The Energy Poverty and Gender Nexus in Himachal Pradesh, India: The Impact of Clean Fuel Access Policy on Women's Empowerment[1]

Dr. Jyoti Parikh
Integrated Research and Action for Development (IRADe)
Executive Director
C 50, Asian Games Village, Khelgaon
New Delhi, India – 110049
Email: jparikh@irade.res.in

PROJECT TEAM

1.	Dr Jyoti Parikh	Executive Director
2.	Ms Saudamini Sharma	Research Assistant
3.	Dr Aparna Negi	Lecturer (SG)
		HP University, Shimla

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Abbreviations

HC: Health Centre
HH: Household
HP: Himachal Pradesh
PDS: Public Distribution System
LPG: Liquid Petroleum Gas

Abstract

This research project has focused on poverty, gender, energy and health issues in the state of Himachal Pradesh (HP) in India, a mountainous state, where the energy uses include space and water heating requirements. Moreover, there is effort involved in walking with headloads of fuelwood over hilly terrain, often at high altitudes. Does the policy to allocate additional quota of clean fuels (LPG, kerosene) in hilly areas, i.e. twenty litres per household as against five litres elsewhere in India, have an impact on gender indicators including literacy, health and income?

The study covered a sample of 9 districts, 84 villages, 792 households and 4296 individuals from HP. The results show that, in HP, biofuels still meet about 70% of fuel needs. In procuring biofuels, women walk typically 30kms each month, and each trip to collect fuelwood takes on average 2.7 hours. The state has infrastructure to provide kerosene and 31% of the population use it. A "willingness-to-pay" survey shows that even at a price of Rs. 13 per litre, which is above the market price, there would be a demand for kerosene. Further, the LPG network is expanding.

The literacy level of women in HP is quite high at 60%, and almost 80% of the women are exposed to some form of media. A lower incidence of domestic violence was reported compared to India as a whole. Biofuel collection is primarily the responsibility of adult women and older men. This is a physically strenuous process, with almost two-thirds suffering from neck ache at least quarterly and half suffering from backache almost daily. Nearly 30% of women felt the time absorbed in collecting wood to be a problem. About 70% of adult women are household cooks and hence exposed to smoke and pollution. They would accept interventions to avoid smoke, and 73% of them would choose some form of ventilation over improved stoves.

Greater political attention and backing are required to give women access to modern fuels and to free them from daily drudgery.

Keywords: gender, empowerment, biofuels, health and indoor air pollution, Himachal Pradesh, India

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Project Team

Executive Summary

Introduction

The project attempts to explore and establish the linkages among gender, empowerment, energy, environment and health issues in Himachal Pradesh (HP). HP was selected for the study as it is seen as one of the four most progressive states in India. Himachal Pradesh is a mountainous state and there is a need for both space and water heating for which biofuels are the primary source of energy. Moreover, there is much physical effort involved in carrying heavy fuel headloads over hilly terrain and this has an economic burden in working days lost. Further, Himachal Pradesh's Government has a policy to allocate an additional quota of clean fuels (LPG, kerosene) to hilly areas in order to prevent deforestation (20 litres per household as against 5 litres elsewhere in India). Has this policy had an impact on gender indicators such as literacy, health and income? Does access to energy on a sustainable basis empower women, and are they freed from their daily drudgery to surge ahead in life? The study tries to provide answers to such questions.

Databases

The study partially depends on information gathered in a previous project by the author and others plus a new gender survey. The dataset from the previous project is referred to as Database A and covers 9 districts, 54 villages, 712 households and 4100 individuals. This integrated survey, using appropriately designed questionnaires, uncovered data on socioeconomic characteristics such as household assets, fuel-related information including types of fuels used in cooking, individual characteristics such as gender, age and height, various symptoms of diseases and economic issues such as expenditure on health and willingness to pay for cleaner fuels. A gender-specific dataset, Database B, was built up based on economic empowerment indicators obtained through structured questionnaires and focus group discussions. Key components of Database B were the role of women in decision-making, fuel-related information such as benefits of fuel types in terms of productivity, leisure and so on, and accessibility to and use of clean fuels. Further, to gain an insight into the actual situation regarding the supply of clean fuel (kerosene), in terms of delivery mechanisms, availability, and access by the poor, a survey of kerosene depots[2] in the area was conducted and formed an important part of database B.

Women's empowerment

A comparison of the state of Himachal Pradesh with India as a whole, in terms of indicators of women's empowerment, was based primarily on the Second National Family Health Survey (1998-99) (NFHS-2). Decision-making power and empowerment have significant impacts on the demographic and health-seeking behaviour such as through providing greater relative control over fertility, contraceptive use and the ability to obtain health services for themselves and their children. Education, work participation and exposure to the mass media are some of the means through which women gain status and autonomy, both important aspects of empowerment. More than 80% of women who are, or were once, married aged 15-49 years have regular exposure to some form of media in HP. Moreover, more women in HP having access to money (80%) than in India as a whole (59%). Further, with a low incidence, domestic violence is not a major issue in HP. Participation in women's organisations generates awareness of various developmental programmes. Thus, in HP, women are relatively strongly empowered, and exercise this power in decision-making at various levels.

[2] Kerosene depots were established by the government, as part of the public distribution system (PDS), to provide a rationed amount of kerosene oil at subsidised rates.

Energy and gender

Information gathered for both databases substantiates the view that HP has seen greater progress than elsewhere, with a well-connected road network and modes of transportation. Education and health care facilities in the state are satisfactory, with at least one primary school and one health centre in each village. People in the state have a relatively high standard of living with most of them owning more than one modern household asset such as radios, fans, televisions, refrigerators. Ownership of gas stoves also increased substantially within the time interval between the two surveys. Biofuels are still the primary source of energy in HP, with a large majority of the population (93%) using fuelwood and only 7% using exclusively clean fuels. Average consumption of fuelwood is 7.4 kg per household per day, and of kerosene 7.8 litres per household per month. Fuelwood collection takes its toll on human resources which is evident from the results of the present study which showed that household members typically walks 30 kms and spend 41 hours collecting fuelwood a month. This is largely the responsibility of women, although older men are often also involved. Women in HP also share the agriculture and animal husbandry workload. The seasonal collection of minor forest products[3] is the exclusive responsibility of older men. The results suggest that although the state has progressed in terms of education, asset ownership etc., the use of new energy technology remains on the periphery, and the brunt of this lack of progress is faced primarily by women.

Health and gender

Using biofuels can have detrimental impacts on health due to the many hours of exposure to smoke. The present article brought out, for the first time, the linkage between health impacts and gender in various age groups. Females under 5 and between 30 and 60 years of age are at greater risk than males in the same age groups. However, the situation reverses in older age, with males over 60 almost twice as likely as females to suffer from smoke-related illnesses. Looking for linkages between literacy and respiratory health yielded some interesting results. Illiteracy apparently influences respiratory health, even in households using clean fuels, with illiterate women being at greater risk (12.5% with symptoms) than literate women (5.2%). Smoking has a profound effect on respiratory health, and the risk of having respiratory diseases is always greater for smokers than non-smokers. The data for HP was consistent with this and, interestingly, female smokers in HP were more likely to suffer respiratory symptoms (30%) than male smokers (17%). Also, within the non-smokers of HP, females were more likely to suffer than men. However, the difference was small between male and female non-smokers for all symptoms, in spite of women's exposure to indoor air pollution while cooking. The impact of indoor air pollution appeared to be less than one might have anticipated, perhaps because of having separate kitchens, good ventilation and the, albeit limited, use of clean fuels. Overall, it seems that women, especially those in the 30-60 age group, and older men in HP are at the greatest risk of having respiratory diseases.

Women's voices and preferences

Decision-making power and empowerment have significant impacts on women by influencing their attitudes (for example, towards fuels and stoves) and preferences (for example, to be freed from drudgery through using modern technology). Linkages between women's preferences and clean fuels were explored in this study. The overall responsibility for fuel procurement was primarily women's, and especially women in the 29 – 42 age group; although the procurement of kerosene and LPG was mainly the responsibility of young men with little involvement of women. The

[3] Non-timber forest products, also known as minor forest products, include oil seeds such as sal, Karanj, and various other items such as honey, mushrooms and fruits.

procurement of wood, agricultural residues and dung cakes was largely the responsibility of women and older men. To procure fuelwood, women walk approximately 30 kms each month with each collection trip lasting around 2.7 hours on average. Women in the state faced numerous difficulties in collecting wood, and their prime concerns were the physically strenuous exercise in procurement and the time taken for the process. About 70% of women in the 30 – 40 age group are involved in cooking, usually as the main household cook, with little or no involvement of men. Chief cooks have a greater risk of respiratory symptoms as they are exposed to a smoky atmosphere for long hours. 18% of respondents indicated that they were willing to spend some money to improve the air quality in their kitchen. Interestingly, 94% of respondents were willing to pay for ventilation as compared to only 34% respondents who were willing to pay for improved stoves. The main health problems related to fuelwood use cited were mainly physical strain in terms of backache, headaches etc. Thus, it can be said that women in HP suffer drudgery due to using biofuels and they are willing to shift to clean fuels.

Energy supply: kerosene oil depot survey

The kerosene oil depot survey, one of the two components contributing to Database B, examined the supply side situation in the Public Distribution System (PDS). Kerosene oil depot owners indicated that, over the years, the demand for kerosene had declined, with more LPG now being used in the area. In winter and the rainy season, the demand for energy increases, but in summer it was 40% below the available quota. The profit margins in selling kerosene under the PDS are also fairly low. Income from kerosene sales constituted only 2% of their total incomes, and most viewed this business as only as sideline. Low demand and low profits deter people from opening a shop to sell the kerosene quotas in the state.

Conclusions

Empowerment level and access to energy are correlated in HP. Both the empowerment level and access to energy in HP are above the all–India averages. Even within HP, the two districts investigated in more detail, with different levels of access to fuels, have different levels of empowerment. Thus gender and energy are closely linked. These issues have remained on the periphery of development policy, and greater political will is needed. Cooperation among government ministries, development agencies and community organisations is necessary to give women access to modern fuels and free them from daily drudgery.

1 Background and introduction

1.1 Background to the research

In India, one hundred and sixty million people, especially women and children, spend long hours gathering biofuels and suffer the health consequences of carrying heavy loads and from the pollution from burning biofuels. If they did not have to gather fuel, these hours could be used towards their self-development or for economically productive activities and hence alleviate poverty. The intersection of energy, poverty alleviation and gender is a key issue that needs to be addressed.

The poor, especially poor women, suffer most from resource scarcity both of modern clean fuels as well as of traditional fuels, and the pollution resulting from the use of traditional biomass. Does energy come first (as an instrument for economic growth and empowerment) or it is economic empowerment that is required to enable the poor to exercise choice and adopt clean energy technologies and fuels; and are other socioeconomic forces such as literacy and exposure to media also involved? Is there a way out of this predicament of rural women suffering due to resource scarcity? Adding to the knowledge in this area could improve energy policies that address poverty and gender issues. Only limited conceptual and empirical work is available specifically on this intersection. A number of studies have addressed energy and development issues, but treat gender only peripherally, if at all, or as a separate, rather than as an integrated, topic. The Millennium Development Goals (MDG) framework is also related with issues of women's development and energy.

This project focuses on poverty, gender, environment and health issues in the state of Himachal Pradesh in India, and has carried out a gender-specific survey to address these issues. Himachal Pradesh benefits from a Government policy to allocate additional quotas of clean fuels (LPG and kerosene) to hilly areas in order to prevent deforestation (20 litres per household as against 5 litres elsewhere in India). Additionally, a large number of LPG distributors are operating in the rural areas, making it an option even in remote locations. Therefore, in Himachal Pradesh, rural household access (i.e. the possibility to obtain) to clean fuels is as high as 40%, compared to only 7% in Rajasthan and U.P**.**

There have been many studies on subsidies in the recent past, including a recent one by the World Bank. These have pointed out that, because of poor execution, clean fuel subsidies often do not reach the purported beneficiaries, i.e. the poorest, and hence should be done away with. The study discussed in this report builds on the existing body of research on cooking fuel subsidies by examining the gender dimension of such subsidies.

1.2 Why Himachal Pradesh?

The State of Himachal Pradesh has a small population and a mountainous ecosystem. It shows a higher level of progress in terms of access to clean energy sources, water supply and sanitation than other states. Has this policy had an impact on gender indicators such as literacy, health and income? The project examines the hypothesis that, when women are given energy on a sustainable basis, they are empowered and freed from daily drudgery, and they move ahead in terms of human development indicators and find new ways to enrich their lives. In this study, a comparative analysis is undertaken between those groups in HP that have access to clean fuels and those who do not, with respect to the level of prosperity and impact on socioeconomic development indicators. An important point not to overlook is that it has been often reported that the poor do not always receive, for a variety of reasons, the full quota of fuel subsidies they are entitled to. Given such a

situation, the study examines how policies translate into action in reality, and what is the impact on men and women.

There are several reasons for selecting the State of Himachal Pradesh for this research, and which have far reaching implications for overall planning and also for energy, forest and health policies, including:

- Himachal Pradesh continues to be the socially most progressive state of the Indian Union, and has emerged as a model for hill development.
- With a sizeable forest cover it is part of the 'lungs' of India, and fuelwood and similar issues have a direct bearing on air quality.
- Forest cover in the hills is supposed to be sixty percent[4], but in Himachal Pradesh the forest cover has dwindled to about twenty percent.
- Being at a high altitude, fuel requirements are greater, with fuel also required for space heating.
- Frequent flash floods and soil erosion in the State are blamed on hydro–electricity projects and the felling of trees. Since hydropower can only be utilised in hilly areas its use could be seen as a cost of development; nevertheless ways have to be devised to minimise the ecological costs of such projects.

1.3 Research questions/hypotheses

a) The economic burden of dirty fuels on the rural poor, including women, is large in terms of sickness, working days lost and the opportunity cost of time spent in gathering fuel.

- What is the time cost of gathering fuels?
- What are the health impacts of dirty fuels?
- What is the economic burden of sickness and time spent gathering fuelwood?
- What do women do with the time they gain from fuel switching?

b) Market distortions aggravate the problem, as there is a willingness to pay more for clean fuels than the current subsidised quota price.

- To what extent are people willing to pay for clean fuels?
- What other improved distribution systems could be feasible on a sustainable basis?

c) Access to energy has an impact on the empowerment of women and their decision-making power.

- What is the role of women in decision-making within the household and outside?
- Does an improved energy service lead to social/economic empowerment of women?

d) The PDS (Public Distribution System) has an impact on usage of clean fuels in the state.

- What are the reasons for the communities not using the full quota of kerosene?
- What is the seasonal demand for kerosene?
- What are the suppliers' perspectives on the policy and any shortcomings and loopholes therein?

[4] According to the National Forest Policy of India, it is required to have minimum of 60% of the geographical area in hilly terrains under forest cover to maintain a proper ecological balance.

2 Study approach

2.1 Study approach and data collection methodology

This project partially depends on data previously collected in an earlier project; and a new gender survey, including the use of questionnaires and focus group discussions, was specifically completed for this research. The sampling procedure for the earlier study can be seen in Figure 2.1, and how the two databases complement each other is shown in Figure 2.2.

Database A

A substantial amount of information was collected in an earlier project (Parikh et al. 2001) through random but representative sampling in rural areas. The dataset collected is referred to in this report as **Database A**, and covers 9 districts, 54 villages, 712 households and 4100 individuals in rural Himachal Pradesh. It was an integrated survey where data on socioeconomic characteristics, types of fuels used in cooking, various symptoms of disease, expenditure on health and willingness to pay for cleaner fuels, were collected. The following aspects are included in Database A for the state of Himachal Pradesh:

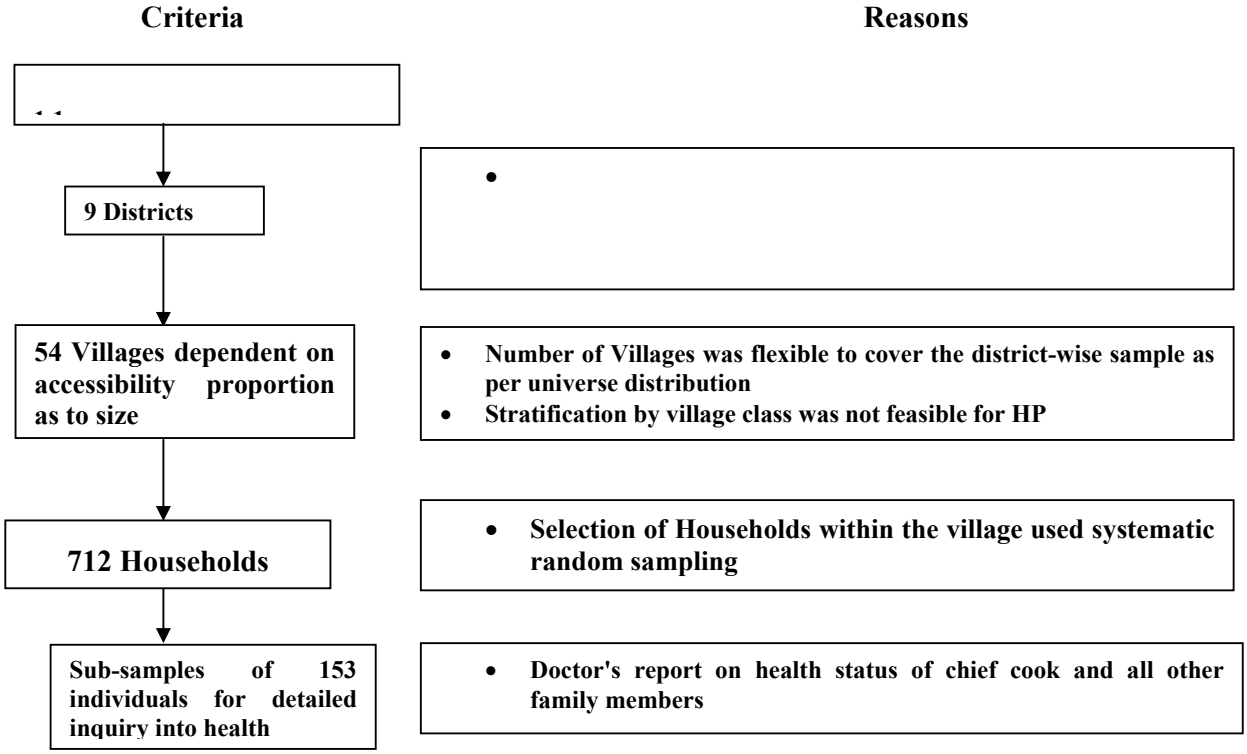
- 54 villages from nine districts, covering 4100 individuals from 712 households.
- Household assets: durables, livestock, land ownership, income, and number of rooms.
- Fuel-related: types of fuel - gathered or purchased, trips made and time spent in gathering, additional demand for clean fuels.
- Individual characteristics: gender, age, height, weight, smoking and cooking involvement.
- Health: expenditure on health and ability to afford medical treatment. Water-related diseases, working days lost due to illness.
- Environmental economics: willingness to pay for certain interventions, environmental priorities and many other variables at village, household and individual levels.

The survey was conducted at three levels, viz. household level survey - including individual responses on health status, village level survey, and a survey of nearby healthcare facilities which villagers use (primary health centres, public health centres, hospitals, etc.). The village level and Health Centre (HC) surveys were performed to validate data acquired at the household and individual level, and also to gain an overall picture of the area. This also helped in reducing the number of questions. At the household level, a multi-pronged approach was used to collect different types of information. The methods used were as follows:

- Face-to-face interviews with the main cook.
- Inquiry into symptoms and health assessment with measurement of weight, height and lung capacity with peak flow meter.
- Diagnostic tests[5] with medical professionals.

[5] These diagnostic tests give a rapid, convenient and/or inexpensive indication of whether a patient has a certain disease

Figure 2.1: Case study of Himachal Pradesh: sampling procedure



Database B

In addition to Database A, supplementary information to fill in the gaps with village-level information has been collected. Gender-specific data based on economic empowerment indicators have been collected through structured questionnaires and focus group discussions for gender and policy analysis. This analysis is based on indicators of gender equality access and control, sustainable freedom from daily drudgery at work, substitution of livelihoods, control of income etc. The key components of **Database B** (field survey data) are as follows:

- Gender-related survey taking into account the following factors:
  -Role of women in decision-making
  -Livelihood options
  -Benefits of clean fuels seen in terms of
    - Productivity (and income) gains
    - Education of girls
    - Entertainment
    - Health
    - Leisure
    - Socialisation
    - Involvement and decision-making in community activities

- Primary survey to estimate accessibility and use of clean fuel by households in two villages in two districts. A survey of the kerosene depots had already been completed.

The project has specifically been looking at gender and energy issues from the perspective of empowerment: what do women see and what do women themselves think of their 'own progress' –

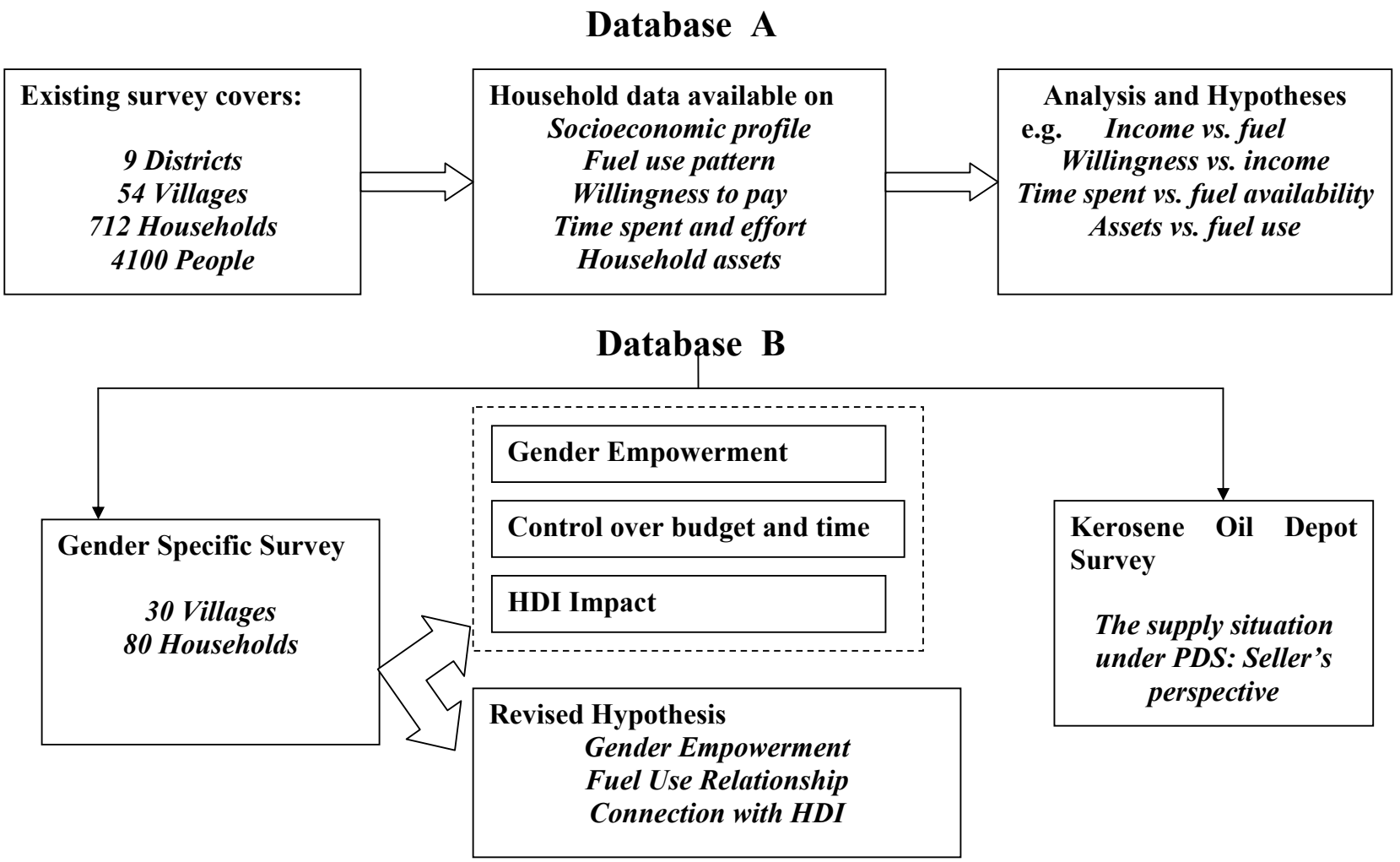
and not in terms of external indicators conceived by others. For this, the following indicators of economic empowerment have been identified and gender-specific data collected:

- Economic budget: access to and use of money by women
    - What is the role of women in decision-making about the purchase of assets, such as in a choice among LPG, a colour television or a motorcycle? Why is it that the woman does not have LPG to cook with even when the household has the purchasing power for telephones, colour televisions etc.?
    - How would women like to spend the household budget? Their preferences for food, education, health, jewellery, household items, fuel and water are examined.
    - Access to clean fuels and their availability has been ascertained by interviewing the PDS suppliers as well as women.
- Time budget: does the use of clean fuels save time?
    - Do women use the time saved through using clean fuels for leisure or for enhancing their livelihoods, and by how much?
    - Who collects clean fuels and what do the women plan to do with the leisure time after switching to LPG. If they have not switched, what is it that they would like to do if they had more time?

The analysis provides inputs for designing future strategies for human development indicators such as literacy and poverty. Finding policy options that are better targeted can be of immense benefit to the vulnerable groups consisting mainly of the poor and, in particular, women.

Figure 2.2: IRADE's case study in Himachal Pradesh

Database: A: Available database used with different perspective
B: Proposed database with gender specific features
HDI: Human Development Indicators – literacy, health, income



3 Empowerment of women at the State level

This section presents a comparison of the state of Himachal Pradesh with India as a whole, with respect to indicators of empowerment of women. This is expected to throw light on the critical linkages between women's empowerment, at the macro-level, and the availability of clean fuels, data on which have been collected as part of Database A, and further substantiated through field-based data in Database B. This analysis draws primarily on the National Family Health Survey-2 (NFHS-2) from 1998-99, which asked about women's participation in household decision-making, their freedom of movement, and access to money that they could spend as they wish, in order to assess women's autonomy and empowerment. The NFHS data was analysed in combination with Database A in order to gain an impression of women's empowerment in the state of Himachal Pradesh relative to the national situation.

Decision-making power and empowerment have significant impacts on the demographic and health-seeking behaviour of households due to greater relative control over fertility, contraceptive use, and by influencing attitudes (for example, towards fuels and stoves) and abilities (for example, the ability to obtain health services for themselves and their children) (*Sen and Batliwala, 1997*). Education, work participation, and exposure to mass media are some of the ways in which women gain status and autonomy, both important aspects of empowerment.

In the NFHS-2 survey, women reported on who in their households made decisions about the following: what items to cook, obtaining health care for herself, purchasing jewellery and other major household items, and her ability to go and stay with parents or siblings. The survey also asked women if they earned money and who decided how the money they earned is spent. In order to see if women were more empowered in Himachal Pradesh than in India as a whole, the following variables were examined:

a) Women's educational level
b) Exposure to mass media
c) Employment status
d) Women's decision-making power

3.1 Women's education level

The table below shows the literacy and educational attainment of ever-married women aged 15-49. According to NFHS-2 (1998-99), about 63.7 per cent of ever-married women aged 15-49 years in HP have some level of education, which is more than in other North India States (with the exception of Delhi) and All India (41.8%). In fact, in Himachal Pradesh the literacy rate had increased the most rapidly since the previous survey: NFHS-1 (1992-93).

Table 3.1: Educational attainment by ever-married women aged 15-49 years

Level of education	India	Himachal Pradesh
	%	%
Illiterate	58.2	36.3
Literate, but less than primary school complete	5.9	4.3
Primary school complete	13.4	23.6
Middle school complete	8.2	12.6
High school complete	7.4	15.6
Higher secondary complete and above	6.8	7.6

Source: NFHS-2, 1998-99

3.2 Exposure to mass media

According to the NFHS-2 study, more than 80% of ever-married women aged 15-49 years are regularly exposed to at least one form of media in HP. Regular exposure to TV and radio is quite high in HP, with more than 70% of women watching TV at least once a week. This is naturally linked to the fact that all the villages in the state are electrified, and that the majority of the households have invested in a television set. Hence, this empowerment indicator can be linked to the provision of clean energy: in this case electricity. Database B, which contains further information on the qualitative indicators of empowerment, such as women's participation in community-level meetings and their role in village-level decision-making, further qualified the nature of this empowerment. Exposure to print media, which is dependent on literacy, is quite high in HP. However, visiting the cinema or theatre is not very popular among women in HP.

Table 3.2: Media exposure of ever-married women aged 15-49 years

Exposure to mass media	India	Himachal Pradesh
	%	%
Reads a newspaper or magazine at least once a week	20.8	27.5
Watches TV at lest once a week	45.7	73.9
Listens to the radio at least once a week	36.5	56.5
Visits the cinema/theatre at least once a month	10.6	2.0
Not regularly exposed to any media	40.3	16.3

Source: NFHS-2, 1998-99

3.3 Employment status

Table 3.3 shows the work status of ever-married women (who could be widows) aged 15-49 years in HP. Women's involvement in formal labour is quite low in HP. The most common form of employment in the state is working on a family farm or in a family business.

Table 3.3: Work status of ever-married women aged 15-49 years

Work status	India	Himachal Pradesh
	%	%
Working in family farm/ business	14.4	11.8
Employed by someone else	19.7	8.6
Self-employed	5.0	0.4
Not worked in the past year	60.8	79.2

Source: NFHS-2, 1998-99

3.4 Women's decision-making power

As can be seen from Table 3.4, women in HP are involved in decision-making at various levels. Moreover, a large majority have access to money. A high level of control over decisions pertaining to themselves in reflected in their involvement in decisions such as purchasing jewellery, which indicates control over cash income, and interacting with friends and relatives.

Table 3.4: Ever-married women aged 15-49 years: involvement in household decision-making, freedom of movement, and access to money

	India	Himachal Pradesh
Involvement in decision-making	%	%
Percentage not involved in any decision-making	9.4	0.8
Percentage involved in decision-making on:	90.6	99.2
- What to cook	85.1	95.1
- Own health care	51.6	80.8
- Purchasing jewellery etc.	52.6	93.4
- Visiting and staying with parents/siblings	48.1	91.4
Percentage who do not need permission to:		
Go to the market	31.6	32.5
Visit friends/relatives	24.4	31.1
Percentage with access to money	59.6	80.1

Source: NFHS-2, 1998-99

3.5 Domestic violence

The experience of violence and the silent acceptance of violence by women undermine attempts to empower women and is seen as a barrier to the achievement of demographic, health and socioeconomic development goals. However, domestic violence is not a major issue in HP which has a very low incidence of domestic violence compared to India as a whole. Only 2% of women in HP were beaten or physically mistreated in the 12 months preceding NFHS-2 compared to a countrywide average of 11%.

Table 3.5: Physical mistreatment of ever-married women aged 15-49 years

Beaten or physically mistreated	India	Himachal Pradesh
	%	%
Percentage beaten or physically mistreated since age 15	21.0	5.8
Percentage beaten or physically mistreated since age 15 by:		
- Husband	18.8	3.9
- In-laws	1.8	1.2
- Others	3.1	1.5
Percentage beaten or physically mistreated in the past year	11.0	2.1

Source: NFHS-2, 1998-99

3.6 Mahila Mandal Protsahan Yojna[6]

With the objective of encouraging women's organisations (Mahila Mandals) to become involved in development programmes, in 1998-99 the Rural Development Department of HP introduced a new scheme entitled "Mahila Mandal Protsahan Yojna" aiming to create an awareness of various developmental programmes among the people and to encourage women's involvement in them. In addition to the aims of generating awareness among rural women of issues concerning family planning and child care, it also covered the promotion of small saving schemes, participation in literacy/post-literacy campaigns and informed them about social evils such as drinking, the dowry system and crimes against women. The funds under this scheme would only be given to registered Mahila Mandals, and on the basis of their performance in various developmental activities. The incentive money sanctioned under this scheme was to be utilised for creating community assets, purchasing utensils, dairies, furniture, musical instruments, organising cultural activities/awareness camps and conducting study tours within the State.

Presently, under this programme, the HP Government provides grants for the promotion/ strengthening of Mahila Mandals, for incentive awards to Mahila Mandals and for the organisation of skill/awareness camps for non-officials etc.

[6] English translation: women's groups' empowerment programme

4 Analysis of household survey results

This section discusses the analysis of the household surveys covered by Database A and Database B. Database A covers 6 districts, 54 villages and 712 households. Database B covers 2 districts, 30 villages and 80 households.

Database A: Household Survey

This part discusses the survey results and preliminary analysis, which familiarises us with the households, individuals and other characteristics.

4.1 Survey area profile

Nine districts, Bilaspur, Solan, Hamirpur, Sirmaur, Una, Chamba, Shimla, Mandi and Kangra were selected to provide a maximum spread within the State (see Table 4.1). These nine districts together contain 92% of the State's rural population. The survey reveals that the area has slightly more females than males in the population with 1036 females per 1000 males. The general characteristics of the districts are as follows:

Table 4.1: Sample coverage in Himachal Pradesh

Characteristics	Total	Study covered
Rural Population	4 670 000	4100 (0.09 %)
Number of villages	16 997	54 (0.3 %)
Estimated number of households	848 000	712 (0.08 %)
Average number of households per village	50	13 (26%)

Source: IRADe database A from field survey

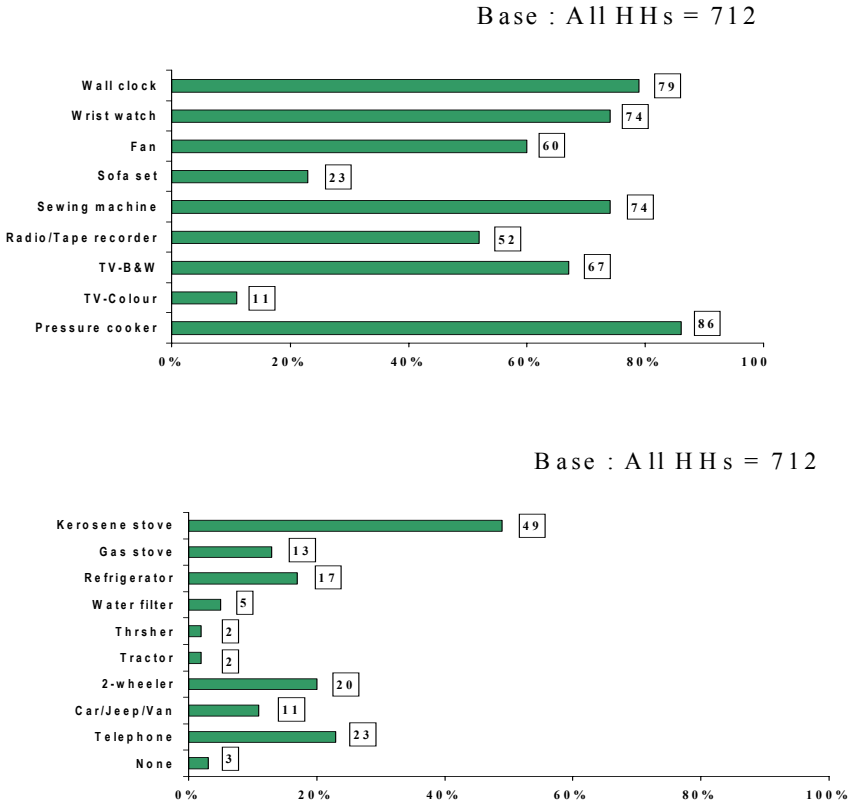
The survey also showed that most villages had some form of road network and modes of transportation. Sixty-four percent of the selected villages had a proper road within half a kilometre and another 18% a road within two kilometres. The sample areas also had good educational facilities. Seventy-three percent of the sample villages had primary schools, and 18% had both primary and secondary schools. However, only one village had a vocational training centre, and 9% did not have any school. Men are more literate than women, with 80% of males being literate compared to 69% of women. Almost all the sampled villages have healthcare facilities, and most of the villages are served by primary health centres/government hospitals/private hospitals. The typical distance to the nearest hospital is between 2 and 5.5 km. Pathological laboratory facilities are available to 27 percent of the villages within an average distance of 1.4 km.

4.2 Household durables

Statements about income are often found to be unreliable in surveys. A more reliable indicator of income is seen as ownership of consumer durables since the various durables owned by a household reflect its purchasing power. The survey reveals that most of the households (79%) own a wall clock and 74% a wristwatch (see Figure 4.1). Over half have fans and a radio or cassette player. Fifty-four percent of households have a gas stove and 49% a kerosene stove although these are not used for all family cooking (see Section 4.3). At least the 49% of households currently owning a kerosene stove could be expected to abandon cooking with biofuels and switch to the next cleaner fuel on the energy ladder (i.e. kerosene) if this was available in sufficient quantity. The issue of access to an adequate supply of kerosene is explored in the kerosene oil depot survey (Section 7).

The questionnaire-based survey, as part of assembling Database B, further clarifies issues related to investment choices between household durables, between common usage durables (fan/ clock/telephone/radio/TV), farm equipment, and kitchen appliances and women's energy saving and convenience devices (gas stove/kerosene stove/refrigerator).

Figure 4.1: Durables owned (% households)



4.3 Fuel-use characteristics

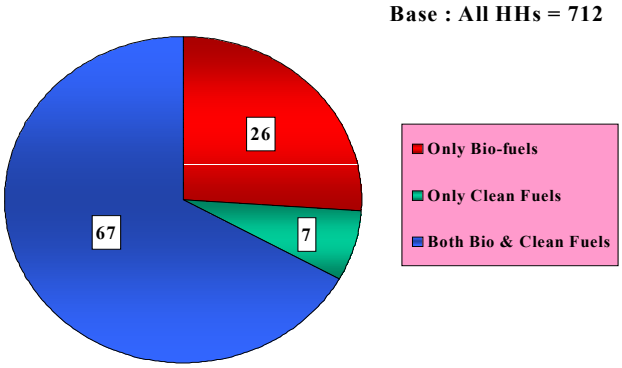
Characteristics of fuel use include issues such as which is the main fuel used for cooking, the time and effort involved in getting that particular fuel, and the availability of other type of fuels in the area. These are discussed in this section.

4.3.1 Fuel consumption pattern

In rural Himachal Pradesh, there is significant use of clean fuels. Distribution systems for LPG and kerosene are quite good. However, biofuels remain the most common cooking fuel, with about 93% of households using fuelwood. Sixty-seven percent of households use both clean and biofuels, but only 7% use clean fuels exclusively (see Figure 4.2). Use of dung cakes for cooking is not very common in the area (only 19% of households). Kerosene is used for cooking in 31% of households.

The results of the study show that fuelwood is the main source of cooking fuel with an average consumption of 7.4 kg per household per day in the area. Where a combination of clean fuels and biofuels are used, kerosene is mainly used for lighting and for cooking snacks or very small meals. The main meals in such households are cooked using fuelwood. This is reflected in the very small amounts of kerosene consumed per household (on average 7.8 litres per household per month). The reasons for the excessive dependence on biofuels (despite the availability of cleaner fuels such as LPG and kerosene) as well as its implications for women in terms of time spent, drudgery, and other health impacts are addressed through the focus group discussions and the questionnaire survey in Database B. This also raises a critical question concerning the discrepancy between the purported policy of clean fuel for all as against the reality of the situation on the ground. The question of how policy translates into implementation is explored through the kerosene oil survey.

Figure 4.2: Fuel consumption pattern



Assuming that lighting uses say 3 - 5 litres of kerosene per household, this suggests that only about a quarter of households use any kerosene for cooking (see Table 4.2).

Table 4.2: Kerosene consumption

Litres of Kerosene per month	Households
Less than five litres	145
Five to ten litres	59
Ten to forty litres	23

Source: IRADe database A from field survey

4.3.2 Fuelwood collection

The 94% of households that use fuelwood generally gather it from village and government forests, with very few households purchasing fuelwood. Usually only one person goes to collect the wood although, in some cases, two people are involved. On average, fifteen trips per household are made in a month to collect wood. In most of the villages the distance travelled to collect wood is less than 2 km (Table 4.3). The average distance travelled to collect fuelwood is about two kilometres and so in a month about 30 km has to be covered. The average time spent on collecting wood is around 2.7 hours per trip.

Table 4.3: Time and effort for collection of fuelwood

Districts	Total	Bilaspur	Solan	Hamirpur	Sirmaur
Base : HHs always/mostly gather wood	617 %	45 %	50 %	51 %	46 %
HHs collecting to 1 km	42	27	28	65	26
HHs collecting between 1 - 2 km	31	35	26	22	24
HHs collecting between 2 - 3 km	12	16	20	6	20
HHs collecting from more than 3 km	14	20	26	6	30
Average time per trip (hours)	2.7	2.6	2.9	2.5	2.8
Average time spent per month per household (hours)	40.8	25.5	45.0	34.3	50.7
Districts	**Una**	**Chamba**	**Shimla**	**Mandi**	**Kangra**
Base: HHs always/mostly gather wood	53 %	58 %	65 %	94 %	155 %
HHs collecting from up to 1 km	21	36	23	65	52
HHs collecting between 1 - 2 km	51	40	40	26	28
HHs collecting between 2 - 3 km	17	14	18	1	8
HHs collecting from more than 3 km	11	10	18	4	12
Average time per trip (hours)	2.8	2.8	3.2	2.4	2.5
Average time spent per month per household (hours)	29.7	53.2	57.3	32.9	37.8

Source: IRADe database A from field survey

4.3.3 Access to and extent of use of clean fuel

The availability of clean fuel was high in the study area. The kerosene public distribution system (PDS) is quite good. However, about one in every eleven of the sample villages did not receive kerosene regularly through the PDS. In the survey area therefore about 91% of villages have a reliable infrastructure for kerosene. While at least 49% of households have *facilities* for using kerosene for cooking, only 31% are actually using kerosene for cooking.
Clean fuel use is greater among higher income groups. Whereas only 8% of households with Annual Household Incomes (AHIs) below Rs. 6000 use clean fuels, 55% of households with AHIs greater than Rs. 30 000 do. This again raises the issue of targeting subsidies, and to whom the kerosene subsidies are actually going.

Sixty-six percent of multiple fuel users (users of both clean fuel and biomass) were drawing kerosene against their quota. Only 4% of households were buying on the open market, and then only an average quantity of 0.7 litres per month for cooking.

4.3.4 Reasons for not using clean fuels

In the survey area, 191 (27%) of the households surveyed are not using clean fuels. Of these, only 22% were unwilling to switch from their current fuel. Various reasons were given for not using clean fuels and these are summarised in Table 4.4. Approximately 64% of households were of the view that clean fuels are very expensive, 22 % were scared / hesitant to use them while 12% said that fuels were not always available.

Table 4.4: Reasons for not using clean fuels

Reasons	No. of households	Percent of households
Not always available	22	11
They are very expensive	123	64
Scared or hesitant of using	43	22
Taste of food changes	2	1
Burning wood acts as an insect repellent	4	2

Source: IRADe Database A from field survey

The availability of clean fuel in the rural areas of HP is not a problem. Of the many options offered, only two reasons stand out, namely the lack of affordability and the hesitance in using. Other conjectures, often found in the literature, such as cooking with kerosene will change the taste of food or wood smoke acts as an insect repellent, received virtually no support in the survey.

Database B: Household Survey

4.4 Survey structure

To examine the demand situation, the research study focussed on two districts, namely *Shimla* and *Sirmour*. The former is relatively urbanised and also has better connectivity in terms of roads and transportation. Through cluster sampling, the appropriate villages were identified and data then collected using a previously designed and tested questionnaire. Interviews with key personnel from the villages were also conducted. Statistical tools were used to analyse the data.

Data were specifically collected to address issues regarding gender analysis and women's voices. A household survey forms the major input into Database B, which explores gender and empowerment aspects in HP. The second component is a study of kerosene oil depots, which was conducted to examine the supply situation. In the following sections we report on the results from the in-depth household survey conducted to examine the demand-side situation. The survey dealt with the following gender-related aspects:

-Role of women in decision-making;
-Livelihood options; and
-Health.

4.5 Village profile

In Shimla district, 13 villages were covered by the survey including nine revenue villages[7] and four hamlets. Whereas in Sirmour district, 17 villages were covered including five revenue villages and twelve hamlets. This composition reflects the populations of the two districts.
It was also noted that scheduled caste[8] composition in Shimla varies from 0 - 40% in the villages and from 25 – 100% in the hamlets of the district. In Sirmour, the caste composition varies from 5 – 80% in the villages and 0 – 100% in the hamlets.

[7] Defined in the Census of India, "A revenue village has definite surveyed boundaries recognised by district administration. The revenue village may comprise several hamlets but the entire village will be treated as one unit".

[8] Scheduled Castes & Scheduled Tribes are communities that are accorded special status by the Constitution of India. These communities were considered 'outcastes' in the Indian subcontinent for thousands of years. These castes and

4.6 Respondents and household profiles

In Shimla, 116 people responded to the survey of which 73 were males, and in Sirmour 80 people responded out of which 68 were male. The average ages of the respondents in Shimla was 45 (men) and 40 (female), whereas in Sirmour both sexes' average age was 42. The respondents' profiles show a 75:25 caste affiliation in favour of the general caste. Respondents in Sirmour are largely dependent upon agriculture for their main source of livelihood, while in Shimla a large number are in government service. This latter occupational option resulted in there being a relatively large number of male respondents in Sirmour. Those respondents with an assured monthly income in Shimla consume more LPG than those in Sirmour.

4.7 Energy usage in the study area

The 2002 HP State Human Development Report observed that if LPG and Kerosene supply were increased by 10%, 20% or 30% the corresponding reduction in fuelwood consumption would be 220, 440 and 661 thousand tonnes respectively.

The profiles of fuel use generated during the field survey however highlight that:

1. Fuelwood is the predominant fuel used for all purposes in both districts.
2. Consumption of wood for cooking and boiling (water, milk etc.) is higher in Sirmour than in Shimla with 57.5% of respondents in Sirmour using wood for cooking as against 37.5% of respondents in Shimla.
3. LPG consumption is very low in Sirmour (4.5% use for cooking) as against Shimla (where 42.5% use LPG) which explains the higher wood consumption in Sirmour than in Shimla (Table 4.5a)
4. The high ownership of gas and kerosene stoves is not reflected in high consumption. This could be due to poor availability of these fuels, or that they are used sparingly in emergencies and on special occasions.
5. On average, a gas (LPG) cylinder can last up to six months in low-income homes whereas the same lasts for no more than a month in well-to-do homes.
6. LPG consumption has increased and kerosene consumption has decreased in both districts over the last five years.
7. Also evident from Table 4.5a is the fact that, for lighting purposes, electricity is the most common fuel used. The completed rural electrification in Himachal Pradesh has ensured easy accessibility.
8. Biogas is conspicuous by its absence in Sirmour. In Shimla District, especially in the villages of Jalel, Anandpur and Kot, 70% of respondents reported non-functional biogas plants. It was also reported that these plants had been set up with subsidies from the government.
9. The main livelihood sources reported were largely own businesses, tea stalls, *dhabas*, and ration shops plus agriculture and government service. In such enterprises, electricity was used mainly for lighting and operating radios and televisions. Such enterprises that used stoves used charcoal and kerosene as fuel. The number of such enterprises using charcoal as fuel for stoves was higher in Shimla (44%).

tribes have traditionally been relegated to the most menial labour with no possibility of upward mobility, and are subjected to extensive economic and social disadvantage and discrimination, in comparison to the wider community

Table 4.5a: Fuel choice by end-use activity (%)

Fuel Type	Cooking		Boiling		Lighting		Livelihood/Business	
	Sh	Si	Sh	Si	Sh	Si	Sh	**Si**
Wood	37.5	57.5	54	68	0	0	8	**32.5**
Crop residues	0	0	3	7.5	0	0	0	**8**
Dung cake	0	1.5	0	0	0	0	0	**0**
Kerosene	12.5	20	4	12.5	2.5	24	20	**35**
Biogas	0	12.5	1.5	0	0	0	0	**0**
LPG	42.5	4.5	8.5	0.5	0	0	20	**12.5**
Electricity	7.5	4	29	11.5	97.5	84	8	**3**
Charcoal	0	0	0	0	0	0	44	**9**
Total %	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: IRADe Database B from field survey

In respect of procuring fuelwood, it is notable that in Sirmour there is relatively greater dependence on own lands and village commons, whereas in Shimla District government forests were a more significant source (see Table 4.5b).

Table 4.5b: Source of fuelwood

Source of fuelwood	Response (%)	
	Shimla	Sirmour
Own Land or nearby	26	31.5
Village forests	27	35
Market	0	0
Government forests	47	25
Other*	0	8.5
Total	100	100

*Other includes occasional procurement from relatives. Source: IRADe Database B from field survey

4.7.1 Comparison between Database A and Database B

There is an apparent difference in the types of fuel used in the two databases. Database A shows that most of the population, both in Shimla (82.3%) and Sirmour (90.2%), used fuelwood for cooking and boiling etc., whereas Database B shows that only a little over half the population of Shimla (54%) and Sirmour (68%) use fuelwood for these activities. This difference is due to the fact that Database A includes all fuels used by a household for cooking etc. whereas Database B records only the main fuel used.

4.8 Gender differences in workload and responsibility

Agriculture is the mainstay of the local populations (particularly in Sirmour) and most are engaged in agricultural practices throughout the year. From a gender analysis perspective the activity profile revealed that the following activities are overwhelmingly undertaken by women. The women – men ratio was as high as 95:5 in Shimla district and 80:20 in Sirmour.

- Clod breaking/land preparation
- Sowing/transplanting
- Gap filling

- Intercropping
- Weeding
- Staking
- Irrigation
- Harvesting
- Selection and storage of seeds
- Fencing

Ploughing and applying fertiliser were the two exceptions – these were generally undertaken by men and older boys although women sometimes helped in fertiliser application.
Two points should be noted: firstly, those agricultural practices that have an essentially ongoing nature and last throughout the season are largely the responsibility of women; and secondly, that the marketing of surplus crops is the responsibility of men as is the responsibility for marketing cash crops.

Forest related activities were reported as:

- Fuelwood collection;
- Fodder collection; and
- Collection of minor forest products.

While fodder collection was the responsibility of women and older men, both of who performed this task at least twice a week; the collection of minor forest products was the exclusive responsibility of older men and was undertaken only seasonally. Fuelwood collection was largely the responsibility of women (and also occasionally children in Shimla district). Fallen twigs and small dried branches are collected for fuelwood purposes. After leaves have been eaten as fodder the remaining twigs/branches are used as fuelwood. Timber for construction is the responsibility of men and older boys.

Animal Husbandry entailed the following activities and was the responsibility of women alone.

- Tending to cattle in sheds;
- Stall feeding;
- Removing dung from shed; and
- Milking.

Supervising animal grazing was an activity carried out by older men and also by school children, especially during vacations and after school. In Shimla, milk is sold in a nearby market. The respondents from Sirmour reported that since the market was at a considerable distance they preferred to sell *ghee.* This fetches a better price (Rs. 200 – 250 per kg) as opposed to about Rs. 10 per litre for milk. The marketing of milk or *ghee* is done by men and children, especially boys help in Shimla district while on their way to school or college.

On the **Home Management** front the activities listed below were performed exclusively by women:

- Dung-cake making
- Food preparation
- Post-harvest processing
- Child care
- Hygiene/health (own plus family)

The following home management activities were shared by men and women:

- Education (of children)
- Water fetching – men helped if distance to be covered was large.

The following two activities were the sole responsibility of men:

- House construction (some tasks such as the curing of walls also involved women)
- Market-related (sale of agricultural produce, purchase of household items)

This activity profile clearly indicates that women do not have leisure time to spend away from their homes.

Livelihood Options especially for women were reported to be in the fields of post-harvest management and handicrafts. Given the time-use pattern determined by the activity profile outlined above, another option is diversification of farm and non-farm activities.

4.9 Health issues

- In Shimla, the reported frequency of health problems was lower than in Sirmour and evidence suggests that this is because LPG is more commonly used.
- In Sirmour, coughing afflicted older men and women more than younger men. In personal communications with key persons it was reported that tuberculosis was also prevalent in the area of most of the villages. However, it was not possible to determine whether the reported coughing was due to TB alone or whether it was being aggravated by fuel smoke.
- Respondents did not cite health problems as an issue in fuel procurement.
- It was observed by the investigators that hygiene was a problem particularly in Sirmour

Respondents in Sirmour district have relatively poor connectivity being some distance from a proper road. The following two transport factors are key in respect of villages in this district:

a) difficult terrain; and
b) affordability.

Being dependent largely on rain-fed agriculture, households in Sirmour have low incomes, and LPG is simply unaffordable. In addition, the journey to Timbi (location of the Civil Supplies Corporation) is through wildlife-infested forest along a narrow track. Consequently, it was reported during the survey that children are never sent to fetch kerosene – it is always the male head of household or another adult male member who goes when required. It was reported that kerosene was readily available at the oil depots, but that there was a need for it to be available closer to the homes. In this regard, the key informants (from the Civil Supplies Department) did point out that once the road is widened and metalled it would be possible to send the tankers to almost all villages.

Conversely, in those villages that are located close to the State highway, 75% of those questioned had LPG equipment, and only 9% had kerosene stoves. The switch to LPG was reported to have accelerated in the last five years. However, fuelwood was still being used: on average approximately 8–12 kg of wood per day by a family of five during winter and 6-9 kg in the summer. Perhaps surprisingly, even those respondents who have moved over to clean fuels did not sight health considerations as a reason. This leads naturally on to the next section on the benefits of clean fuels.

The **benefits of clean fuels** are seen in terms of:

- *Productivity gains*: respondents using LPG reported that a single cylinder lasted between five and six months in low-income households but perhaps only for a month in higher income households. This limited use was because food cooked over wood is relished, and so the gas stove is sparingly used, mainly for making tea, especially when guests arrive. Consequently, productivity gains in terms of time released from kitchen work and fuelwood collection were observed only rarely, and only in households in the Shimla district.

- *Education of children (girls)*: It was encouraging to find that parents send their children (both boys and girls) to school and that children help with housework only before or after school hours and during vacations. When fuelwood was used, girls were expected to help in its gathering.

- *Leisure and Socialisation*: The activities of rural agricultural households as described in the section above leave little leisure time, with heavy daily as well as seasonal workloads. The use of clean fuels provides them with some leisure time which they can use for socialisation purposes.

4.10 Respondents' comments

Respondents were of the view that:

1. A complete shift to LPG would not be possible because it is too expensive.
2. Availability of kerosene and LPG is not the problem; rather access is the key issue, especially in Sirmour where respondents have to walk long distances to collect their allocation.
3. Household poverty has invariably led to indebtedness and in such a situation LPG becomes a luxury that can be ill afforded.
4. Women belonging to *Mahila Mandals* were noted, but it was also pointed out that membership followed social affiliations, and disbandment and re-registration of new *Mahila Mandals* was not uncommon.
5. The policing role of the State through its forest guards poses problems for women who have to spend more time in fodder and fuelwood collection.
6. An optimistic view of the inexhaustible character of forest resources was reported.

4.11 Conclusions

Himachal Pradesh has a high level of progress when compared to other states. This view is substantiated by our survey in Database A that shows that Himachal Pradesh is a well-connected state with most villages having some sort of road network and transportation. Education provision as well as health care facilities are also satisfactory in the State, with almost all villages having at least a primary school and a healthcare facility. The standard of living and the purchasing power, both indicators of income, show that the people in Himachal Pradesh have a relatively high standard of living with more than 50% of households owning durables such as a wall clock, fan, television, radio or cassette player. Although few own a gas stove, it can be expected that the 49% of households who already have a kerosene stove will move to this next rung on the energy ladder since Database B shows that the ownership of gas stoves had increased substantially between the two survey dates.

In terms of fuel consumption, it was observed that fuelwood is still the main source of cooking fuel, with 93% people using fuelwood to some extent, and only 7% using exclusively clean fuels. This is reflected in the fact that consumption of fuelwood is 7.4 kg per household per day whereas the consumption of kerosene is only 7.8 litres per household per month. Database A also indicates the toll on human resources in terms of the time and effort spent in fuelwood collection with almost 30kms being travelled and 41 hours spent in a month by the typical household. Although there is a good infrastructure for kerosene oil with almost half of the area having facilities to obtain it, only 30% of households were actually using it. The main reason given was that it is very expensive.

The information gathered in Database B highlights the views of the local people regarding preferred fuels, the importance of various health problems and the sharing of responsibilities among household members. It appears that those who are using LPG still suffer from some of the same drudgery and are not reporting any extra time available as an additional benefit. This could be for two reasons:

- Fuelwood is still required for water and space heating.
- Those with LPG may be cooking more dishes, rather than just one simple one as cooked by the poor.
- In terms of health, people seem more concerned about the various pains resulting from carrying heavy headloads than respiratory diseases.

5 Health impacts and gender linkages

5.1 Introduction

The health impacts of indoor air pollution due to the use of biofuels can largely be attributed to exposure to smoke. Since a large number of variables are involved in linking air pollution with human health, it is very difficult to prove that air pollution has a clearly demonstrable effect on human health. Many studies in the past have tried to link air pollution with respiratory diseases (Ostro, 1995; Smith, 1987, 1996; NFHS, 1995). In this study we have tried to link health impacts and the effect on women with exposure to indoor air pollution as well as other confounding socioeconomic variables.

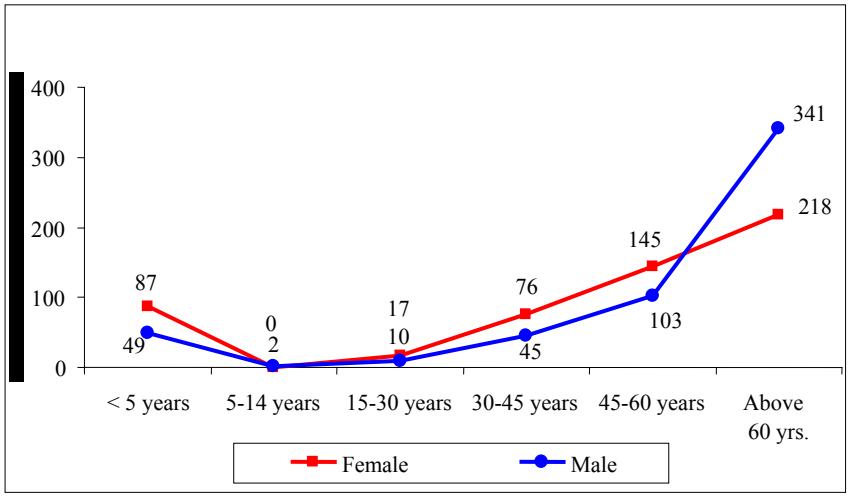
Data related to health status were collected through personal interviews, a peak flow meter was used to assess lung function and check-ups were arranged with doctors for symptomatic cases. To obtain an overall view of the area, data were collected from health centre (HC) records and interviews with employees. We first overview the health profiles obtained from selected HCs.

5.2 Gender and health

5.2.1 Vulnerability risk

It can be observed in Figure 5.1 that girls aged below five, who generally receive less medical care than boys, are almost twice as likely as boys to show symptoms of respiratory problems. Subsequently, at school age and youth the gender differences reduce, but females between 30-60 years are at significantly higher risk than men in the same age group. It is interesting to note that above the age of 60 men are at much greater risk than women.

Figure 5.1: Number with symptoms per thousand individuals by gender and age



5.2.2 Impact of literacy

Table 5.1 shows that literate women who use biofuels are at much lower risk (4.8%) than illiterate women (20%). It was interesting to note that literacy level has an influence on respiratory symptoms even in households that use clean fuels, with illiterate women being at higher risk (12.5%) than literate women (5.2%). The risk of having respiratory symptoms is much higher among illiterate males than their illiterate counterparts, probably because, in general, economic conditions improve with education level.

Table 5.1: Impact of literacy on health of females

Households using:	Illiterate females		Literate females	
	No. of women	No. with symptoms	No. of women	No. with symptoms
Biofuels for cooking	175	35 (20.0%)	187	9 (4.8%)
Clean fuels for cooking	16	2 (12.5%)	58	3 (5.2%)

Source: IRADe database A from field survey

5.2.3 Smoking habits

The risk of having respiratory symptoms is significantly greater among smokers (females and males) than among non-smokers. It is interesting to note that women smokers are at much greater risk (30%) than male smokers (17%). Also, it can be seen in Figure 5.2 that women non-smokers are at much greater risk (5.7%) than male non-smokers (2.9%), which could be due to the fact that women are exposed to biofuel pollution for longer hours as they are the main household cooks.

Figure 5.2: Proportion with symptoms by smoking habits and gender

5.2.4 Linkages of health with biofuel use

The linkages between health and biofuel use were examined on the basis of self-reported symptoms of respiratory diseases. It was observed that male smokers are highly prone to most of the disease symptoms compared to male non-smokers and to females. It is worth noting that the difference is small between male non-smokers and females for all symptoms despite women's exposure to indoor air pollution while cooking. The likelihood of having symptoms related to indoor air pollution appears to be reduced through having a separate kitchen, good ventilation and using clean fuels.

5.2.5 Comparison of female and male respiratory health in the 15-30 age group

Females in this age group have a prevalence rate for any respiratory symptom of 1.7% (12 cases out of 697) whereas males in this age group have a slightly lower prevalence rate (1.0%, 6 cases out of 603). Illiteracy is found to be the most significant discriminating characteristic for this age group, which may be because illiterate females are engaged more in household work including cooking. The fuel index, which is a composite measure of exposure to indoor air pollution, not surprisingly is another discriminating characteristic.

5.2.6 Comparison of female and male respiratory health in the 30-45 age group

In this age group, females have a quite high prevalence rate of respiratory symptoms (7.6%, 30 cases out of 396) whereas men have a significantly lower prevalence rate (4.5%).

6 Women and fuel usage assessed at the State level

6.1 Introduction

This section aims to throw light on the linkages between women's preferences and the availability of clean fuels, data for which were collected as part of Database A, and further substantiated through field-based data collected towards Database B. Decision-making power and empowerment have significant impacts on the demographic and health-seeking behaviour of household members by influencing their attitudes (for example, towards fuels and stoves) and abilities.

6.2 Women and fuel usage

6.2.1 Responsibility for the procurement of fuel

In both the districts investigated in detail, it was observed that women had the prime responsibility for fuel procurement (see Table 6.1), and especially women aged between 29 and 42. The procurement of wood, agricultural residues and dung cakes was primarily the responsibility of women and older men, with older men especially responsible for the collection of wastes such as fodder remains. The procurement of kerosene and LPG was largely the responsibility of young men, with no involvement of women in procuring LPG.

Table 6.1: Family members responsible for the procurement of fuel

Fuel Type	Gender (%)				Age (Average)			
	Shimla		Sirmour		Shimla		Sirmour	
	Male	Female	Male	Female	Male	Female	Male	Female
Wood	38	62	48.5	51.5	53.5	29	26.5	34.5
Agriculture residues	24.5	75.5	36	64	19	32.5	31.5	35
Dung cakes	4	96	18.5	81.5	57	34	47.5	29.5
Kerosene	58.5	41.5	62	38	21.5	36	23	36.5
LPG (for cooking)	100	0	100	0	29	NA	31	NA
Others *	60	40	53.5	46.5	51.5	41.5	41.5	39

* includes fodder waste and other waste wood. Source: IRADe Database B field survey

6.2.2 Difficulties in fuelwood collection

The difficulties in collecting fuelwood in the district of Shimla arose mainly in searching and gathering fuelwood, and the effort involved in transporting it, and the consequent time taken (Table 6.2). Concern over the time involved is very high and dominates all the other problems showing that as the economy improves the value of time becomes a factor. Surprisingly, the physical stresses and strains are seen as less important. Yet, later in the health tables one sees that physical strain does appear to be a major factor. That is, while it is a prominent issue among the health aspects, health in itself is not.

Table 6.2: Difficulties in collection of fuelwood

Problem	Response (%)	
	Shimla	Sirmour
Walking	3	5
Searching and Gathering	31	24
Carrying Heavy Loads	20	19
Time Taken	32	29
Physically Strenuous	11	10
Other*	3	13
Total	100	100

* includes fear of being caught by guards and social ban. Source: IRADe Database B field survey

6.2.3 Involvement of females in cooking

In most households, the main cook is a female aged above 15 years. Females below the age of 15 generally only assist in cooking. About 70% of women in the 30 – 40 age group are involved in cooking and usually as the main household cook (see Table 6.3). Those who are the main cooks have a greater risk of respiratory symptoms. The average total time spent in cooking meals was about 3 hours 25 minutes a day. Therefore, cooks are exposed to a smoky atmosphere for a considerable amount of time, which may well affect their health. Generally men are not involved in cooking at all.

Table 6.3: Cooking involvement of females in different age groups

Age group	Unit	Involvement in cooking Base: 1509			
		Chief cook	Always assist	Sometimes assist	Not involved*
10 - 15 yrs.	%	2	7	69	22
16 - 20 yrs.	%	13	50	20	17
21 - 30 yrs.	%	51	14	5	30
31 - 40 yrs.	%	68	8	5	19
41 + yrs	%	28	11	8	53

*Females over 15 years of age who are not at all involved in cooking represent those women also who had cooked in past as chief cook but currently not involved due to old age or some other reasons
Source: IRADe Database A from field survey

6.2.4 Willingness to reduce smoke pollution

In order to reduce smoke pollution it is important that fuelwood use is reduced, and the use of clean fuels increased. The respondents to the surveys in the two districts were asked their views, and in urban Shimla an overwhelming 83% were ready to shift to clean fuels, time saving being the chief reason. However, in the less urban Sirmour, people were less willing to shift to clean fuels (43%). The main reason cited in both places for not changing to clean fuels was that they were expensive (Tables 6.4a and 6.4b). The distance to the fuel supplier was another reason given for an unwillingness to shift to clean fuels.

Table 6.4a: Willingness to shift to clean fuel (Shimla)

Yes (82.5%)		No (17.5%)	
Reason	Response %	Reason	Response %
Convenient (to turn on/off)	18	It is expensive	49
Time saving	39	The supplier is too far	5
Cleaner household	36	Supply is inadequate	7.5
Easy accessibility	7	We do not need it	26
		We forgo our ration	12.5
Total	100	Total	100

Source: IRADe Database B from field survey

Table 6.4b: Willingness to shift to the clean fuel (Sirmour)

Yes (43%)		No (57%)	
Reason	Response (%)	Reason	Response (%)
Convenient (to turn on/off)	22	It is expensive	42
Time saving	37.5	The supplier is too far	37.5
Cleaner household	38.5	Supply is inadequate	0
Easy accessibility	2	We do not need it	19
		We forgo our ration	1.5
Total	100	Total	100

Source: IRADe Database B from field survey

6.2.5 Willingness for other interventions to avoid smoke

In all 204 households, residents indicated a willingness to take action to reduce smoke. Those who are willing would like to spend on the items shown in Table 6.5. It is interesting to note there is a greater willingness to pay for ventilation (46%) rather than for improved stoves (17%) Even fitting a chimney was given preference over having an improved stove. Some respondents were willing to consider having more than one improvement.

Table 6.5: Improvements for reducing kitchen smoke

Improvements	Number of respondents	Percent of respondents
Fitting a window/ventilator	94	46
Fitting a chimney	73	36
Installation of improved chulha	34	17
Fitting a door	3	1

Source: IRADe Database A from field survey

The costs of the improvements to reduce smoke in the kitchen, as estimated by the respondents, were associated with the present living conditions, i.e. kitchen type (kachcha, pucca or semi-pucca). The average estimated cost varies from Rs. 1333 to Rs. 2514. As against this, they were willing to spend on average Rs. 1250 and Rs. 1505 respectively for kachcha and pucca type kitchens.

6.2.6 Awareness of clean fuels

The respondents in the study were asked about the awareness of the following clean fuels:

- LPG
- Biogas
- Electricity
- Solar appliances

Respondents were generally aware of the above-mentioned clean fuels, and many respondents in the more-urbanised towns like Shimla have converted to clean fuels. The reasons cited were easy availability, time saving and cleaner households.

6.2.7 Main health problems related to fuelwood use

The main health problems related to fuelwood use cited were mainly physical strains in terms of backache etc. as well as headaches. Encounters with wild animals and snakes were also a significant concern while other health effects included stinging eyes and coughing which mainly result from burning fuelwood (see Table 6.6).

Table 6.6: Main health problems related to fuelwood use

Problem	Response		Frequency of Occurrence (%)					
			Daily		Once a Week		Quarterly	
	Sh	Si	Sh	Si	Sh	Si	Sh	Si
Neck Ache	12	4	0	5	24.5	38	75.5	57
Headache	32	9	24	12.5	48	70	28	59.5
Backache	18	21	64	39	22	35	14	26
Bruises	7	5	0	0	82	78	18	22
Encounters with wild animals and snakes	2	14	0	0	0	42	100	58
Burning eyes	25	23	1	0	64	72	35	28
Coughing	9	26	42	65	50	30	8	5

Note: Sh. = Shimla; Si = Sirmour Source: IRADe Database B from field survey

7 Kerosene oil depot survey

Kerosene oil in the State is distributed by means of the public distribution system (PDS) wherein approved kerosene depots sell kerosene at subsidised rates. The kerosene oil depot survey, one of the two components making up Database B, examines the supply side situation. This section presents the findings of the kerosene depot survey with the objective of comparing the stated clean fuel distribution policy with the actual status on the ground in terms of delivery mechanisms, availability, and access for the poor. The present research effort is part of a larger initiative entitled "Impact of Fuel Scarcity and Pollution on Rural Poor: A Comparative Analysis of Vulnerable Groups in Himachal Pradesh". To fulfil the overall objective, a specific sub-objective, which the methodology adopted has to address, has been set. This is to understand the mechanisms of the ration supply system from the suppliers' point of view and compare it with the point of view of consumers.
The number of households served by retail depots in the district of Shimla is approximately 700, and in Sirmour district approximately 1500.

7.1 Methodology adopted for the kerosene oil depot survey

To examine the supply situation, the present research identified two districts for data collection, namely *Shimla* and *Sirmour*. The former is relatively more urbanised and also has relatively better connectivity. Through cluster sampling, the required depots were identified and data collected using a pre-designed/pre-tested questionnaire. Secondary sources were used to record additional information: e.g. government notifications, list of depots (*Annex 2*) and interviews with personnel from the concerned government department. Statistical tools were used to analyse the data. The findings are reported below.
One aspect of the supply side situation that should be clarified refers to the 'agent', i.e. the person who purchases the kerosene from the depot. In Shimla district, the depot owners reported that the usual practice was for men, and in some cases boys on their way home from senior classes (i.e. VIIth standard onwards), to collect and carry the kerosene home. In the district of Sirmour, the depot owners surveyed reported that the usual practice was for men to come to purchase kerosene, with children only doing so very occasionally.

7.2 The public distribution system: sellers' perspective of the kerosene supply situation

Twenty per cent of the cooperative societies have a kerosene dealership and sell kerosene on the open market at commercial rates, while 80% of them do not and confine themselves to supplying the subsidised rations.

a) Kerosene distribution: policy and reality

Kerosene oil is distributed through the PDS system only to those families who have a Ration Card, and the amount allocated is independent of family size. The families who do not have a ration card can only buy kerosene on the open market. The monthly quota for individual family is as follows:

- 20 litres per month for a family having no LPG cylinder;
- 3 litres per month for the family having a single LPG cylinder;
- Nothing for families with two or more LPG cylinders.

Since 1998 the average demand has fallen back to around twelve litres per household per year (from our field survey) because kerosene prices have increased to Rs. 10 per litre and LPG is more readily

available. Before 1998, the average usage was 20 litres per household per year because the price was lower at Rs. 3 per litre, despite the availability of kerosene being less. The demand fluctuates according to season as can be seen in Table 7.1. It is low in the summer, medium in the rainy season and highest in the winter season when more than 80% of the quota is demanded. Despite demand being significantly below quota levels, no closure of any depot was reported.

Table 7.1: Demand for kerosene

Season	Shimla (% of total quota)	Sirmour (% of total quota)
Summer	40	35
Rainy	65	50
Winter	90	80

Source: IRADe database B from field survey

b) Reasons for under-utilisation of quota

The oil retailers reasoned that the households were not fully availing themselves of their quotas for the reasons listed in Table 7.2. From this, the following three points are highlighted:

1. For the people of Sirmour, the use of firewood was the main reason for not drawing their full quota of kerosene. Whereas, for the people of Shimla, using LPG appears to be the main reason for not using the full kerosene quota. Due to the greater use of LPG, the use of firewood is also much lower in Shimla than Sirmour.
2. The other main reasons suggested for the people of Sirmour not availing themselves of the kerosene quota are the distance to the shop and kerosene being expensive. For Shimla, the distance from the shop is also a factor, but not seen as a very important one.
3. The price of kerosene is not seen as the reason why the people of Shimla do not use their quota.

The differing reasons can be attributed to the fact that Shimla is more urbanised than Sirmour.

Table 7.2: Retailers perceptions of reasons why households do not use full quota

Reason	Shimla (%)	Sirmour (%)
Expensive	5	20
Distance to shop	10	25
Presence of LPG	40	10
Simply forgoes their share	30	5
Irregular supply	0	10
Use of firewood	15	30
Use of biogas	0	0
Other	0	0
TOTAL	100	100

Source: IRADe Database B from field survey

Low demand is also influenced by the following factors:

- Local residents do not usually use kerosene, preferring LPG and even firewood. In the case of LPG cylinders, a ration card is only used in the first instance for the purpose of identification and subsequently the ration card (and the attendant paperwork) is not required whereas to procure kerosene a ration card is needed every time.
- Itinerant labourers (who are usually migrants) and outsiders (officials etc.) who are usually only temporary residents mostly use kerosene. Since both groups are temporary residents,

they have to buy kerosene on the open market rather than from kerosene depots where a ration card is required. This limits the demand on depots.

- Suppliers do not supply kerosene in the absence of a ration card.

c) Reasons for opening a depot

The above findings are somewhat corroborated by the following reasons cited by the oil depot owners when asked about their reasons for opening a depot despite the stated low returns.
One of the main reasons for opening a depot, despite low demand and low returns, is using it as a supplementary business or as an additional source of income. Interestingly, neither the subsidies provided for opening a depot nor economic reasons were commonly seen as good reasons for opening a depot.

Table 7.3: Reasons for opening depot

Reason	Shimla (%)	Sirmour (%)
Economic reasons	10	25
Local demand	20	25
Supplementary business	**65**	**40**
Regular supply	0	0
Subsidies regarding the opening of the depot	5	10
Other	0	0
TOTAL	100	100

Source: IRADe Database B from field survey

8 Synthesis

8.1 Introduction

As explained in the introductory section, this research project set out to explore the linkages between women's empowerment (reflected in economic empowerment as well as other qualitative factors such as health status, role in domestic and community level decision-making and domestic violence) and the availability of clean fuels. A comparison of macro-level indicators of women's empowerment at the state level indicates that, in general, the women of Himachal Pradesh score better than their counterparts in the country as a whole as far as basic indicators such as education status, work and employment status and exposure to mass media are concerned.

8.2 Analysis of household survey results

Database A, which resulted from a survey of 712 households in Himachal Pradesh, revealed the following:

- Most villages have good infrastructural facilities such as schools, healthcare and roads. The survey shows that in rural Himachal Pradesh most of the villages have some form of road network and some form of transportation. Almost all the villages have access to primary school and health care facilities, with usually one or two doctors in each health centre.
- The majority of the villagers (60 %) are landless and about 36 percent of the villagers are either small or marginal farmers.
- The income structure is such that only 11% of households have an average annual income less than Rs. 10 000, the level used to define poverty.
- The average distance travelled to collect fuelwood is about two km per trip, with a total of around 30 km covered each month by a typical household. Such households spend about 41 hours each month collecting fuelwood.
- Most have household durables such as wall clocks. The reasons for investing in household durables including kitchen goods (which have a bearing on women's role in household decision-making) were addressed through the questionnaire survey as part of Database B.
- The state distribution systems for LPG and kerosene are quite good, however 93% of the households continue to use biofuels (at least for some functions) to provide them with energy security and to meet various needs such as water and space heating. The reasons for the dependence on biofuels (despite the availability of cleaner fuels such as LPG and kerosene) as well as its implications for women in terms of time spent, drudgery and other issues were addressed in the questionnaire survey as part of Database B.
- About 6% of households who use fuelwood purchase it, and spend an average of Rs. 145 per month on fuelwood which is equivalent to the price of an LPG cylinder. Demand for kerosene, at the market price of Rs. 5 valid at the time of survey, was calculated to be 2700 litres per month in the sampled households. Thus, there is a latent demand for kerosene even at the market price, and many people chose to purchase at this price rather than go through the procedure necessary to obtain a ration card and then potentially have to travel greater distances to a PDS outlet. This demand could be further tapped to reduce health impacts and drudgery of women.

Database B, which covers 80 villages, was assembled to review additional issues. Data were collected through two surveys. One was a kerosene depot survey to understand the kerosene supply situation, and the other a household survey to explore the gender and empowerment aspects of Himachal Pradesh. The main observations from the household survey are as follows:

- The household survey indicated that Shimla was better placed in terms of household assets than Sirmour. In terms of occupations, Shimla is also better off with more people engaged in government service as compared to Sirmour where the primary occupation is agriculture.

- Decisions to invest in kitchen durables such as LPG or kerosene stoves saw an increase in their use in the period between the data being collected for the two databases. This suggests an interest in reducing drudgery as well as smoke problems.

- Fuel usage indicated that fuelwood is the predominant fuel used for all purposes in both districts. LPG consumption is greater in Shimla than in Sirmour and consequently there is a greater consumption of fuelwood in Sirmour.

- There appears to have been no involvement with biogas in Sirmour. Whereas, in Shimla District, 70% of respondents reported being aware of non-functional biogas plants.

- It was found that women were largely responsible for the procurement of fuel in Sirmour, whereas in Shimla fuel procurement is mostly done by the male members of the family.

- The problems with collecting fuelwood arose mainly from the time taken to search for and gather it, plus the physically strenuous process of transporting it.

- In terms of a gender analysis of workloads and responsibilities it was found that agricultural practices are largely the responsibility of women whereas the marketing of cash crops and any surpluses is the responsibility of men. While fodder collection was the responsibility of women and older men, the collection of minor forest products was the exclusive responsibility of older men.

- In the district of Shimla, health problems were less common than in Sirmour where fuelwood consumption is higher and older men and women are more afflicted by coughing.

- Respondents in Shimla were aware of clean fuels and had access to them. The reasons cited for changing to cleaner fuels were their easy availability, time-saving and cleaner households. In Sirmour, due to poor connectivity as well as to low incomes, people do not have access to clean fuels and hence are largely dependent on fuelwood.

8.3 Empowerment status

- It was found that about 63.7% of ever-married women aged 15-49 years in HP have some level of education, which is significantly higher than in other North India States (excepting Delhi) and India as a whole (41.8%).
- About 80% of ever-married women were found to be exposed to some form of media, which can be seen as an empowerment indicator. Even the exposure to print media, which is dependent on literacy, is quite high in HP.

- Women in HP are involved in decision-making at various levels. A large majority have access to money and have a high level of control over decisions pertaining to themselves such as buying jewellery.
- In terms of employment, women's participation in paid work is quite low in HP.

8.4 Gender and health status

- Women of all age groups, especially those in the 30 - 60 age group, who use biofuels were found to be more susceptible to respiratory illnesses than females using clean fuels.
- Illiteracy seems to lead to a greater likelihood of suffering respiratory symptoms whatever fuel is used. Illiterate women were at greater risk of having respiratory illnesses than literate women whether biofuels or clean fuels were used for cooking.
- Smoking increases the likelihood of suffering from respiratory illnesses for both men and women. However, women smokers have a higher risk (by as much as 30%) of having respiratory illnesses than male smokers. Giving support to the indoor pollution argument, even female non-smokers are at a higher risk than male non-smokers.
- The linkages between health and biofuel use were established on the basis of self-reported symptoms of respiratory diseases. Households using biofuels were found to be twice as likely to have members, and more of them, with respiratory symptoms than households using clean fuels. The symptoms of phlegm and breathlessness were significantly more common in households using biofuels than in households using LPG.
- The prevalence of respiratory symptoms in the 15 – 30 as well as the 30 – 45 age groups was higher in females than in males.

8.5 Women and fuel usage

- Responsibility for the procurement of fuelwood was primarily that of women and older men, whereas the procurement of kerosene oil and LPG was the responsibility of young men.
- The difficulties in collecting fuelwood were mainly related to searching and gathering, with concern expressed for the time taken overriding all other problems. The women did not regard physical strain as an important issue in collecting fuelwood.
- The main household cooks were usually females aged over 15, with the 30 – 40 age group most actively involved in cooking. Men had little or no involvement in cooking.
- Women being the main cooks spent a long time in the kitchen. On average, women spent about four hours per day in the kitchen cooking food.
- Willingness to pay for ventilation or fitting a chimney in order to reduce smoke was greater than for purchasing improved stoves.
- Respondents were aware of clean fuels and many people in urban areas such as Shimla had switched to clean fuels. In less urbanised areas, such as Sirmour, people were still dependent on biofuels for cooking and boiling liquids etc. The reasons most often cited for not changing to clean fuels were their expense and non–availability.
- Health effects due to fuelwood use were mainly physical strains such as back and neck aches. Another concern expressed was the frequent encounter with wild animals.

8.6 Kerosene depot survey

The key observations from the kerosene oil survey are as follows:

- The discussions with kerosene oil depot owners indicate that, over the years, the demand for kerosene has declined as more LPG is used. In both survey districts, the demand level in summer was less than 40% of the available quota. In the winter and rainy seasons, when the demand for energy increases (and fuelwood availability is restricted), the demand is correspondingly higher and especially by the better off. Primary reasons for the limited use of kerosene, as advanced by the kerosene sellers, are the availability of and preference for LPG, distance to the shops, and the availability of firewood.
- The profit margins in selling kerosene under the PDS are fairly low, at 25 paise per litre for rural areas and 15 paise per litre for urban areas. As a result, most sellers have other businesses, often grocery shops. In fact, most said that the income from kerosene sales constitutes only 2% of their total incomes, and most view this as no more than a supplementary business.
- The high investment needed, coupled with wastage and low demand, deters many shopkeepers from opening a depot.

8.7 Conclusion

It appears that the empowerment level and access to energy are correlated in HP. Both the empowerment level and energy access are higher than in India as a whole. Even within HP, the two districts with their different levels of access to fuels have different levels of empowerment.

As women are the primary sufferers from the adverse impacts of using biofuels, there is a close linkage between gender and energy. Gender and energy issues have remained on the periphery of development policy, and require greater political attention and backing. Given that women are particularly impacted upon by the continued use of traditional fuels, a specific commitment is necessary to provide them with cleaner fuel choices, as well as rural electrification options that can also provide better opportunities for income generation through agriculture and small-scale industries. Gender empowerment is clearly linked with access to modern fuels which can free women from time-consuming daily drudgery. Moreover, access to modern fuels can have an impact on the Millennium Development Goals in areas such as literacy, life expectancy and child mortality.

8.8 Consultation Workshop

A Consultation Workshop on the "IMPACT OF FUEL SCARACITY AND POLLUTION ON RURAL POOR: A Comparative analysis of vulnerable groups in Himachal Pradesh" was held on March 11, 2005 at the India International Centre, New Delhi, inaugurated by Dr Kirit Parikh, Member of the Planning Commission and Chairman of IRADe. A small group of knowledgeable people from a wide range of backgrounds attended the workshop, leading to a valuable spread of feedback. A list of participants is appended in Annex 3.

The workshop discussed the poor quality and availability of biofuels and the efforts involved in collecting them that affect the quality of women's lives. These issues have an impact on the Millennium Development Goals and women's empowerment. The following recommendations were made at the workshop:

- Since women are the most affected by the use of biofuels, emphasis should be on educating women since this helps not only in efficient energy management but also in reducing the health impacts.

- Efforts should be made to enhance livelihood options so that people, and especially women, at the local level can earn more and invest in clean fuels.

9 Recommendations

In HP, women manage 90% of fuel usage by gathering and collecting biofuels. They are also at the receiving end of the harmful effects of using these biofuels as can be seen from the results of the study. On the basis of the summary of results presented above, but not limited to them, some steps to mitigate the problem can be recommended. The problem is vast as it affects millions of people in India and needs a range of solutions that cover the whole gamut of issues such as energy supply, health and gender empowerment.

9.1 Policy initiatives

A major shift in the paradigm in terms of policy initiatives is needed such as:

- A shift in the focus from energy supply to end-use activities.
- Encouraging public-private partnerships must take over from solely governmental initiatives.
- Instead of subsidies, support must be given in the form of micro-credit and loans.

In order to meet the above objectives in policy initiatives, projects must be formulated that have gender-based outcomes so that the current situation is highlighted and brought to light. Women's participation should also be encouraged in all initiatives so that they become direct beneficiaries of the policies.

9.2 Energy supply and consumption

- Fuels should be available closer to people's homes. Targets need to be set to ensure that fuels are available within one or two kilometres.
- When formulating energy supply policy, greater attention should be paid to gender equity.
- Transport solutions such as mechanised/non-mechanised wheelbarrows must be provided in order to relieve women of their daily drudgery.
- There is a need for increased awareness of energy management through improved stoves, biogas, energy efficiency and other technologies.
- The traditional focus in India of providing "electricity - water" should be expanded to "fuel - electricity–water".

9.3 Health impacts

- Exposure to air pollutants can be minimised by structural changes in housing, for example by improving the ventilation of the kitchen or house, or by having a separate kitchen, or installing chimneys or switching to clean fuels (often desired in that order).
- The survey shows that with improvements in female literacy, the adverse health impacts of respiratory and eye-related diseases are likely to be reduced.

There are health impacts in the entire chain from collection, processing, transportation through to cooking. The first three stages lead to bruises, insect bites, snakebites, rashes, headaches,

backaches, allergies and so on. These deserve just as much attention as respiratory problems related to indoor air pollution.

9.4 Gender empowerment

Gender empowerment is linked with access to modern fuels since women can be freed from the daily drudgery that takes up a considerable amount of their time. Hence a specific commitment is needed to provide them with cleaner fuel choices, as well as rural electrification options that can provide better opportunities for income generation through agriculture and small-scale industries.

ANNEX 1: MDGs - ENERGY AND GENDER

MDG 1: Poverty and hunger

1. Time burden

The study addresses the issue of time burden. It discusses the time and effort spent on fuelwood collection. Also, the benefits gained by women through the use of modern fuels and stoves.

MDG 2: Education

1. Literacy

The present study addresses the issues of health and literacy showing that health is affected by literacy. Thus, one MDG helps another.

MDG 3: Gender equality

1. Leisure

Issues of women's empowerment and leisure are also explored.

2. Control over and access to energy services

The study showed that decision–making power in acquiring energy and ownership and use of improved energy services are linked with gender empowerment.

3. Transformation of gender roles

The results showed that when the energy used is fuelwood, women are responsible for its procurement; but when modern energy like LPG and kerosene is used there is a reversal of roles and men get involved in its procurement.

4. Violence/discrimination against women

The issue of violence against women was also addressed in the study.

MDGs 4, 5 & 6: Health

1. Indoor air pollution

The impact of using biofuels in cooking etc. on children, women and older people was also studied.

2. Effects of modern energy services on women's health

The positive impact of using clean fuels in terms of good respiratory health and leisure was explored through the study.

ANNEX 2: KEROSENE OIL SURVEY RESPONDENTS

1. List of Wholesale Distributors contacted:

A) In Shimla District

Ms Rekha Oil, Chaupal, Shimla District; Ms Krishna Coal Company, Shimla; Gainda Mal Hem Raj, Shimla; Anup Service Station, Kaithu, Shimla; Jagdamba Oil Motor, Barrier, Shimla and Swadeshi Enterprises, Dhalli, Shimla-12

B) In Sirmour District

Ms. Gulshan Rai Baweja, Nahan and Ms. Tula Ram Rakesh Kumar, Solan

2. List of Retail Depots contacted:

A) In Shimla District

- Thakur Provision Store, Sangti; Durga Provision, Sangti; Smt. Neelam Sharma, Tara Devi; Vikram Thakur, Shoghi; Jitender Kumar, Shoghi; Dinesh Sharma, Khabara Chowki; Hem Chand, Ghanahatti; Om Prakash, Ghanahatti – all private
- Kalhanj CAS, Shoghi – Cooperative Society
- Kalhanj CAS, Tara Devi – Civil Supplies Cooperative Society

B) In Sirmour District

- Sh. Jai Prakash, Giripul; Sh. Chuni Lal, Kotla Panjula; Sh. Shyam Singh ,Chandol; Sh. Gian Chand, Dhawander; Smt Sulochana, Neri Pul; Sh. Balak Ram, GianKot; Gurudwara, BadduSahib; Sh. Mahant Ram, Shargaon; Sh. Mahendar Singh, Khari; - all private
- GSSS Rajgarh; CSSS Narag – both Cooperative Society
- CSS Rajgarh – Civil Supplies Cooperative Society

ANNEX 3: LIST OF WORKSHOP PARTICIPANTS

Participants included senior officials from the Planning Commission, Himachal Pradesh State Govt and the Forest Survey of India, NGOs, Professors from IGIDR, JNU and universities, international agencies, and research students.

Name	Designation	Organisation
Dr. D. N. Rao	Professor	JNU
Mr. Hemant Gupta	Regional Director	Forest Survey of India, HP
Ms.Mamta Chander	Director	Jagriti, HP
Mr. Shyam Karmakar	Consultant	IRADe
Ms. Soma Dutta	Consultant	ENERGIA / ETC Foundation
Mr. Surya Prakash Sethi	Additional Secretary	Planning Commission
Dr. Vijay Laxmi Pandey	Asst. Professor	IGIDR, Mumbai
Dr. Rajesh Sharma	Joint Secretary	HP Government
Mr. Rajesh Kumar	Technical Officer	Forest Survey of India, HP
Mr. Mirju Ram Lakhta	Sr. Technical Assistant	Forest Survey of India, HP
Dr. Anmol Gupta	Asst. Professor	IGMC, Shimla
Dr. Veena Joshi	Focus – in – charge	Swiss Agency for Development & Co-operation
Mr. Yogendra Sahai	Director (Communication & Marketing)	Petroleum Federation of India
Mr. Ayan Pujari	Research Scholar	IGIDR
Ms. Shubha Pandey	Research Associate	TERI
Dr. Pallav Purohit	Senior Lecturer	UPES
Mr. Mainpal Bhola	Research Associate	UPES
Ms. Radha R Ashrit	Sr. Research Officer	Planning Commission

Organisers from Integrated Research and Action for Development (IRADe), New Delhi

Name	Designation
Dr. Jyoti Parikh	Executive Director
Ms. Kavita Singh	Researcher
Ms Saudamini Sharma	Researcher
Mr.J.M.Singh	Consultant
Ms. Pallavi Maitra	Researcher
Mrs Meenu Mishra	Consultant

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