

## CHAPTER-3

### OBJECTIVES AND METHODOLOGY

This chapter presents the objectives and methodology of the study. First, the objectives of the study are stated, followed by the research questions. Then, the methodology of the study is presented which includes the data source, sampling procedure and analytical framework.

#### 3.1 Objectives of the study

By considering the research gap and importance of the study discussed in Chapter 2, the present study has attempted to focus on the issues related to the rural livelihood, livelihood diversification and sustainability of livelihoods in the surrounding rural areas of the Oil and Natural Gas Corporation (ONGC) and Oil India Limited (OIL) in Assam.

The main objectives of the study are-

- i) To assess the impact of ONGC and OIL on the livelihood of rural people in the study area.
- ii) To examine the nature and extent of rural livelihood diversification in the study area and to identify the influencing factors thereof.
- iii) To study the sustainability of livelihoods of rural people in the operational area of ONGC and OIL

#### 3.2 Research questions

The present study attempts to answer the following research questions:

- i) How the oil exploring oil companies in Assam affected the different livelihood assets of the local rural community?
- ii) What are the vulnerability contexts associated with the sustainable rural livelihoods of the neighbouring rural community of the oil exploring companies?
- iii) How do the local rural communities of oil industries adopt a livelihood diversification strategy?
- iv) What is the extent of livelihood diversification of the rural households under study?
- v) What factors influence the livelihood diversification of the local community of oil industries?
- vi) How do various livelihood components contribute to the local rural households of the oil companies in achieving or deteriorating sustainable livelihoods?

### **3.3 Methodology**

#### **3.3.1 Data**

The study is based on both primary and secondary data. Primary data has been collected with the help of a structured questionnaire from the respondents of the sample households. Moreover, focus group discussions (FGDs) have been conducted with the communities of the study area to qualitative information related to the objectives of the study.

The secondary data are collected from different sources like Indian Petroleum and Natural Gas Statistics, Annual Reports of ONGC and OIL, Economic Survey of Assam etc.

#### **3.3.2 Selection of study area, sampling procedure and sample size**

The ONGC and OIL are the two major companies associated with oil exploration and production in Assam. The oldest operational areas of ONGC and OIL in Assam are spread over three districts: Sivasagar, Dibrugarh and Tinsukia (table 3.1). So, the present study has been carried out in these three districts. The basic reason for selecting the districts having the oldest operational areas for the present research was that they would experience more impact of oil exploration. A similar judgment was postulated by Mishra (2009), who selected the oldest coal mining areas to assess the impact of mining on the rural livelihoods of Odisha. For the present research, the study area has been classified into two categories – i) operational area (where oil and gas extraction and production units are located, i.e. the oilfields, group gathering stations, oil collecting stations, etc.), and ii) operational headquarter (i.e. Nazira, the headquarter of ONGC, Assam Asset; and Duliajan, the headquarter of OIL). It has been expected that the status of rural livelihood, issues, impacts from oil extraction on rural livelihood, and so on, would differ in the operational area and operational headquarter.

Table 3.1

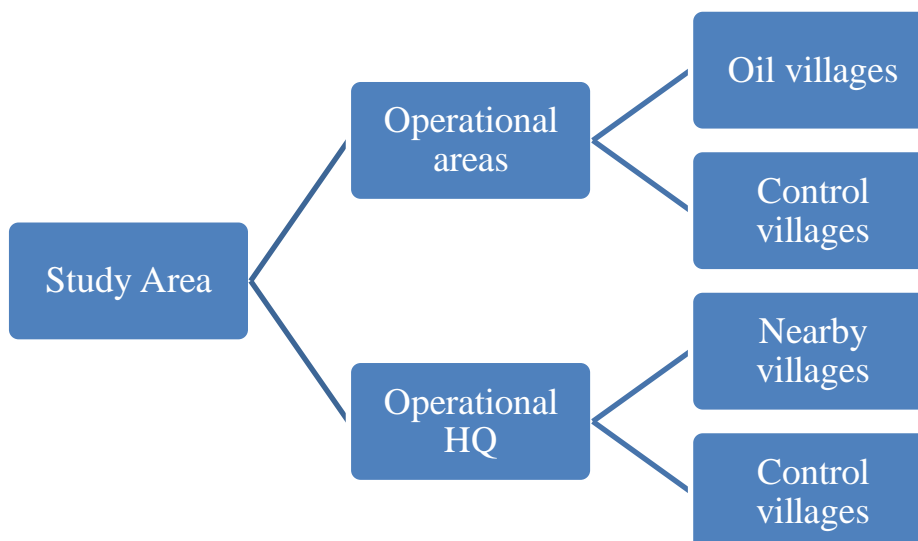
## List of the oldest oilfields of ONGC and OIL

Oil extracting company	District	Oil and gas extraction areas	Year of discovery of the oil field
ONGC	Sivasagar	Rudrasagar	1960
	Sivasagar	Lakwa	1964
	Sivasagar	Gelakey	1968
OIL	Tinsukia	Digboi	1889
	Dibrugarh	Naharkatiya	1953
	Sivasagar	Moran	1956

Source: Indian Petroleum and Natural Gas Statistics, 2015-16

Figure 3.1

## Sampling procedure for primary survey



From the operational areas of ONGC and OIL, two categories of villages have been selected – i) the oil villages where many operational works related to oil and gas extraction and production have been done, and ii) the control villages where there are no such activities done. The sampling procedure from each area has been presented in figure 3.1. The oil villages are identified through the Geographic Information System (GIS) and the villages with more concentration on operational activities have been selected for field

survey. A total of 30 oil villages have been selected from the operational areas of ONGC and OIL in three districts. The total number of sample households selected from the oil villages is determined by using the formula of Yamane (1967) as given below.

$$n = N / [1 + N(e)^2] \text{ ----- (3.1)}$$

where N = total number of households in the oil villages

e = the acceptable sampling error = 5%

n = Number of sample households

The total number of households in the selected 30 oil villages is 9249 and hence the required sample size is 383. The allocation of sample households (i.e. n=383) among the selected villages is done by using Bowley's (1926) formula:

$$n_i = n(N_i/N) \text{ ----- (3.2)}$$

When the allocated sample households by using Bowley's formula (Bowley, 1926; as cited in Pandey & Verma, 2008) has been estimated to be less than 10 in the case of a village, then a minimum of 10 households have been selected from that village for data collection (table 3.2). Thus, the number of sample households from the oil villages has risen to 443. The systematic random sampling technique has been applied to select the sample households from each oil village. Table 3.2 shows the number of sample households selected from the oil villages of different oilfields operated by ONGC and OIL under the study area.

**Table 3.2**

**No. of sample households from oil villages (Operational area)**

Sl. No.	Oilfields	Number of sample households selected from the oil villages of different oilfields
1	Gelakey (ONGC)	99
2	Lakwa (ONGC)	63
3	Rudrasagar (ONGC)	54
4	Naharkatiya (OIL)	62
5	Barekuri & Baghjan(OIL)	96
6	Moran (OIL)	69
	<b>Total</b>	<b>443</b>

To examine the impact of oil exploration on the rural livelihoods of the oil villages, the *with and without* approach<sup>1</sup> is used. For that, along with the oil villages, another two nearby villages where there are no oil and gas extraction by the ONGC and OIL are purposively selected from the same locations. These types of villages are termed as control villages. Thus, a comparative study is carried out between the oil villages and control villages of operational areas.

The control villages of the operational areas are selected from distant locations. The main purpose of selecting the control villages is to examine the impact of the oil industry on local livelihoods by comparing oil villages and control villages. Two villages where there are no oil and gas extraction activities by ONGC and OIL have been selected as control villages. These selected control villages are located within ten kilometer distance from oil and gas extraction points. For selecting the control villages, some criteria have been specified. These are: i) there was the same primary occupation between the oil villages and control villages before the oil exploration started in the oil villages, ii) the oil villages and the control villages have the same cultural/ethnic group or composition, iii) they are located in the same development block, iv) no specific livelihood development project was done by Government or non-government organizations either at oil villages or control villages, and v) they have the same agro-climatic condition (Cosyns et al., 2013; McSweeney & Freedman, 1980; Mishra, 2009; Das, 2015). From each control village of the operational area, 10 per cent of households have been randomly selected. Table 3.3 shows the number of sample households selected from the control villages adjacent to different oilfields of ONGC and OIL under the study area.

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<sup>1</sup> Mishra (2009) used the *with and without approach* to identify the impact of coal mining in Orissa. To apply this approach the author selected two types of villages- one is mining villages where the mining activities were done, the other type is control villages where there was no mining activities.

**Table 3.3****No. of sample households from control villages (Operational area)**

<b>Sl. No.</b>	<b>Oilfields</b>	<b>No. of sample households selected from the control villages adjacent to different oilfields</b>
1	Gelakey (ONGC)	40
2	Lakwa (ONGC)	34
3	Rudrasagar (ONGC)	27
4	Naharkatiya (OIL)	23
5	Barekuri & Baghjan(OIL)	43
6	Moran (OIL)	20
	<b>Total</b>	<b>187</b>

Note: When 10 per cent of the total households of a sample village is less than 10, then a minimum of 10 households are selected for data collection.

On the other hand, to assess the impact of the oil industry on the neighbouring rural community of the operational headquarters (i.e., Nazira and Duliajan), two categories of villages have been selected for primary data collection. One category is the nearby villages which are adjacent to the operational headquarters, and the other category consists of the control villages which are located at least 5 kilometer distance from the operational headquarters. From each nearby village and control village, 10 per cent of sample households have been selected for the primary survey. Table 3.4 shows the number of sample households selected from the nearby villages' operational headquarters of ONGC and OIL under the study area, while table 3.5 shows the number of sample households selected from the control villages which are located away from these operational headquarters.

**Table 3.4****No. of sample households from nearby villages (Operational headquarters)**

Sl. No.	Operational headquarters	No. of sample households selected from the nearby villages adjacent to the operational headquarters
1	Nazira (ONGC)	43
2	Duliajan (OIL)	82
	<b>Total</b>	<b>125</b>

Note: When 10 per cent of the total households of a sample village is less than 10, then a minimum of 10 households are selected for data collection.

**Table 3.5****No. of sample households from control villages (Operational headquarters)**

Sl. No.	Operational headquarters	No. of sample households selected from the nearby villages adjacent to the operational headquarters
1	Nazira (ONGC)	<b>162</b>
2	Duliajan (OIL)	<b>57</b>
	<b>Total</b>	<b>219</b>

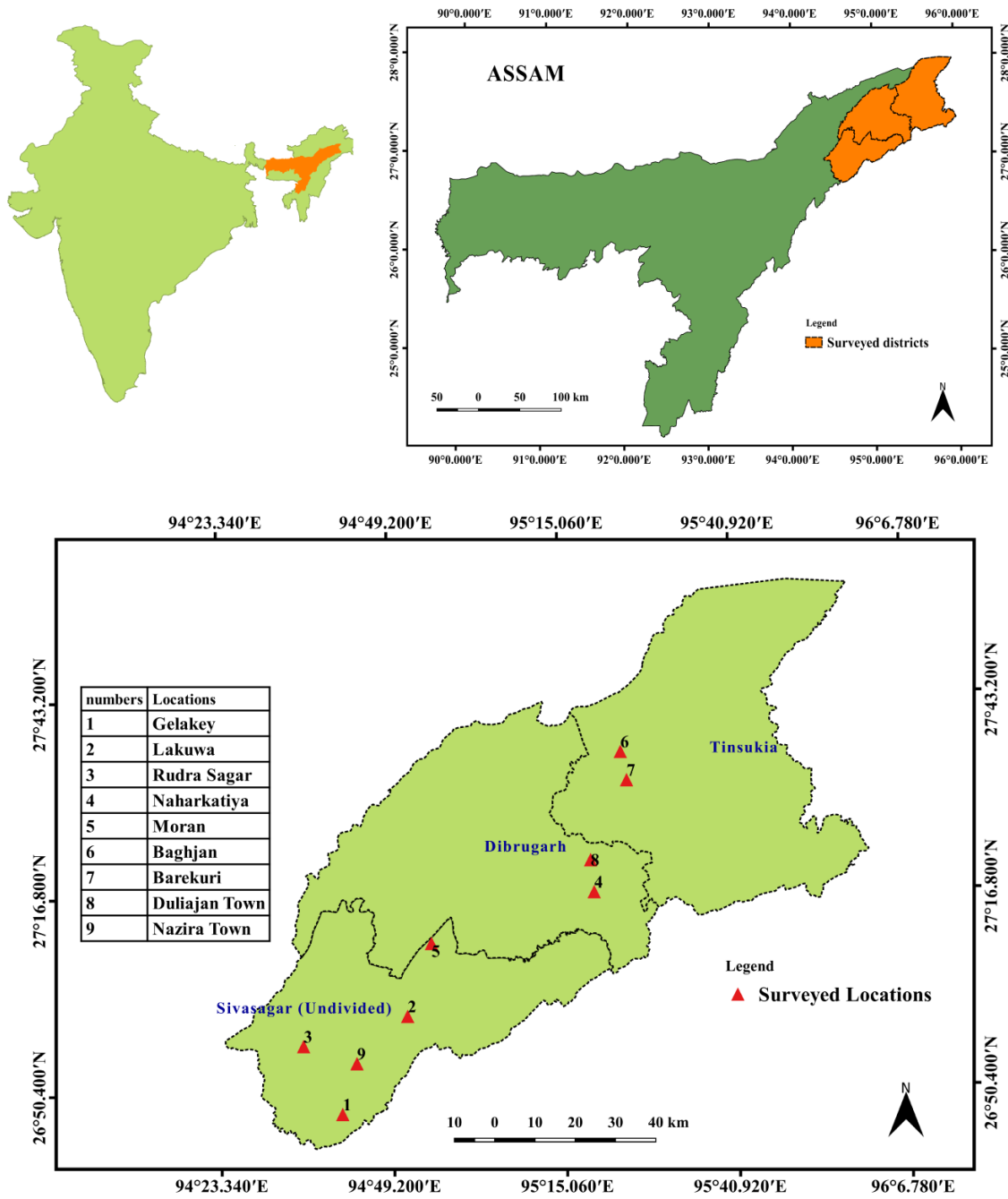
Note: When 10 per cent of the total households of a sample village is less than 10, then a minimum of 10 households are selected for data collection.

Hence, the total number of sample households for the study is  $(443+187+125+219=)$  974. This is summarized in table 3.6.

**Table 3.6****Total number of sample households selected from the study area**

Category of study location	Type of villages	Number of sample households selected from different villages
Operational area	Oil villages	443
	Control villages	187
Operational headquarter	Nearby villages	125
	Control villages	219
	<b>Total</b>	<b>974</b>

**Map 1**  
**Map of the Study Area**





### 3.4 Analytical framework

Since the oil industry in Assam started long years back, the assessment of the impact on rural livelihood is a difficult task by comparing two different periods. So, the entire study is carried out by comparing the villages located within and outside the operational areas and operational headquarters with the help of cross-section data. Similar research regarding impact assessment of extractive industry has been done by Mishra (2009) and Hota & Behera (2016) while studying the impact of coal mining on local livelihoods in Orissa.

With regards to the first objective i.e., to assess the impact of ONGC and OIL on the livelihood of rural people in the study area, the sustainable livelihood approach is followed. More specifically, the impact of the oil industries is examined by analyzing its impact on different livelihood assets such as financial capital, physical capital, human capital, natural capital and social capital.

An industry creates diversified work opportunities in the surrounding rural areas. So estimation of livelihood diversification bears significance in livelihood research. There are several methods to measure livelihood diversification. Some researchers have measured livelihood diversification by counting the number of income sources on which households depend (Ibrahim et. al., 2009; Khatun & Roy, 2018). Some other researchers estimated livelihood diversification by accounting for the contribution of different income sources to the total household income. There are several indices to measure livelihood diversity. Some of the popular indices used by earlier researchers are the Herfindahl index, Simpson index, Entropy index, Modified Entropy index and Composite Entropy Index (Mandal & Bezbaruah, 2013; Mandal, 2014; Ahmed et. al., 2018). But, the Simpson index of diversification is widely used by researchers to the determination of livelihood diversification for its robustness, simplicity, and wider acceptance (Sujithkumar, 2007; Mishra, 2009; Khatun & Roy, 2012; Saikia, 2015; Roy & Basu, 2020; Sarker et al., 2020b). So, in the present study, the Simpson index of diversification (SID) is used.

$$SID=1- \sum (S_i^2), \quad 0 \leq SID \leq 1 \quad \text{-----} \quad (3.3)$$

where  $S_i$  indicates the contribution of  $i^{\text{th}}$  livelihood source to total income. The value of SID equal to zero indicates complete concentration and one implies complete diversification.

Moreover, to identify the influencing factors of rural livelihood diversification, a Tobit regression analysis is done by considering SID as the dependent variable. The model specification and rationality of independent variable selection are stated in the concerned chapter (Chapter 6).

To fulfil the third objective, the sustainable livelihood index (SLI) is estimated for all categories of villages. The value of SLI helps to understand the comparative status of different categories of villages in terms of sustainable livelihood. The major component indices of SLI are financial capital index, physical capital index, human capital index, natural capital index and social capital index. The selected indicators of each component index and the formula of SLI are discussed in the concerned chapter (Chapter 7).

In addition to the quantitative techniques, a qualitative approach has also been used to understand the quality of livelihoods in the neighbouring areas of ONGC and OIL. DFID (1999) stated that the full diversity and richness of livelihoods can be understood only by qualitative and participatory analysis at a local level. Therefore, six focus group discussions (FDG) with the local rural people have been conducted. The selected villages for this purpose are Dehingia Konwar Gaon (Lakwa), Chutia Gaon (Gelakey) and Bhatiyapar (Rudrasagar) under ONGC operational areas; and Balipara Sasoni (Naharkatiya), Baghjan (Barekuri-Baghjan) and Khumtai Gaon (Moran) under OIL operational areas.