil fuel'. This was an open-ended question where the respondents came up with suggestions and any other remarks that they wished to make.

A summary of the responses received are listed below:

- Information on RE should be made effective and should reach out to a larger audience.
- Awareness on this aspect should be a major focus of the government.
- Initial cost must be economical with options like EMIs which are available for larger investments.

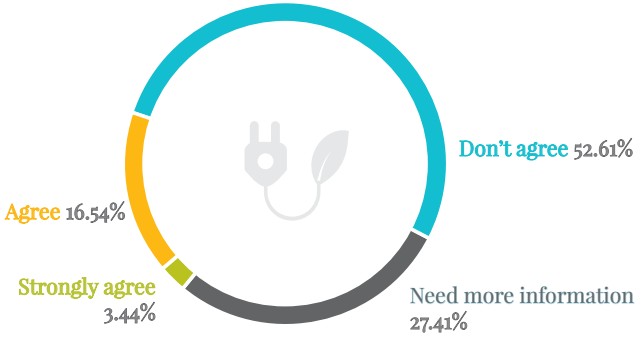
2.1.4 Awareness on the linkage between biodiversity and renewable energy technologies

Q **Compared to fossil fuel do you think renewable energy based technologies have much lesser impact on biodiversity and the environment?**



According to 53 per cent Indians, renewable energy based technologies do not have any harmful impact on the environment and biodiversity. Further, more than 90 per cent of the respondents believe that renewable energy has much lesser impact on biodiversity and the environment, as compared to fossil fuel based energy.

Q **Do you think renewable energy application also have harmful impact on biodiversity and the environment?**



In order to analyze people's perception on the linkage of renewable energy and biodiversity, two questions were put forward before the respondents. One aimed at analyzing people's perception on the plausible harmful effects of these technologies on biodiversity (conventional technologies v. RE technologies). The second, probed the popular belief regarding the harmful effects of RE applications on the environment and biodiversity.

Comparison between people's perception on non-renewable technologies/sources and renewable technologies impacting biodiversity showed that more than half of the respondents, 59.16 per cent (533 respondents), strongly agree that RE technologies have lesser impact on biodiversity. This set of respondents would have come across media articles/research findings that focus on the impact of RE technologies on biodiversity. Of the total, 30.41 per cent (274 respondents) of the respondents also agreed that RE technologies have lesser impact on biodiversity, but not as strongly as the previous set of respondents. This set could probably consist of people who have heard about the same in peer group and discussions revolving around this issue.

The option 'don't agree' that renewables have lesser impact on biodiversity' comprise 2.44 per cent (22 respondents) of the total respondents. They are either people who have some first-hand experience on the negative impacts of RE on biodiversity or are convinced of this perception. This could probably be attributed to existing information gap on this issue. People who 'need more information' on this issue comprised 7.99 per cent (72 respondents). This section probably consisted of mainly those people who have never come across this concept, and would need access to additional information in order to comment on this issue.

A summary of the comments received for this section are listed below:

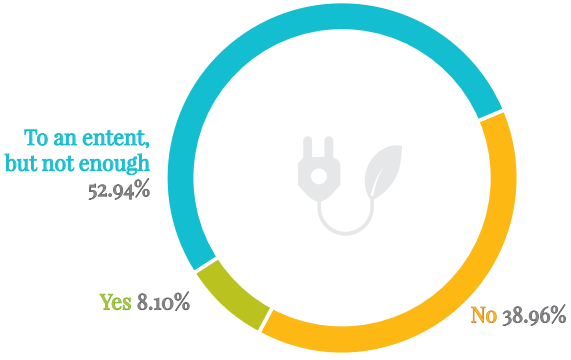
- Before installing a windmill/ solar plant, path taken by birds should be properly studied.
- There is need for research on the impact of renewables on biodiversity. The impact on the environment due to wind mills reducing air currents and huge solar plants reducing the energy transfer to the ground, and their corresponding effects on the environment has not been properly studies.
- Other non-renewable technologies that have a harmful effect on biodiversity should also be the focus of research groups, and results of such studies should also be shared with the public.

2.2. Policies, Incentives and Subsidies

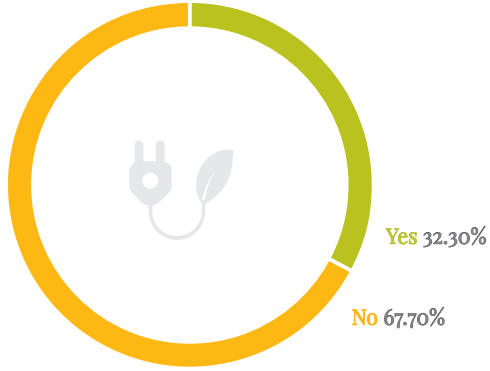
Studies have shown that citizens can be made more informed and educated about government initiatives by making such information readily accessible. This requires transparent functioning and accountable systems for the citizens.[11] Studies also show that government can foster a fact-based public debate on RE, if they provide all relevant information.[12] For the development of renewables in various countries, formulation of effective policies are considered to play an important role[13]

2.2.1 Awareness on plans and policies of the government on renewable energy

Q Do you think the government is taking initiatives to help you switch to renewables?



Q Do you know of any plans/policies of the central/state government in regard of renewable energy? If yes, please name a few.



In order to analyze people's perception of government policies and schemes for RE technologies, it was important to analyze three important aspects: first, whether or not people are actually aware of government's plans and policies on renewables; second, are they aware of or able to recall and name some of these schemes or policies; and third, are they aware of subsidies available for RE applications. It is seen that more than half of the respondents, 52.94 per cent (477 respondents) are of the view that there have been initiatives by the government, but believe that these initiatives are not enough to make the switch possible. This clearly highlights that *'there exists a huge gap between government-led initiatives and the actual beneficiaries'.*

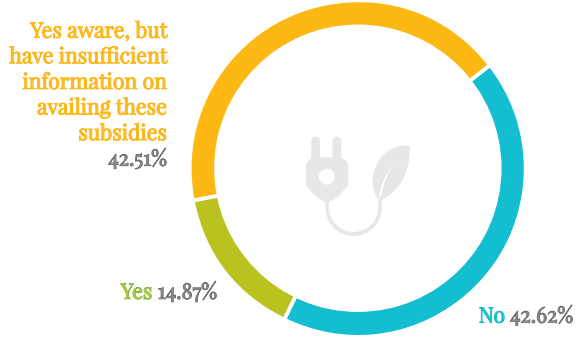
Of the total respondents, 38.96 per cent (351 respondents) have 'no knowledge of these initiatives at all'. This brings to light a very important fact that 'adoption of RE among common citizens is not taking place as should be the ideal case (considering the rate at which RE technology and its manufacturers and suppliers are increasing in the country). *Therefore, this calls for action on the part of the government with regard to effective 'dissemination of information' on subsidies/plans/policies that have individual/household-centric benefits.*

It's only a small percentage of 8.10 per cent (73 respondents) who are aware of RE initiatives and feel that the government has taken steps to help individuals shift to renewable energy. This highlights that there is awareness but only to the ones who want to opt for a particular technology and have ventured into availing subsidies or taking loans for RE products.

When asked further if they could name a few plan/policies by the central/state government, majority (67.70 per cent or 610 respondents) said 'no' they cannot name any such initiatives and 32.30 per cent (291 respondents) said 'yes' they could. Analysis of the policies/programmes respondents named shows that the Jawaharlal Nehru National Solar Mission (JNNSM) is the most popular choice among the respondents. Various state RE policies also featured in the list which included states like Gujarat (wind projects and solar park), Tamil Nadu (green home project), Karnataka (hydrothermal projects, road tax rebate on REVA cars), and Kerala's Agency for Non-conventional Energy and Rural Technology (ANERT). Subsidies on solar and biogas plants came through as a frequent response. Other responses included Solar Lantern Programme, National Biogas and Manure Management Programme (NBMMP), Solar Thermal Energy Demonstration Programme, Non-Conventional Energy Development Agency (NEDA) schemes, National Solar Mission, Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY), etc.

2.2.2 Awareness of subsidies on renewable energy

Q **Are you aware of government subsidies to purchase renewable energy applications?**



43 per cent Indians are aware of government subsidies on renewables, but admit to having insufficient information on availing these subsidies. Another 43 per cent citizens said that they have no information at all on existing subsidies on renewables.

Subsidies on solar water heater and solar lantern were most popular among individuals.

For an analysis of whether people have requisite information of government subsidies on RE applications, there is a perfect balance between 'yes aware but have insufficient information on availing these subsidies' (42.5 per cent or 383 respondents) and 'no' (42.62 per cent or 384 respondents). This proves that 84.13 per cent of potential users of RE applications still require correct, usable and consumer-friendly information on government subsidies. Only 14.8 per cent of the respondents (134 respondents) were aware of the subsidies available and understood the nitty-gritty of availing such subsidies. This group included existing RE users and well-informed individuals. This low percentage also highlights the fact that there is a lot more that needs to be done in terms of easy and accessible information transfer.

Additional comments on government subsidies included:

- Government subsidy through NABARD, on solar heating, solar lanterns, solar PV in Kerala and Delhi
- Lack of easily available information – no public information
- Some respondents are under the impression that there are no government subsidies for individuals; subsidies are only available for implementing firms.

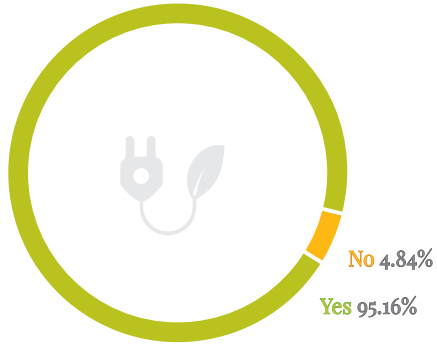
On being asked if they would like to suggest specific support policies/measures on RE that the government should initiate, a general sense of "not enough is being done" was expressed. This means that either individuals are not informed of the various government policies and initiatives or there is not enough dissemination of relevant information on RE technologies. A substantial number of respondents were aware of the programmes at a very peripheral level (most respondents said they do not remember the actual names, but have some information about subsidy policies from hearsay).This clearly suggest that there is a need for providing more information to the people on government RE initiatives. In addition, there is a need for information decoding for better acceptability of RE policies.

2.3. Willingness to Invest In and Adopt Renewable Energy Technologies

2.3.1 Willingness to adopt renewable energy technologies

Studies show that decisions taken emotionally are stronger than fact and knowledge based decisions[14]

Q **If you haven't used any renewable energy application as yet, do you plan to use it in future?**

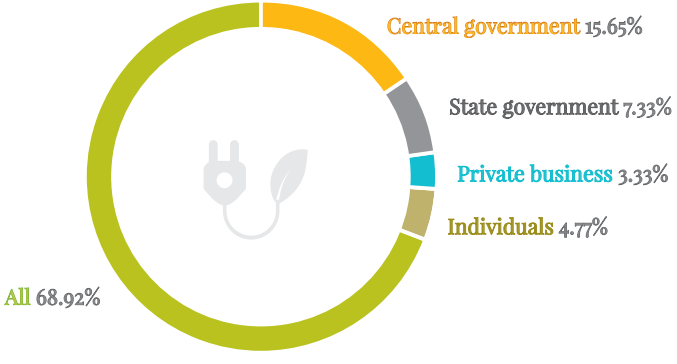


More than 95 per cent of the current non-users of renewables are willing to adopt RE technology and use it in the near future.

In order to analyze this aspect, non-users of RE technologies were targeted and were asked to respond whether or not they plan to use it in the near future. A remarkable 95.16 per cent of the respondents (727 respondents) gave their support to this aspect. This shows that people have a positive outlook towards RE adoption. However, what is required at present is to transcend this positive outlook into positive action for which, information on these technologies and plans/ policies/programmes have to be made readily available to them.

2.3.2 Willingness to take the lead in renewable energy adoption

Q To increase the use of renewable energy, who do you think should take the lead in facilitating action on renewable energy adoption?



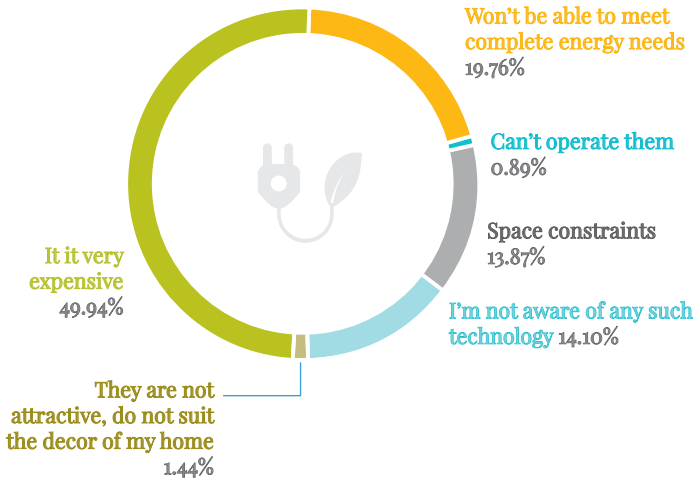
Nearly 69 per cent of the respondents feel that central government, state governments, private businesses and individuals – all together – must take the lead action in RE adoption.

Analyzing the willingness aspect further, another question was put forward to the respondents on who, they think, should take the lead in facilitating action on RE adoption. The options include central government, state government, private business, individuals or 'all', which is a combination of the above.

Instead of placing the responsibility on one group, majority of the respondents, 68.92 per cent (621 respondents), supported the 'all' option. This leads to the fact that a transition to renewables can only be possible with a collective and shared responsibility of all important stakeholder, viz., the central and state governments, private businesses and the individual. Most respondents feel that a wider adoption of RE is possible only through consolidated efforts. The central government was preferred to be the second choice to be the change agent and lead the action in making the transition possible, with 15.65 per cent respondents (141 respondents) voicing their opinion. This shows that the government through its plans/policies/subsidy initiatives can act as an effective catalyst in the adoption of renewable energy among individuals/households.

2.3.3 Barriers towards the adoption of renewable energy technologies

Q If you don't plan to install a renewable energy technology in your home, which of the following reason applies?



While 50 per cent of the respondents think that renewables are expensive, 20 per cent feel that renewables will not be able to meet their overall energy demands.

In order to analyze the barriers towards adoption of RE technologies, the respondents were asked a simple question on what are the most common reasons for a non-user to not install an RE product. Based on the most commonly observed reasons, multiple options were provided to the respondents. Of the seven reasons listed in the question, a high share of the respondents, 49.94 per cent or 450 respondents, were of the opinion that 'renewables are expensive'. Some other percentages are as follows:

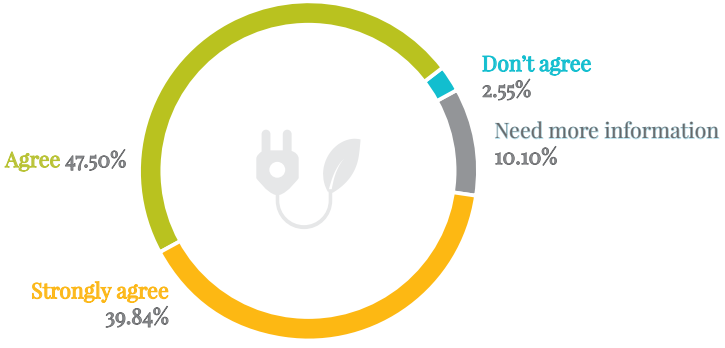
- 19.76 per cent (178 respondents) think that 'RE will not be able to meet the complete energy need'
- 14.10 per cent (127 respondents) said that they are not aware of such technologies.
- A fair number of people, 13.87 per cent (125 respondents), consider space as a constraint for RE adoption at the household level.
- Some respondents also feel that these technologies are not attractive (1.44 per cent or 13 respondents), and few also admitted to not knowing how to operate them (0.89 per cent).

Other reasons for not planning to install an RE technology at home, as cited by the respondents are:

- No proper incentives from the government
- Infrastructure constraints
- No easy availability of the technology at the market
- Individuals are not convinced enough to make the switch
- Restricted accessibility to such products
- High maintenance cost
- Rented accommodations. So, it is beyond the individual's control to install such applications.

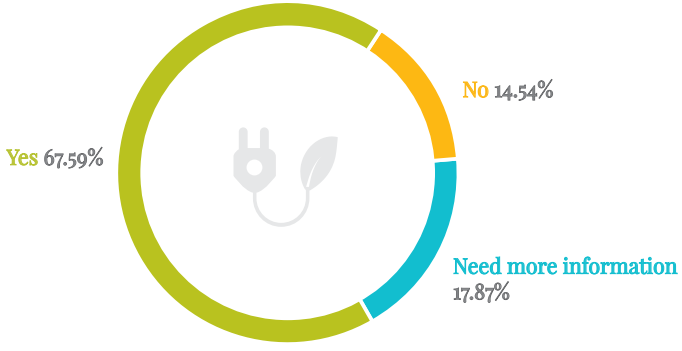
2.3.4 Willingness to invest in renewable energy technologies

Q Do you think investing in renewable energy is financially sustainable in the long run?



About 87 per cent of the respondents think that investing in renewable energy is financially sustainable in the long run. At the same time, close to 68 per cent consider the high initial cost of RE technology a barrier to their willingness to invest in renewables.

Q Is higher initial cost a barrier to your willingness to invest in renewable energy technologies?



To further assess the motivation level among people to invest in RE technologies, they were asked to share their opinion on whether or not investment in renewables would be financially sustainable in the long run.

A majority of the respondents had a positive support for investment which is seen by the responses received for the choice of 'strongly agree' (39.84 per cent or 359 respondents) and agree (47.50 per cent or 428 respondents). This helps us infer that these groups of people understand the long-term benefits of switching to RE and are already paying or would like to pay the stipulated cost of such a transition. In addition, these respondents are the ones who have a positive inclination and understanding of investment in renewables.

People who 'need more information' constitute about 10.10 per cent (91 respondents), which is the share of people seeking more information on 'RE investment' and is the reason why they couldn't choose other options.

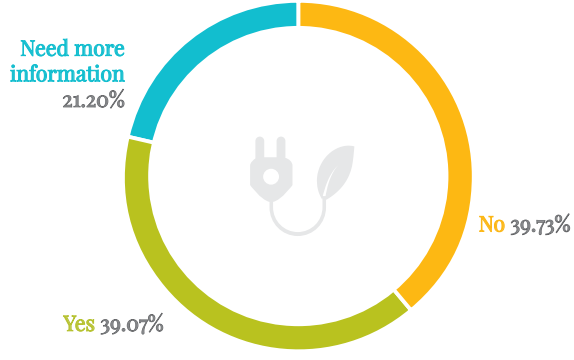
Only a small number of people 2.55 per cent (23 respondents) who opted for 'don't think RE investment is sustainable', which could perhaps be the result of existing information gap, understanding and the common perception that renewable energy is expensive.

Higher initial cost of RE technology was also assessed as an altogether different component in understanding the barriers to invest in renewables. A significant majority consisting of 67.59 per cent of the respondents think that the initial investment is a huge barrier for them, and probably lack an understanding of the long-term sustainability benefits associated with renewables. This perception therefore hinders their plans, if any, to invest in renewables. This category of 67.59 per cent is also supported by people who 'need more information', i.e., 17.87 per cent, which shows that they still have an unclear mindset on higher initial cost and sustainable benefits associated with RE technologies. Additionally, only 14.54 per cent (131 respondents) have a clear understanding of the long-term benefits associated with RE investment and believe that higher initial cost is not a barrier to adopt RE technologies.

2.4. Access to Information

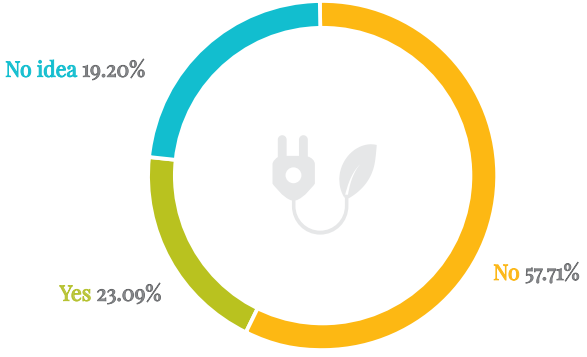
2.4.1 Access to information on renewable energy initiatives and programmes

Q **Do you know about platforms (like websites, magazines, etc.) where you can read and understand more about renewable energy status in India?**



About 40 per cent of the respondents are not aware of appropriate platforms to access information on RE-related initiatives and programmes. Further, nearly 77 per cent of the respondents think that their local media do not cover news related to policies, initiatives and programmes on renewables.

Q **Does your local media cover news on renewable energy policies, programmes, products, innovations etc., by governments, NGOs, agencies in your city?**



Statistical analysis shows that there is a balance between people who have access to information on RE technologies (39.07 per cent or 352 respondents) and those who do not (39.73 per cent or 358 respondents). Thus, 39.07 per cent of the respondents are interested in learning more on renewables, while the remaining 39.73 per cent are not aware of platforms where they can get more information about renewables. The latter ones are those who know very little on the subject. Further, the category of people who opted for 'need more information', 21.20 per cent (191 respondents), are those who know about renewables but do not know the right platforms to read more on it. *The analysis hints at the compelling need for effective dissemination of information by government/NGOs and other related organizations on renewables through proper communication mediums like magazines, websites, editorials, etc.*

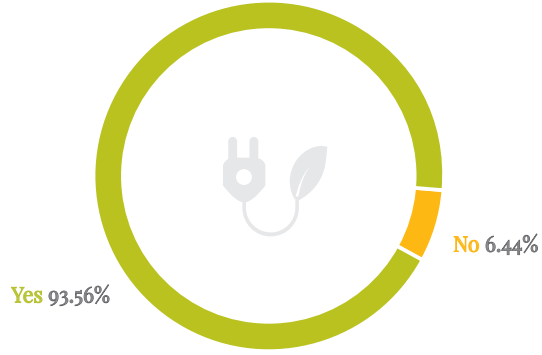
More than half of the respondents, 57.71 per cent (520 respondents), were of the view that their local media did not cover news on RE policies, programmes, products, innovations, etc., initiated by the government, NGOs and other agencies. This shows that *there is a huge target audience who are keen on getting information on RE related activities and initiatives.* There is also a category of people, around 19.20 per cent (173 respondents), who have 'no idea' on the local RE initiatives. Based on this study, one can infer that *if information is made available to people at the local level, there is a scope for making 76.91 per cent of the respondents more aware and positively inclined towards renewables.* Only 23.09 per cent of the respondents (208 respondents) had information on renewables which could either be a result of their future plans to purchase RE products.

2.4.2 Access to information on renewable energy outlets and vendors

Q Do you know of outlets where you can purchase renewable energy equipments you need?

Almost 66 per cent Indians did not know of outlets to purchase their choice of RE application. And, 94 per cent Indians want the information on RE vendors to be readily available, in an easy to access medium, such as in newspapers.

Q Do you want a list or renewable energy vendors to be made readily available (such as in newspapers)?



After analyzing access to information on renewable energy and programmes among Indians, it seemed very important to know *'whether individuals are aware of channels where RE products could be purchased'.* Of the total individuals surveyed, a high percentage of people, i.e., 66.37 per cent did not know of outlets from where they could purchase RE equipment, which shows that a huge number of people still do not have knowledge of and access to technology providers. Only 33.63 per cent of the respondents knew of avenues to purchase RE products.

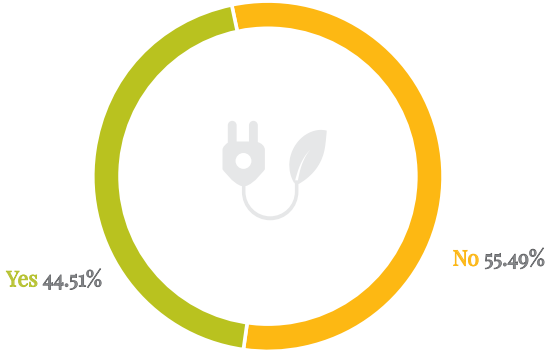
Also, in continuation to this, individuals were asked if they would like a list of renewable energy vendors to be made readily available to them (such as in newspapers, etc.), on which *93.56 per cent responded*

'yes'. This clearly shows that a wide adoption of RE applications is possible if the needed information is provided to them through the most accessible medium, such as newspaper, magazines, etc.

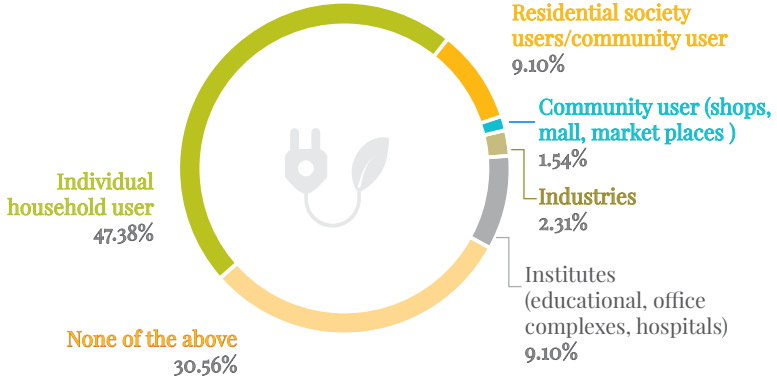
2.5. Public Choice, Acceptability and Reliability

2.5.1 Public choice of renewables

Q Do you use any renewable energy application(s)?



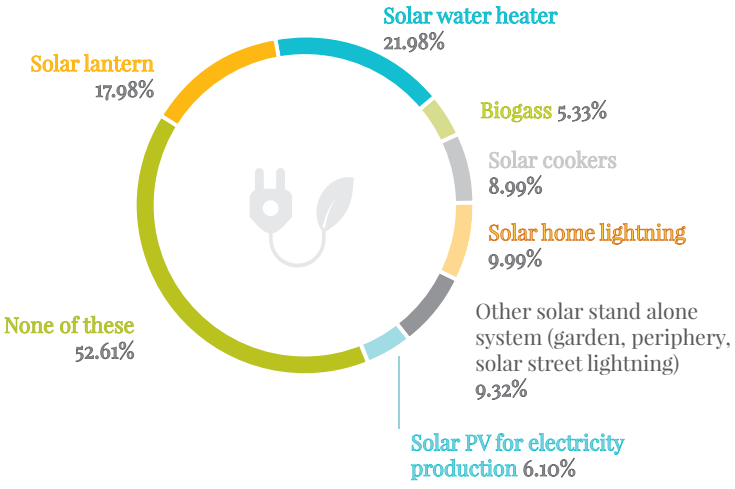
Q If yes, in which category will you put yourself as a renewable energy user?



45 per cent of the total target audiences use some or the other renewable energy appliance, while 55 per cent of them do not use any renewable energy product.

Water heater is the most commonly used RE product, with 46 per cent of the users of RE technologies (and about 22 per cent of the total respondents) using a solar water heater. This is followed by solar lantern (38 per cent of the users and about 18 per cent of the total respondents) and solar home lighting system (21 per cent of users and 10 per cent of the total respondents).

Q Which renewable energy application do you use?



In order to determine the acceptability of RE applications among the respondents, it is important to know how many respondents directly/ indirectly use renewable energy. Analysis showed that 55.49 per cent (500 respondents) do not use RE applications, while 44.51 per cent (401 respondents) use RE applications. Further analysis of the users of RE applications (i.e., referring to 44.51 per cent respondents) showed that majority of them are individual household users (47.38 per cent). There is an equal share among residential society/community user and institutes (educational, office complexes, hospitals, etc.) of 9.10 per cent each and only a small percentage of users fall under the industries and commercial user category (shops, malls, market places, etc.), 2.31 per cent and 1.54 per cent respectively.

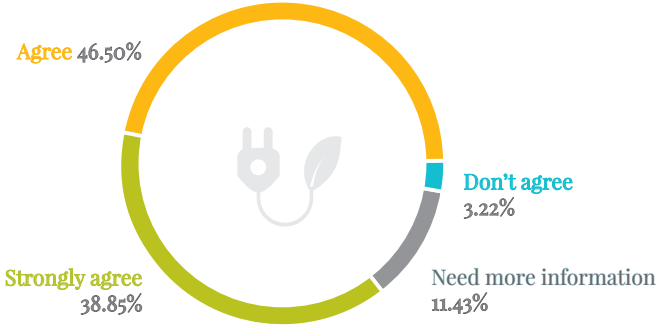
To understand RE technology with the highest penetration among users, an assessment of actual usage of the same was done amongst the respondents. Of them 'solar water heater' had the highest applicability (21.98 per cent or 198 respondents), followed by 'solar lantern' (17.98 per cent or 162 respondents). Also, 9.90 per cent people use solar home lighting system, 9.32 per cent use other solar stand-alone systems (garden lighting, periphery lighting, solar street lighting, etc.), 8.99 per cent use solar cookers and 6.10 per cent use solar photovoltaic for electricity production. Biogas based technology was used by 5.33 per cent of the respondents.

Apart from the ones listed above, other RE applications that are used by individuals include:

- Solar fencing
- Solar mobile chargers
- Solar battery chargers
- Kitchen waste composting
- Solar pump
- Solar flashlights
- Wind turbine

2.5.2 Public acceptability of renewables

Q **Do you think it is possible for you to shift to renewable energy at the household level to meet the energy demand partially or completely?**



Around 85 per cent of the respondents feel that it is possible to shift to renewable energy at the household level to meet their energy demand through renewables partially or completely.

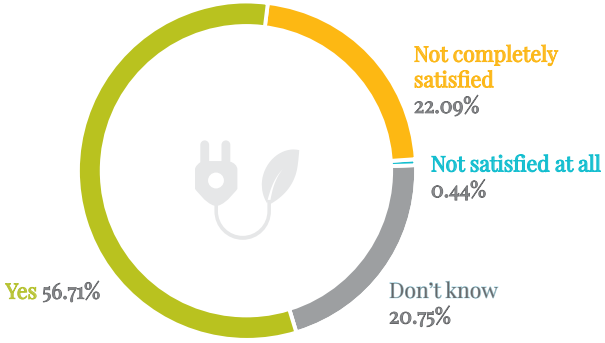
In order to assess the possibility of shift to renewables at the household level, an analysis of a common perception was done, i.e., *'a shift to renewable energy cannot meet household energy demand partially or completely'*. Acceptability by far depends largely on how well people perceive the potential of renewables. People's perception on whether shifting to renewables can meet their energy demand partially or completely was assessed. This is based on the premise that acceptability of renewables can be made possible only when people believe in its potential to meet their energy demand.

A majority of the respondents opted for,'they agree that RE can meet their household energy demand partially or completely'. This shows that 46.50 per cent (419 respondents) of the respondents support the idea of shifting to renewables and are convinced of its potential. This group of people are more likely to take action on implementing the same if more information on renewables is provided to them. Other groups of people in this categories include:

- 38.85 per cent of the respondents *strongly agree* with the view. This comprises people who are well informed on making the shift to renewables at the household level and have a good access to information on technologies, vendors, subsidies and other needful information.
- A small number of respondents, i.e., 3.22 per cent (29 respondents), 'don't agree' that RE can meet their household demand even partially. This shows that this category of people do not believe in the potential of RE and do not deem it fit to be used at the household level.
- While 11.43 per cent (103 respondents) said they 'need more information' for assessing the potential of RE to meet their energy demand partially or completely. This means that a significant section of people do not have the relevant and required information to make the shift to renewables.

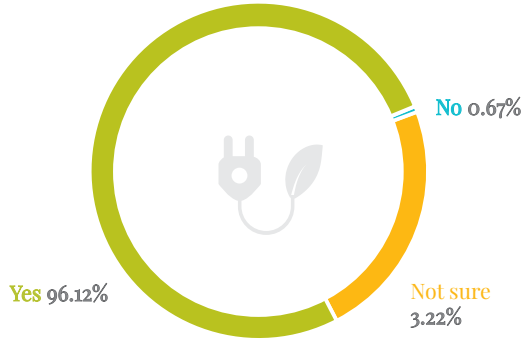
2.5.3 Public reliability on renewables

Q Do you think renewable energy technologies are reliable?



About 57 per cent of people find renewable energy reliable. More than 96 per cent of people believe that renewable energy shift can contribute to a greener lifestyle.

Q Do you think that a shift to renewable energy can contribute to a greener lifestyle?



The component of reliability was evaluated by analyzing actual experiences that people had after making a shift to RE technologies. This included evaluation of components like problems faced by users after purchasing RE applications, issues related to operation and maintenance, availability of post-sale servicing, etc.

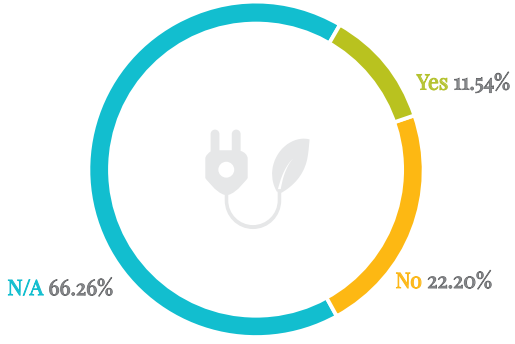
Reliability of RE technologies, as perceived by the general audience, was assessed. It was found that a majority of the people 56.71 per cent (511 respondents) responded in affirmative. This section of respondents can possibly comprise prospective buyers of RE technology in India. 20.75 per cent of the users were 'not completely satisfied' with RE applications, thus showing that there is a group of

people who do not find RE technology reliable due to their previous experiences. Only 0.44 per cent of the respondents said they are not satisfied at all with RE technology. In addition, 20.75 per cent of the respondents said that they are not in a position to assess the reliability of RE technology as they do not know anything about the technology. This means that either they do not have any first-hand experience in using RE applications or they have absolutely no information on the subject.

In order to evaluate how people foresee the role of renewables in the near future, it is seen that an overwhelmingly large number of people, i.e., 96.12 per cent (866 of the total 901 respondents), are of the view that a shift to renewable energy can contribute to a greener lifestyle. These are people who understand the long-term benefits of shifting to renewables.

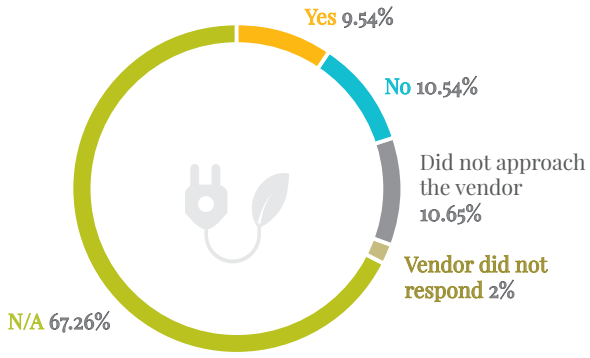
2.5.4 Post-purchase problems faced by people using renewable energy products

Q **Did you face any problems after purchasing a renewable energy product? If yes, please elaborate on the problem faced.**



About 66 per cent of RE users did not face any problems after purchasing an RE product. Of the ones who faced such problems, nearly 33 per cent of the users were not provided with post-sale services and nearly 32 per cent of them did not even approach the vendor. Only about 29 per cent of the users were provided with maintenance services.

Q Were you provided with maintenance service by your vendor?



Providing maintenance service is very crucial as it plays an important role in customer satisfaction, thus enhancing reliability of the products. *About 67 per cent of the respondents answered in N/A category.* Of the total people who had adopted RE technology and were applicable respondents (295 of 901 respondents), only 29.15 per cent of the people were provided with maintenance services by their vendors while a majority, i.e., 32.54 per cent (95 respondents) said they were not provided maintenance services by their vendors. On the other hand, 32.5 per cent of the target respondents did not even approach the vendor. Possibly, once the default was noted, the customer presumed that the product was unreliable and therefore thought it would not be a judicious decision to get back to the vendor. Out of the total users, only a few said that 'vendor did not respond', i.e., 2 per cent (18 respondents), which shows that the majority of vendors do offer maintenance service after the purchase of RE products.

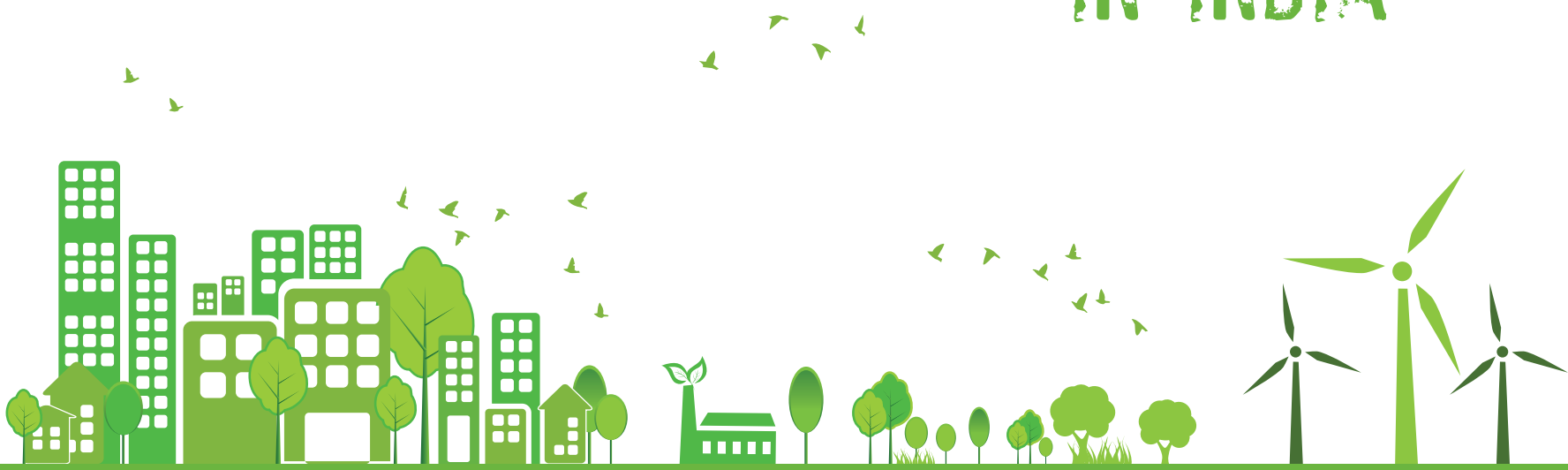
Analysis of problems faced by people after purchasing an RE application showed that a majority of the respondents, i.e., 22.20 per cent (200 respondents), did not face any problem, while 11.54 per cent people (104 respondents) faced problems of maintenance. *About 66 per cent of the respondents answered in N/A category.* This means that out of the 304 applicable respondents to this question, 34 per cent of the actual users faced post-purchase problems and 66 per cent of them did not face any problem. Performance issues have thus been identified which need to be rectified as soon as possible. This would help curb development of any plausible wrong perception on the reliability of RE technology.

Specific problems faced:

- Non-availability of spare parts/batteries
- Installation problem
- Wires and tubes of solar equipment are eaten up by animals
- After the installation, problems with regard to software/maintenance reminders, but no one has taken onus to provide sufficient information.
- Very few places where the equipment can get repaired
- Suppliers do not respond to post-sale grievances
- Lack of skilled professional for after sale servicing

Chapter 3

MANUFACTURER'S PERCEPTION OF RENEWABLES IN INDIA



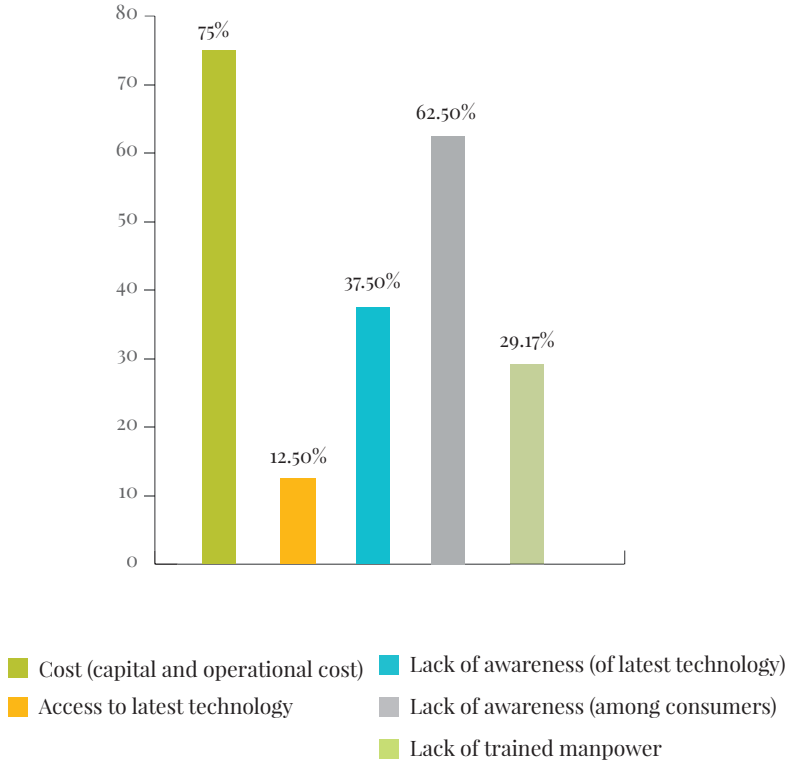
3.1. Challenges Faced by Manufacturers

Studies have shown that analysis of various challenges faced by manufacturers/sellers of RE products, contribute in identifying crucial components in making strategies for effective promotion and adoption of their products in the market. A survey done in India shows that there is 'lack of awareness (among consumers)' as only 56 per cent of Indian consumers have heard of 'renewable energy' or 'clean energy', and only 27 per cent of consumers have heard of 'energy efficiency'.[15] In addition, studies have also shown that renewable energy is assumed to be costlier and plays an important role in cost driven decision making and policies.[16] Further, some studies highlight that project developers may face problems to arrange for credit mainly due to lack of collateral, poor creditworthiness or distorted capital markets.[17]

Costs are the biggest challenges faced by 75 per cent manufacturers/suppliers/implementers. Lack of awareness about renewables among the consumers is the second biggest challenge for the manufacturers.

Specific challenges include poor designing, engineering, implementation and installation of projects leading to improper/unsatisfactory results.

Q **What are the challenges faced by you as a renewable energy manufacturer/supplier/implementer to get increased demand for your RE products?**



In order to analyze the components that hinder manufacturer/supplier/implementer to increase the demand of their products, they were provided with 12 most observed and well-researched reasons. Out of these, a majority of them chose cost *(capital and operational cost)* as the main reason, which is closely followed by *ineffective or lack of government incentives/support mechanism.* Also, some other challenges such as lack of awareness (among consumers) and lack of easy access to finance and consumer willingness to pay also received some responses. Other important challenges faced by manufacturer/supplier/implementer include aspects related to policy/regulatory framework, lack of awareness (of latest technology), lack of trained manpower and lack of a successful business model.

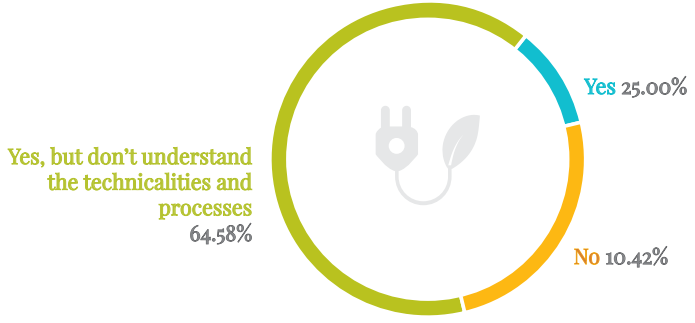
Comments on specific challenges included:

- Poor designing, engineering, implementation and installation of or projects leading to improper/unsatisfactory results. Thus, customer loses faith in the industry as a whole.
- Some rating system of the installers (in solar thermal too) to be in place.
- Even a small domestic system has to be installed properly after proper site survey and is thus a project in itself.

3.2. Consumer Awareness on RE Subsidies

Research has highlighted that many Indians have not heard about government subsidies on RE applications. Also, a considerably good percentage of commercial/industrial respondents were also not aware of government subsidies on RE.[18] Further studies on RE application have emphasize that large public subsidies, both implicit and explicit, in varying amounts can distort investment cost decisions.[19]

Q **Are individuals aware of various government subsidies for renewable energy technologies?**



About 65 per cent of RE manufacturers say that their consumers are aware of subsidies but are clueless on how to avail them.

Further 62 per cent of the manufacturers said that they take efforts in making their consumers aware of subsidies by breaking down and simplifying the information for them. While the remaining percentage of manufacturers admitted to not having done much in this regard, mainly because the process is tedious and time consuming.

Manufacturers/suppliers/implementers are the very first point of contact for a consumer. Therefore, they can be the best resource to extract consumers' awareness levels and knowledge on government subsidies/ initiatives on RE technologies. They also serve as a resource pool in making consumers aware of various subsidies related to RE.

- 64.58 per cent of the manufacturers/supplier/implementers responded by saying that a majority of consumers know that subsidies for particular renewable energy technologies exist, but they cannot understand the technicalities and processes involved in it.
- While 25 per cent of the manufacturer/supplier/implementers responded that consumers have complete understanding of subsidies when they approach them.
- While 10.42 per cent of respondents said that they have no knowledge of it, thus highlighting a very important aspect that a number of consumers that go to purchase RE technologies have absolutely no knowledge of RE subsidies and it's the manufacturer/supplier/implementer through whom they get to know about the same.

Further to analyze whether manufacturer/supplier/implementers take steps in explaining consumers about subsidies, a majority of them, i.e., 62.07 per cent responded 'yes', while 41.38 per cent said 'no'.

Steps manufacturers/suppliers/implementers take to make people aware on RE subsidies:

- Training women from rural communities
- Increasing awareness and informing the public
- Elaborately explain the policies and processes
- Awareness camps
- Simplifying the information for the customers by breaking it down into bullet points

Reasons why manufacturers/suppliers/implementers do not take steps to make people aware on RE subsidies:

- Complex process
- Time consuming procedure

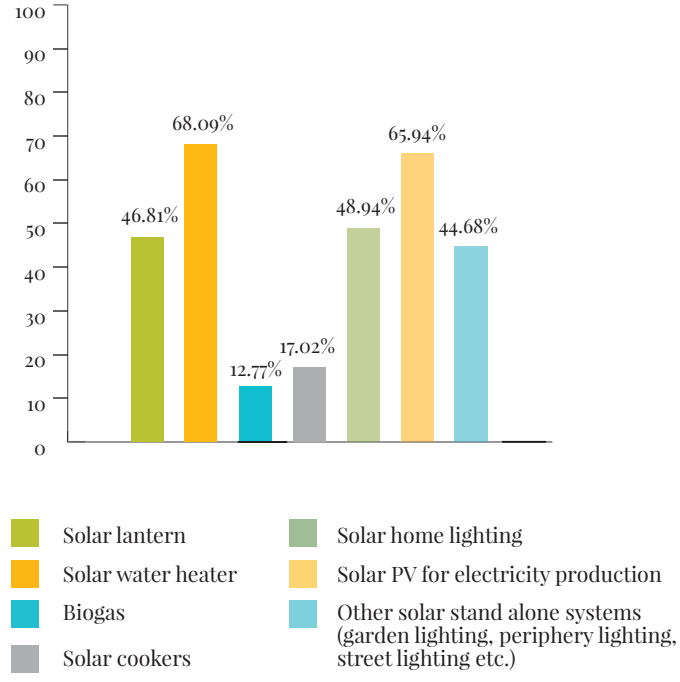
When asked to list down specific support policies/measures on RE from the perspective of manufacturers/suppliers/implementers, the following comments were received:

- Policies are not clear on a long-term basis
- Grant and soft loans for RE vendors
- Government has created a lot of confusion over subsidies. Need to make it simple.
- Banks must be incentivized to finance RE projects
- Implementation of policies is more important rather than mere policies
- Phase out subsidies and encourage low-interest financing for solar
- More awareness
- Working capital support for manufacturers
- Direct subsidies to end-users
- VAT exemption
- Stop subsidies on LPG

3.3. Consumer's Choice of Renewable Energy Technology Technology

Global studies have shown that people favour one form of RE application in comparison to the other, mainly due to personal choices and emotional inclination towards a particular technology.[20]

Q **Which application do people generally choose while opting for renewables? (can choose more than one option)**



According to 68 per cent of the total RE manufacturers, solar water heater is the most popular choice of RE technology among the consumers. This is followed by solar PV for electricity generation (66 per cent of the total respondents).

Consumer's preference of RE technology, as witnessed by manufacturers/suppliers/ implementers, (on being given an option to choose from more than one technology) was assessed. The analysis provided the following results:

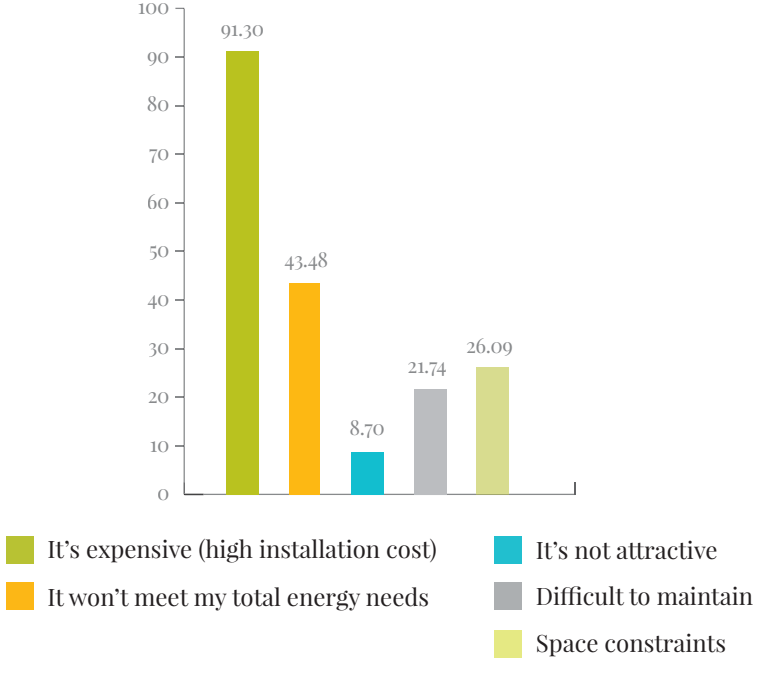
According to the manufacturers/suppliers/implementers, solar water heater and solar PV for electricity production were the most preferred technologies.

- Other technologies that are most common among consumers are solar home lighting, solar lantern and other solar stand-alone systems (garden lighting, periphery lighting, street lighting, etc.).
- Other preferred technologies include solar cookers and biogas.
- Other often opted RE technologies listed down by manufactures include solar water pump, solar pumping system, bio-chulhas, biomass cook-stoves and solar mini grid.

3.4 Negative Perceptions among Consumers about Renewable Energy Products and Applications

Studies have shown that as the prices of renewables go up in the market, it would create negative perceptions among people regarding its adoption and investment.[21] The initial investment cost of renewable energy is higher, but they work out to be cheaper in the long run.

Q What are the 'negative perceptions' buyers have about renewable energy, when you initially interact with them?



According to 91 per cent of RE manufacturers, consumers are of the view that renewables are expensive with a high installation cost. Renewables are also perceived to be unable to meet their total energy demand, according to 43 per cent of the total manufacturers surveyed.

When manufacturers/suppliers/implementers were asked if they would like to suggest some measures to overcome hindrances mentioned above, some of the recommendations included:

- Training/skill building institutes for technical and marketing personnel
- Easy finance options
- Subsidy disbursement must be quick and transparent
- Behavioural change through awareness
- Work on improving the look and design of the equipment

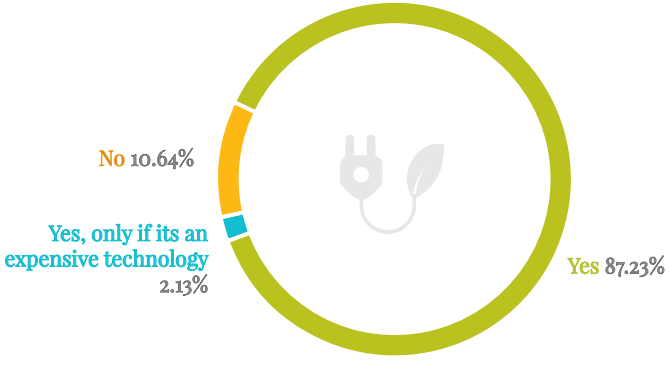
Since a particular manufacturer/supplier/implementer is involved in selling various types of RE products, therefore while listing down negative perceptions buyers have about the use of renewables, they could choose more than one option. Understanding the manufacturers' impression of their customers would enable listing the most common perceptions that consumers have according to the perception of the manufacturers. Consequently, policymakers and implementers can build interventions around breaking these prejudices.

- Results show that the most common perception witnessed by consumers include that 'renewables are expensive (and accompanied with a high installation cost)' and also that 'renewables would be ineffective in meeting the total energy demand'.
- A fair amount of people believed that RE technologies are difficult to maintain and have associated space constraints.
- There were also a few respondents who did not consider these technologies attractive.

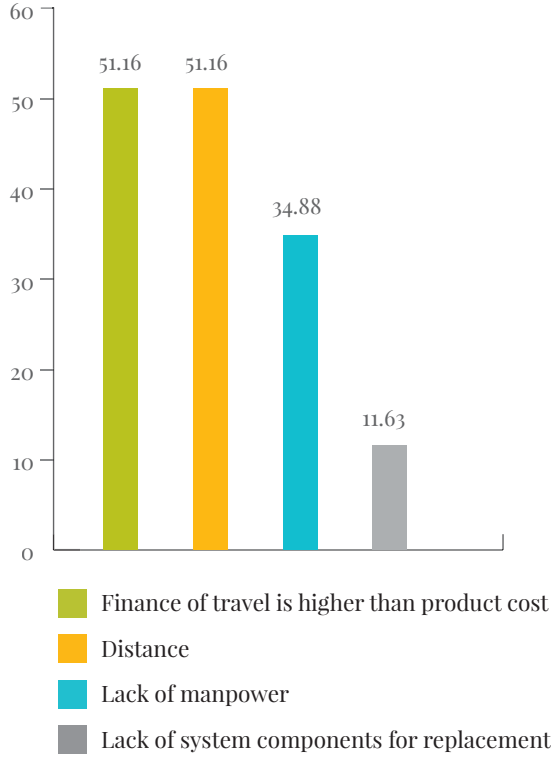
3.5 Determining Post-Sale Services

Studies have shown that in order to assure reliability of renewable energy, vendors should focus on appropriate design, correct installation practices and proper after-sales services.[22] In certain places, RE manufacturers are also very few and scattered, who are not able to provide after-sales services.[23] Considering the penetration of renewable energy in India, manufacturers/suppliers have to take multiple responsibilities, from educating the marketplace to handling after sales service and bill collection, which hinders their time-to-time delivery.[24]

Q Do you deliver post-sales services?



Q What are the factors that contribute to ineffective post-sale services?



About 87 per cent of the RE suppliers provide post-sale services. However, cost of travel and the distance involved turn out to be the main reasons for ineffective post-purchase services.

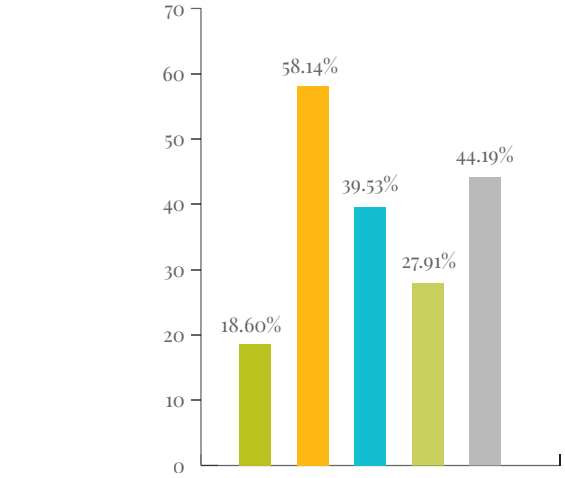
Out of the total RE manufacturers/suppliers/implementers surveyed, 87.23 per cent (41 respondents) confirmed delivering post-sales services to their clients. They seem to value customer satisfaction and believe that it is the good experiences that will be shared with others, which will help in the propagation of both the technology and the service provider. 10.64 per cent of the respondents do not provide after-sales services, which may be due to issues like distance from the consumer, finance and manpower availability issues, availability of spare parts for repair, etc. One of the responses also stated that sales service would be provided only when the fault appears in expensive technologies as this will be more lucrative.

A further analysis was done to assess the main reasons for manufacturers /suppliers /implementers' ineffective post-sales services. The main reason was the cost of travel that turns out to be much higher. Lack of manpower and lack of system components for replacement were also recognized to be contributing to ineffective post-sale services.

3.6 Access to Means of Communication

Research shows that 'websites, social media, and other promotions' regardless of whether a company uses on-product messaging, typically relies on its website as an additional means of communication.[25]

Q What are the main issues you face in terms of accessing relevant information that limit your sales?



About 58 per cent of the respondents think that there is no readily available information on technology, target market and end consumers, which limits their access to information and further limits their sales.

There is no readily available information on technology, target market and end consumers, which turns out to be the biggest challenge faced by manufacturers/suppliers/implementers in accessing relevant information, which further limits marketing and sales of RE products. Other issues include dependence on experience-based learning and conventional knowledge by local small manufacturers/producers. Lack of manpower to manage communication activities on website and other mediums of communication as well as lack of finance to fund for marketing and sales activities are major issues pointed out by the manufacturers. Some are also completely clueless on how to access research materials in order to upgrade their technology.

Apart from these, delayed disbursement of subsidies from the government has also come to light as an important issue because of which the RE industry is losing the motivation to grow.

Chapter 4

KEY FINDINGS AND CONCLUSIONS

4.1 Key Findings

- Amongst the various RE options, solar energy topped the preference as the most commonly known RE application, both among individuals as well as among manufacturers. Majority of the individual respondents are of the view that solar energy has the highest potential in the country. Also, the targeted manufacturers are promoting solar-based technologies more as compared to other RE technologies.
- Solar water heater is the most popular choice of RE technology among individuals. Solar water heater also turned out to be the most popular choice as observed by the manufacturers. Other popular applications included solar lantern and solar PV for electricity.
- 55 per cent of the people still do not used any renewable energy application. Nevertheless, more than 95 per cent current non-users are willing to adopt RE technology in the near future. This means that there is tremendous scope for expansion of renewable energy in the country. Individuals are keen and eager to adopt renewables. Rampant scaling up and rapid awareness creation is the need of the hour.
- The most common perception that exists among individuals is that renewable energy is expensive and does not meet their complete energy demands. The same has been observed and voiced by the manufacturers. A majority of respondents still seem to lack an understanding of the long-term sustainability benefits associated with renewable energy. 67.59 per cent of the people consider the initial investment as a huge barrier for adoption of renewables.
- 43 per cent of the people are aware of government subsidies on renewables, but admit to having insufficient information on availing it. 65 per cent RE manufacturers say that their consumers are aware of subsidies but are clueless on how to avail them. Besides, 43 per cent of the respondents also said that they have no information at all on existing subsidies on renewables. Thus, information on subsidies is perceived to be quite complicated and very difficult for consumers to decode and understand.
- Access to apt and readily available information comes across as a big barrier for both individuals to adopt renewables and for manufacturers to enhance and promote their products.
- Operational and capital costs are the biggest challenges faced by 75 per cent manufacturers/suppliers/implementers. Lack of awareness of renewables among the consumers is the second biggest challenge for the manufacturers.
- More than 90 per cent of the respondents believe that RE-based technologies have much lesser impact on biodiversity and the environment, as compared to fossil fuel based energy.
- 96 per cent of the respondents believe that a shift to RE can contribute to a greener lifestyle.
- Nearly 69 per cent of the people feel that the central and state governments, private businesses and individuals – all together – must take the lead action in RE adoption.

4.2 Conclusions

The study clearly presents a favourable case scenario for RE adoption and expansion. With over 90 per cent of the individuals convinced that renewable energy contributes to a greener lifestyle and more than 95 per cent non-users of RE technologies are willing to adopt renewables in the future, there is tremendous scope for scaling up of RE applications in the country. Citizens have a positive outlook towards renewables and are of the view that it has the potential to gradually replace fossil fuels over the medium-term (say 5–20 years). They also believe that renewables are less harmful to biodiversity, as compared to fossil fuels.

While wind energy has a higher potential in India, individuals instead perceive solar to have a higher potential in the country. Solar promotion has always been on a higher scale and hence visibility of solar energy remains highest among individuals. Thus, there is a need for increased awareness and promotion of various schemes and policies related to RE. There is also an increased need to harness the potential of RE sources other than solar and more importantly, make that perceptible to the general masses.

Despite a positive way forward for renewables, there are various challenges ahead that need to be addressed and deployed in future actions. The biggest barrier to uptake and propagation of renewables are the various myths and misconceptions that inhabit the minds of prospective RE adopters. The most common of them being that renewables are expensive and that they are unable to meet the energy demands. It is crucial to make individuals aware of the long-term sustainability benefits associated with RE technologies. It is also crucial to make people aware that RE has the potential to meet most of the energy demands of the user. The biggest challenge faced by the manufacturers also relates to cost with operational and capital costs proving to be the biggest challenges for RE technology providers.

Awareness with respect to government subsidies and policies on RE accounted to be very low among Indian citizens. There is a need to provide readily available information on RE vendors in a lucid and easy-to-access method. Also, it is very important to break down the information for common citizens in an easy-to-understand manner.

Lastly, but of course not the least, there is a need for a shared vision, which the people have identified in the survey. The step to call and take up action is perceived to be of all the stakeholders together – governments, both at the centre and the state, institutions, government organizations, NGOs and individuals.

PEOPLE'S PERCEPTION STUDY

Renewable Energy in India 2014

More than **92 per cent** respondents are of the view that solar energy has a higher potential in India.

About 68 per cent of the people were unable to name any government plans or policies connected with RE.

Nearly 69 per cent of the people feel that central government and state governments, private businesses and individuals – all together- must take the lead action in RE adoption.

More than 96 per cent Indians believe that a shift to RE can contribute to a greener lifestyle. About 57 per cent of the people find RE reliable.

About 68 per cent consider the high initial cost of RE technology a barrier to their willingness to invest in RE.

50 per cent of the respondents think that renewables are expensive. According to 91 per cent of the RE manufacturers, consumers are of the view that renewables are expensive with a high installation cost.

About 55 per cent of people still have not used any renewable energy application.

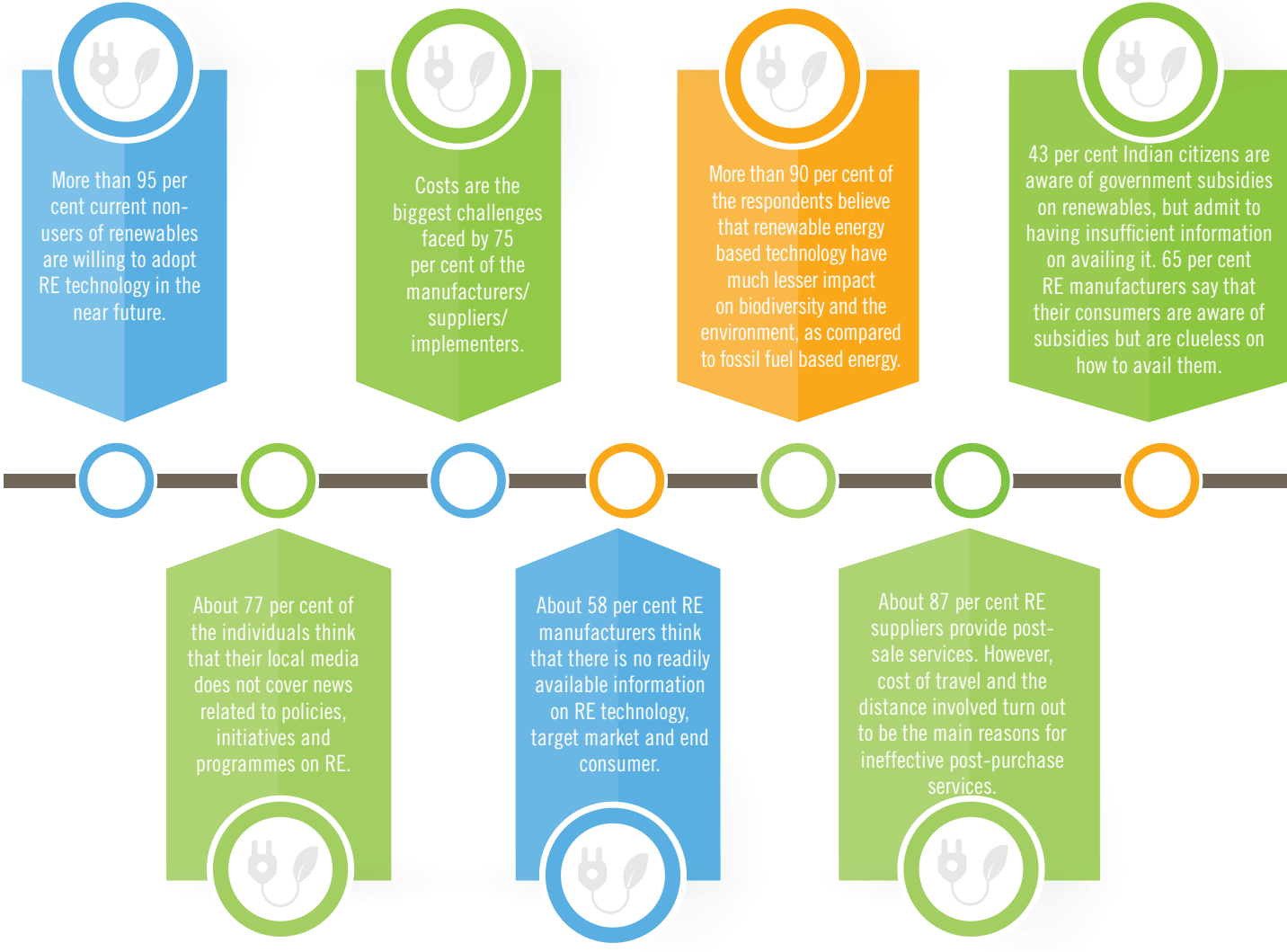
20 per cent feel that renewables will not be able to meet their complete energy demands. Renewables are also perceived to be unable to meet their total energy demand, according to 43 per cent of the total manufacturers.

Almost 92 per cent of the people feel that renewables can replace fossil fuel use in the near future. Of this, 63 per cent of the respondents think that such a transition can occur in the medium-term (5–20 years).

Solar water heater is the most commonly used RE source, with 46 per cent users of RE technology using a solar water heater. According to 68 per cent of the total RE manufacturers, solar water heater is the most popular choice of RE technology among the consumers.

Jawaharlal Nehru National Solar Mission (JNNSM) is the most popular government initiative among individuals.

About 53 per cent of the respondents feel that there have not been enough initiatives to make the switch to RE possible.


More than 95 per cent current non-users of renewables are willing to adopt RE technology in the near future.
Costs are the biggest challenges faced by 75 per cent of the manufacturers/ suppliers/ implementers.
More than 90 per cent of the respondents believe that renewable energy based technology have much lesser impact on biodiversity and the environment, as compared to fossil fuel based energy.
43 per cent Indian citizens are aware of government subsidies on renewables, but admit to having insufficient information on availing it. 65 per cent RE manufacturers say that their consumers are aware of subsidies but are clueless on how to avail them.
About 77 per cent of the individuals think that their local media does not cover news related to policies, initiatives and programmes on RE.
About 58 per cent RE manufacturers think that there is no readily available information on RE technology, target market and end consumer.
About 87 per cent RE suppliers provide post-sale services. However, cost of travel and the distance involved turn out to be the main reasons for ineffective post-purchase services.

Chapter 5

KEY ASKS FROM THE STAKEHOLDERS

Individuals

- Spread the word! Ask more and more people to shift to renewables.
- Adopt smart and efficient RE equipment and make the share of RE count.
- Seek and share information on RE vendors and policies.
- In coordination with other stakeholders, individuals should take the lead in making a shift to renewables.
- Reach out to government agencies, manufacturers, NGOs in the renewable energy area in their state to retrieve more information on RE technology, cost and specifications.
- Individuals should be well aware of their personal/household energy consumption level and gain a thorough understanding of what difference would it make by shifting to renewables.

Media

- Create a positive outlook for RE uptake.
- Increased coverage on RE policies and programmes, both at the central and state levels. International, national and local level initiatives must also be extensively covered.
- Local media must play a proactive role in covering news pertaining to RE initiatives at the local level.
- Felicitate and encourage positive dialogue between policy implementers, RE vendors and individual end users. Build upon positive stories on RE adoption by various stakeholders in order to enhance wider adoption of these technologies.
- Include once a week column on renewables, which can be an interaction with an ‘expert in RE field’.
- Relation of RE application with social and environment factors in addition to economic ones must be explored and highlighted.

Civil Society

- Mobilize, advocate and generate awareness through effective ‘knowledge sharing process’ among individuals on renewables.
- Influence policymakers to develop policies that promote renewable energy and enable a just transition to renewables.
- Liaison with RE manufacturers and technology providers, and develop projects at the grassroots to promote sustainable energy.
- Organize fairs and exhibitions on RE to popularize its applications.
- By engaging with various stakeholders, civil societies should take the lead in making a shift to renewables possible.

Technology Providers

- Increase awareness among consumers on various aspects of renewables such as subsidies, technology, potentials and benefits.
- Make increased efforts at enhancing and improving post-sale services.
- Stay updated on new research and information pertaining to renewable energy technology.
- Constantly innovate and develop new technologies.
- Stay updated about various government subsidies, programmes and policies on renewable energy.
- Engage with the government wherever possible, to contribute towards effective policymaking.

Government

- Create awareness around RE, its various sources/technology, its potential and scope, and policies, incentives and subsidies.
- Efforts at revamping the already existing government communication mediums like website, magazines, newsletters, bulletins, etc., to effectively communicate about various policies, incentives, technology, etc.
- Information on subsidies should be simplified and made easily available to the consumers.
- Initiatives to promote wider use of renewable energy equipment in institutions, organizations and commercial places.
- Incentivize RE manufacturers and provide them with financial and technological support
- Governments, along with other stakeholders, must take the lead action in making a shift to renewables.
- To communicate effectively to the consumers about the various benefits of shifting to RE rather than the conventional energy sources.
- Bring in policies that enable large-scale adoption of RE at the grassroots.
- Ensure effective implementation of existing RE policies. In particular, timely dispersal of incentives and subsidies that are already in place.

REFERENCES

1. WWF International. 2011. *The Energy Report: 100% Renewable Energy by 2050.* WWF International, Ecofys & OMA. Gland, Switzerland. http://d2ouvy59p0dg6k.cloudfront.net/downloads/the_energy_report_lowres_111110.pdf, accessed on 27 August 2014.
2. IPCC. n.d. Glossary. *IPCC Fourth Assessment Report: Climate Change 2007: Working Group II: Impacts, Adaptation and Vulnerability.* Intergovernmental Panel on Climatic Change. http://www.ipcc.ch/publications_and_data/ar4/wg2/en/annexessglossary-a-d.html, accessed on 27 August 2014.
3. Blasting, T.J. 2014. Recent Greenhouse Gas Concentrations. Carbon Dioxide Information Analysis Center. http://cdiac.ornl.gov/pns/current_ghg.html, accessed on 30 August 2014.
4. TERI. 2013. *TERI Energy Data Directory & Yearbook 2012/13.* The Energy and Research Institute, New Delhi.
5. Planning Commission. 2011. *Low Carbon Strategies for Inclusive Growth: An Interim Report.* Government of India, New Delhi. http://planningcommission.nic.in/reports/genrep/Inter_Exp.pdf, accessed on 15 December 2013.
6. Ernst & Young. 2014. Renewable Energy Country Attractiveness Index. Issue 41 (June). http://www.ey.com/Publication/vwLUAssets/Renewable_Energy_Country_Attractiveness_Index_41_-_June_2014/$FILE/EY-Renewable-Energy-Country-Attractiveness-Index-41-June-2014.pdf, accessed on 29 August 2014.
7. MNRE. n.d. Physical Progress (Achievements). Ministry of New and Renewable Energy, Government of India. http://www.mnre.gov.in/mission-and-vision-2/achievements, accessed on 29 August 2014.
8. Ibid.
9. MacArthur, Julie. 2014. Challenging Public Engagement: Participation, Deliberation and Power in Energy Policy Design and Implementation. Waikato Sustainability Symposium: Transforming Public Engagement on Controversial Science & Technology, 17–18 February. The University of Waikato, Hamilton, New Zealand. http://www.waikato.ac.nz/fass/conference/sustcitconf/papers/MacArthur%20Waikato%20Sustainability%20Symposium%20(2).pdf, accessed 1 September 2014; Geothermal Communities. 2013. *Study on Public Perception on Geothermal Energy.* Geothermal Communities. http://www.geothermalcommunities.eu/sitedir/project_material/d61_study_on_public_perception_of_geothermal_energy.pdf, accessed on; Department of Energy and Climate Change. 2012. *DECC Public Attitude Tracker – Wave 2: Summary of Key Findings.* Department of Energy and Climate Change. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65520/6410-decc-public-att-track-surv-wave2-summary.pdf, accessed on 1 September 2014.
10. See Eshchanov, Bahtiyor R., Stultjes, Mona Grinwis Plaat and Ruzumboy A. Eshchanov Sanaatbek K. Salaev. 2011.

People's Perceptions on Renewable Energy Sources' Penetration Prospects in the Khorezm Province, Uzbekistan. *Journal of Knowledge Management, Economics and Information Technology.* Issue 7 (December). http://www.scientificpapers.org/wp-content/files/1237_Peoples_Perceptions_on_Renewable_Energy_SourcesPenetration_ProspectsintheKhorezm_Province_Uzbekistan.pdf, accessed on 1 September 2014.

11. The main purpose, as Beierle says, is to "create a better-informed and educated public and to increase trust by making government and the regulated community more accountable and transparent to citizens". See Beierle, Thomas. C. 1998. Public Participation in Environmental Decisions: An Evaluation Framework Using Social Goals. Discussion Paper 99-06, Resources for the Future, Washington, DC, quoted in Zea, Alfredo Santos, Benavides, Ana Catalina Vargas, Ogungbemi, Benjamen Toluwalope, Namuyondo, Esther, Enwena, Nneka Maryrose and Olga Petrikova. 2012. *Public Participation in Renewable Energy Infrastructure Projects: A Comparison between the Copenhagen and Malmø Regions.* Aalborg University, Denmark. http://energioresund.org/pic_m/17_verdi_182_ProjectWork-EMSS2-42012.pdf, accessed on 1 September 2014.

12. *Governments can and should provide information about RE which can help foster a fact-based public debate, while striking a careful balance to ensure that their communications do not come across as 'propaganda'. See Bridle, Richard, Collings, Jonathan, Cottrell, Jacqueline and Aaron Leopold. 2013. Communication Best-Practices for Renewable Energy. IISD, FOS and Collings & Money. http://iea-retd.org/wp-content/uploads/2013/04/IEA-RETD-RE-COMMUNICATE-Report_Final_20130403.pdf, accessed on 1 September 2014.*

13. Jacobsson, S. and Lauber, V. 2006. The Politics and Policy of Energy System Transformation: Explaining the German Diffusion of Renewable Energy Technology. *Energy Policy* 34(3): 256–276; Winkler, H. 2005. Renewable Energy Policy in South Africa: Policy Options for Renewable Electricity. Energy Policy 33(1): 27–38; Tan, K.T., Lee, K.T. and A. R. Mohamed. 2008. Role of Energy Policy in Renewable Energy Accomplishment: The Case of Second-Generation Bioethanol. Energy Policy 36(9): 3360–3365; Peidong, Z., Yanli, Y., Jin, S., Yonghong, Z., Lisheng, W. andL. Xinrong. 2009. Opportunities and Challenges for Renewable Energy Policy in China. *Renewable and Sustainable Energy Reviews* 13(2): 439–449; Mitchell, C. and Connor, P. 2004. Renewable Energy Policy in the UK 1990–2003. Energy Policy 32(17): 1935–1947.

14. A study by Bang et al. (2000) revealed that emotionally charged decisions are more important than facts and knowledge-based decisions among US citizens. See Bang, H. K., Ellinger, A. E., Hadjimarcou, J. and P. A. Traichal. 2000. Consumer Concern, Knowledge, Belief, and Attitude toward Renewable Energy: An Application of the Reasoned Action Theory. *Psychology & Marketing 17* (6): 449–468. See also Eshchanov, Bahtiyor R., Stultjes, Mona Grinwis Plaat and Ruzumboy A. Eshchanov Sanaatbek K. Salaev. 2011. People's Perceptions on Renewable Energy Sources' Penetration Prospects in the Khorezm Province, Uzbekistan. *Journal of Knowledge Management, Economics and Information Technology.* Issue 7 (December). http://

www.scientificpapers.org/wp-content/files/1237_Peoples_Perceptions_on_Renewable_Energy_SourcesPenetration_ProspectsintheKhorezm_Province_Uzbekistan.pdf, accessed on September 2014.

15. According to a first-of-its-kind survey conducted by Mercom Capital Group titled 'India Renewable Energy Awareness Survey,' only 56 per cent of Indian consumers have heard of 'renewable energy' or 'clean energy', and only 27 per cent of consumers have heard of 'energy efficiency'. See Mercom Capital Group, http://mercomcapital.com/awareness-of-renewable-energy-and-energy-efficiency-low-in-india-according-to-survey-by-mercom-capital-group1, accessed on 1 September 2014.

16. Many argue that renewable energy costs more than other sources, resulting in cost-driven decisions and policies that avoid renewable energy. See Beck, Fredric and Martinot, Eric. 2004. Renewable Energy Policies and Barriers. *Encyclopedia of Energy.* Vol. 5.Elsevier Inc. http://www.martinot.info/Beck_Martinot_AP.pdf, accessed on 1 September 2014.

17. Consumers or project developers may lack access to credit to purchase or invest in renewable energy beacause of lack of collateral, poor credit worthiness or distorted capital markets. See Mercom Capital Group. 2010-2011. *India Renewable Energy Awareness Survey.* Mercom Capital Group, LLC. http://www.mercomcapital.com/MercomIndiaREAwarenessSurvey.pdf, accessed on 1 September 2014.

18. About 62 per cent of all surveyed respondents had not heard of government subsidies for renewable energy. An 80 per cent of rural respondents had not heard of renewable energy subsidies, while 61 per cent of commercial/industrial respondents were unaware of government subsidies for renewable energy, 54 per cent of residential respondents were also not aware of subsides. Vyas, Charul and Hurst, Dave. 2013. *Energy and Environment Consumer Survey.* Navigant Research. http://www.navigantresearch.com/wp-assets/uploads/2013/12/WP-EECS-13-Navigant-Research.pdf, accessed on 1 September 2014.

19. Large public subsidies, both implicit and explicit, are channeled in varying amounts to all forms of energy, which can distort investment cost decisions. See Beck, Fredric and Martinot, Eric. 2004. Renewable Energy Policies and Barriers. *Encyclopedia of Energy.* Vol. 5.Elsevier Inc. http://www.martinot.info/Beck_Martinot_AP.pdf, accessed on 1 September 2014.

20. Close to 80 per cent of the respondents favoured the concept of solar energy, which led all concepts in favorable responses, followed by wind energy (72 per cent). Vyas, Charul and Hurst, Dave. 2013. *Energy and Environment Consumer Survey.* Navigant Research. http://www.navigantresearch.com/wp-assets/uploads/2013/12/WP-EECS-13-Navigant-Research.pdf, accessed on 1 September 2014.

21. The higher the costs of renewable energy the more negative is the perception. See Kuhn,Marc, Zajontz, Yvonne and Vanessa Kollmann. n.d. Consumer Perception of Global Renewable Energy Projects – exemplified at DESERTEC. http://www.lcbr-online.com/index_files/proceedingsemc12/12emc005.pdf, accessed on 1 September 2014.

22. The only way of ensuring the reliability of renewable energy systems is to focus on (a) appropriate design, (b) correct installation practices, and (c) proper after-sales service (India should accelerate renewable energy. See Kumar, Amit. 2014. *India should Accelerate Renewable Energy.* The Energy and Resource Institute (TERI).http://www.teriin.org/index.php?option=com_featurearticle&task=details&sid=839, accessed on 1 September 2014.

23. Manufacturers were also very few and scattered who could not provide after sale services. SeeIn SolTherm Times. n.d. Interview: Mr. Deepak Gupta, Secretary, Ministry of New and Renewable Energy. *InSolTherm Times.* Ministry of New and Renewable Energy and Solar Thermal Federation of India.http://mnre.gov.in/file-manager/solar-thermal-newsletter/volume-1-issue-2/EN/interview.html, accessed on 1 September 2014.

24. Who provides marketing and after sales service? Given the embryonic state of renewable energy development in rural areas, entrepreneurs are usually required to do everything from educating the marketplace to handling after sales service and bill collection. See Sustainable Energy Solutions. 1998. *Asia-Pacific Economic Cooperation Guidebook for Financing New and Renewable Energy Projects.* New Energy and Industrial Technology Development Organization, Japan. http://www.apec.org/~/media/Files/Groups/EWG/98_ewg_guideproj.pdf, accessed on 1 September 2014.

25. 'Websites, Social Media, and Other Promotions' Regardless of whether a company uses on-product messaging, it typically relies on its website as an additional means of communication. Websites have minimal constraints, so companies may include detailed descriptions of their involvement with renewable energy. See Brannan, Deborah Baker, Heeter, Jenny and Lori Bird. 2012. Made with Renewable Energy: How and Why Companies are Labeling Consumer Products. National Renewable Energy Laboratory (NREL), Department of Energy, USA. http://www.nrel.gov/docs/fy12osti/53764.pdf, accessed on 1 September 2014.

About WWF-India

WWF-India is one of the largest conservation organizations in the country dealing with nature conservation, environment protection and development-related issues. Established as a Charitable Trust in 1969, it has an experience of over four decades in the field. Its mission is to stop the degradation of the planet's natural environment, which it addresses through its work in biodiversity conservation and reduction of humanity's ecological footprint.

WWF-India works across different geographical regions in the country to implement focused conservation strategies on issues like conservation of key wildlife species, protection of habitats, management of rivers, wetlands and their ecosystems, climate change mitigation, enhancing energy access, sustainable livelihood alternatives for local communities, water and carbon footprint reduction in industries, and combating illegal wildlife trade. WWF-India is actively engaged in promoting renewable energy uptake, enabling energy access, demonstrating renewable energy projects in critical landscapes, and overall promoting clean energy solutions.

WWF-India has been working on issues related to biodiversity conservation, sustainable livelihoods and governance, and climate change. The Climate Change and Energy programme of WWF-India is working towards a climate resilient future for people, places and species that support pathways for sustainable and equitable economic growth. Low carbon development and renewable energy at scale are the thrust areas of climate change and energy programme.

Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

www.wwfindia.org

WWF-India Secretariat
172-B Lodi Estate
New Delhi 110003
Tel: 011 4150 4814 Fax: 011 4150 4779