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A group of five women are sitting around a long wooden table in a room with corrugated metal walls. They are engaged in a discussion, with some looking at small cards on the table. The woman on the far left is wearing a yellow shirt and holding a yellow card. The woman in the center is wearing a floral patterned top. The woman on the far right is an older woman with white hair, wearing an orange top. The table is covered with several small cards, some yellow and some green, with handwritten text and symbols. The background shows a window with a view of the outdoors.

**RESEARCH METHODS FOR
THE PACIFIC CLIMATE CHANGE AND
MIGRATION (PCCM) PROJECT**

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Further UNU-EHS staff involved in the development of the methods include Jakob Rhyner, Koko Warner, Noemi Cascone and Ann-Kristin Matthé. UNESCAP staff involved in methodological development include Jillian Campbell.

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1. HOUSEHOLD SURVEY

A representative sample of the population was interviewed through a household survey. The survey was aimed at producing household-level data related to vulnerability and migration patterns and specifically to investigate the relationship between household vulnerability and migration. UNU-EHS and ESCAP trained and guided local enumerators from the University of the South Pacific who interviewed household representatives.

2. CORRELATION SENSITIVE VULNERABILITY INDEX

In order to investigate vulnerability, a Correlation Sensitive Vulnerability Index was created. The index aims to identify which households are vulnerable based on six dimensions; economic situation, education, health, housing, connectivity, and community and social networks. The more vulnerable a household is in the respective dimension, the higher the index-value for the household would be. As an example, a household with no primary education for any household member would have a high education vulnerability score. Details on the vulnerability index are included in the annex.

3. QUALITATIVE ANALYSIS

Participatory Research Appraisal (PRA) was included in the fieldwork to complement household survey data with information at the community level and to ensure that local perspectives were represented. PRA sessions were carried out in order to better understand livelihood risks, migration decision making and the institutions and organisations which can help with migration.

In order to gain a deep understanding of the range of shared attitudes on climate change and migration, a “Q” study was conducted. This is a method for investigating opinions on a particular issue by statistically analysing participants’ ranking of statements connected about the issue. The Q study was conducted on household representatives.

4. AGENT BASED MODELLING (KIRIBATI AND TUVALU)

To project future patterns of human mobility two separate agent based models were built for Kiribati and Tuvalu to simulate the flows of migrants under future climate change scenarios until 2055. The models were populated with agents created to migrate according to different preferences and situations. The models were built using actual birth and death rates, therefore were also able to generate future population projections for the countries and the main islands.

ANNEX 1: HOUSEHOLD SURVEY

D1. Questionnaire number

D2. Date of data entry

D3. Name of data entry officer

A. IDENTIFICATION OF THE VILLAGE

A1. Region

A2. District

A3. Municipality

A4. Village Name

B. IDENTIFICATION OF INTERVIEWEE

B1. GPS. Latitude:

B2. GPS. Longitude:

B3. Full Name of Interviewee

B4. Telephone of Interviewee

C. IDENTIFICATION OF THE ENUMERATOR

C1. Name of interviewer

| Number of Visit | | | | | | RESULT'S CODE | | |
|-----------------|------|----|------|--------|-----------------|-----------------|---|---------------------------------------|
| | C2. | | | C3. | C4. | C5. | | |
| | Date | | | Result | HR Beginning | HR Finishing | | |
| | DD | MM | YYYY | | | | | |
| 1 | | | | | : | : | 1 | Complete |
| 2 | | | | | : | : | 2 | Partial |
| | | | | | | | 3 | Refused |
| | | | | | | | 4 | No one currently / temporarily absent |
| | | | | | | | 5 | Uninhabited house |

C6. Observations:

SECTION 1: Socio-economic profile of the household

List all present and absent members of the household that contribute to/rely upon the resources of the household (plus their children)

| ID Identification | 1.01 | 1.02 | 1.03 | 1.04 | 1.05 | 1.06 | 1.07 |
|-------------------|--|---|---|--------------|-----------------------------------|-----------------------------------|--|
| | Name | The home at birth | The age group of the person | Sex | Currently employed | The level of education | Current location for most of the year |
| | Start the list with the household head | 1= from this island Specify if not this island | 1= 0-14 2= 15-24 3= 25-50 4= 51+ 99= Don't know | 1= M 2= F | 1= yes 2= no 99= Don't know | 1= yes 2= no 99= Don't know | 1= this island Specify if not this island |
| Name | Code or specify | Code | Code | Code | Code | Code or specify | |
| 1. | | | | | | | |
| 2. | | | | | | | |
| 3. | | | | | | | |
| ... | | | | | | | |

Section 1. Socio-Economic Profile of the Household

For questions 1.09 to 1.10 code "1" for yes

| | | | | | | |
|---|---|---|----------------------|-----------------|-------------------|-------------------|
| 1.09 In the last 10 years has your community been affected by: | 1. Drought/ irregular rains | 2. Salt-water intrusion | 3. Sea level rise | 4. Floods | 5. Cyclone | 6. Strom surge |
| 1.10 What are the economic activities and sources of income of the household? | 1. Employed by government | 2. Employed by others | 3. Fisheries | 4. Savings | 5. Real estate | |
| | 6. Remittances (people in country) | 7. Remittances (people abroad) | 8. Agriculture | 9. Seafaring | 10. None | |

SECTION 1. SOCIO-ECONOMIC PROFILE OF THE HOUSEHOLD

For questions 1.11 to 1.19 code "1" for yes

NOW

10 Years ago

1.11

Does your household have one or more chronically sick or permanently injured members?

1.12

Does your household have access to good quality healthcare?

1.13

Does your household have access to clean and safe drinking water at least once a week?

1.14

In the last year has there always been enough food to feed all household members with 3 meals a day?

1.15

Does your household have access to electricity every day?

1.16

In the last year has your household faced any security problem?

1.17

In the last year has your household suffered from discrimination/exclusion in employment/health or education?

1.18

Does your household have access to a secondary education facility?

1.19

Has anyone in your household been educated overseas?

SECTION 1. SOCIO-ECONOMIC PROFILE OF THE HOUSEHOLD

| | NOW | 10 Years ago |
|--|---|---|
| <p>1.20 Does your household own a house and/or land?</p> | <ol style="list-style-type: none"> 1. House on this island 2. Land on this island 3. House overseas 4. Land overseas 5. Neither 99. Don't know | <ol style="list-style-type: none"> 1. House on this island 2. Land on this island 3. House overseas 4. Land overseas 5. Neither 99. Don't know |
| <p>1.21 If you receive remittances how often do you receive them?</p> | <ol style="list-style-type: none"> 1. Every month or more 2. Every 2-6 months 3. Once a year 4. Occasionally 5. Never 99. Don't know | <ol style="list-style-type: none"> 1. Every month or more 2. Every 2-6 months 3. Once a year 4. Occasionally 5. Never 99. Don't know |
| <p>1.22 If you receive remittances what are the sources?</p> | <ol style="list-style-type: none"> 1. Seafarers 2. Internal 3. From Fiji 4. From Australia/New Zealand 5. Other country 6. Don't know/refused to answer | <ol style="list-style-type: none"> 1. Seafarers 2. Internal 3. From Fiji 4. From Australia/New Zealand 5. Other country 6. Don't know/refused to answer |
| <p>1.23 Which of the following items does your household have?</p> | <ol style="list-style-type: none"> 1. Television 2. Mobile phone 3. Radio/transistor 4. Computer 5. Stove/wood burner 6. Sewing machines 7. Motorised two wheelers (scooter/bike) 8. Motorised four wheelers (car/jeep/bus) 9. Non-motorised vehicle (cart etc.) 10. Boat 11. None 99. Don't know/refused to answer | <ol style="list-style-type: none"> 1. Television 2. Mobile phone 3. Radio/transistor 4. Computer 5. Stove/wood burner 6. Sewing machines 7. Motorised two wheelers (scooter/bike) 8. Motorised four wheelers (car/jeep/bus) 9. Non-motorised vehicle (cart etc.) 10. Boat 11. None 99. Don't know/refused to answer |

SECTION 1. SOCIO-ECONOMIC PROFILE OF THE HOUSEHOLD

| | NOW | 10 Years ago |
|---|--|---|
| 1.24 How does the household get most of its drinking water? | 1. Ferro-cement tank 2. Plastic tank 3. Ground water 4. Other 99. Don't know | 1. Ferro-cement tank 2. Plastic tank 3. Ground water 4. Other 99. Don't know |
| 1.25 What is the main source of electivity in your home? | 1. Solar power 2. Generator 3. Electric authority 4. Other | 1. Solar power 2. Generator 3. Electric authority 4. Other |
| 1.26 If your house needs help who can it revert to? | 1. Family 2. Migrated members of HH 3. Friends/neighbours 4. Other community members 5. Church/religious organisation 6. Other 7. Nobody 8. 99 Don't know/refused to answer | 1. Seafarers 2. Internal 3. From Fiji 4. From Australia/New Zealand 5. Other country 6. Don't know/refused to answer |
| 1.27 How much is your household's monthly income (on average)? | | |
| 1.28 Does your household make use of formal (banks/financial institutions etc.) credit? | 1. Yes 2. No 3. Don't know/refused to answer | 1. Yes 2. No 3. Don't know/refused to answer |
| 1.29 Does your household make use of informal (friends/family/neighbours /community associations or cooperatives etc.) credit? | 1. Yes 2. No 3. Don't know/refused to answer | 1. Yes 2. No 3. Don't know/refused to answer |
| 1.30 What is the financial situation of the household? | 1. Savings 2. No savings, no debt 3. Debt 4. Don't know | 1. Savings 2. No savings, no debt 3. Debt 4. Don't know |

SECTION 1. SOCIO-ECONOMIC PROFILE OF THE HOUSEHOLD

| | NOW | 10 Years ago |
|---|---|---|
| <p>1.31</p> <p>What is the primary construction material of the housing unit's exterior walls and roof? Choose 2 options in different materials</p> | <ol style="list-style-type: none"> 1. Stone & mortar 2. Metal sheeting 3. Reinforced concrete 4. Brick 5. Logs 6. Thin wood 7. Earth 8. Mud or earth bricks 9. Mud and straw 10. Bamboo 11. Plastic 12. Reeds 13. Fabric 14. Coconut and Pandanus 15. Other 16. 99 Don't know | <ol style="list-style-type: none"> 1. Stone & mortar 2. Metal sheeting 3. Reinforced concrete 4. Brick 5. Logs 6. Thin wood 7. Earth 8. Mud or earth bricks 9. Mud and straw 10. Bamboo 11. Plastic 12. Reeds 13. Fabric 14. Coconut and Pandanus 15. Other 16. 99 Don't know |
| <p>1.32</p> <p>In the last year has your household taken any measures to prevent impacts of future hazards?</p> | <ol style="list-style-type: none"> 1. Relocated to a safer place 2. Used safer building materials 3. Constructed physical barriers around house/farm (e.g. dykes. walls) 4. Diversified economic activities 5. Sent a household members outside the village to earn money 6. Other 7. None 99. Don't know | <ol style="list-style-type: none"> 1. Relocated to a safer place 2. Used safer building materials 3. Constructed physical barriers around house/farm (e.g. dykes. walls) 4. Diversified economic activities 5. Sent a household members outside the village to earn money 6. Other 7. None 99. Don't know |

SECTION 2: MIGRATION HISTORY OF THE HOUSEHOLD

Migration history

| 2.03 | 2.04 | 2.05 | 2.06 | 2.07 | 2.08 | 2.09 | 2.10 |
|---|---|--|----------|-----------------------------------|--|---|--|
| Name of migrant | Internal/ International movement | Reason for migration | Location | When did they leave the location | Duration | Does your Household send or receive money? | How frequently does he/she send/ receive remittances? |
| From the most recent to the oldest within a ten year time frame | 1= Internal 2= international 3= Seafaring | 1= Education 2= Work 3= Medical 4= Climate change 99= Don't know | | 1= yes 2= no 99= Don't know | | 1= Receive 2= Send 3= None 4= Don't know. refuse to answer | 1= At least once a month 2= Every 1-3 months 3= Every 4-5 months 4= Every 6 months or more 5= Only for emergencies or other special occasions 6= Never 99= Don't know/ refused to answer |
| Name | Code | Code | Specify | (mm/ yyyy) | Months (m) or year (y) If current location write 999 | Code | Code |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| ... | | | | | | | |

SECTION 2: REASONS FOR NOT MIGRATING

List all the times someone wanted to migrate but could not

2.11

2.12

2.13

Name of migrant

Year

Reason for not leaving

- 1= Lack of money
- 2= No visa/permit
- 3= Health reasons
- 4= No contacts/jobs at destination
- 5= Looking after family members
- 6= Others
- 99= Don't know/ refused to answer

Name

(yyyy)

Code

1

2

3

...

SECTION 3. FUTURE MIGRATION

3.01

If someone in your household migrates in the next year what is their most likely destination?

1. Within country
 2. Fiji/ other Pacific island
 3. Australia
 4. New Zealand
 5. Seafaring
 6. Other
 99. Don't know
-

3.02

If someone in your household migrates in the next year what will be the likely reason?

1. Economic
 2. Education
 3. Displacement
 4. Planned relocation
 5. Family reunification
 6. Other
 99. Don't know
-

3.03

If someone from your household migrates in the next year what employment option will they take up?

1. Seafaring
 2. Fruit picking
 3. Home care
 4. Other
 99. Don't know
-

3.04

If someone from your household migrates in the next year what would be the preferred employment option?

1. Seafaring
 2. Fruit picking
 3. Home care
 4. Other
 99. Don't know
-

For questions 3.05 to 3.08 code "1" for yes

3.05

Is it your intention to educate your children overseas?

3.06

Do you have relatives living in Australia?

3.07

Have you considered moving to Australia?

3.08

Do you have Australian citizenship?

SECTION 3. FUTURE MIGRATION

3.09

In general who makes the decisions which affect women?

1. Women
 2. Men
 3. Other
 99. Don't know/ refused to answer
-

3.10

With how many people outside of the household do you discuss important decisions?

1. Nobody
 2. 1 person
 3. 2-3 persons
 4. 4-5 persons
 5. More than 5 persons
 6. Don't know/ refused to answer
-

3.03

If someone from your household migrates in the next year what employment option will they take up?

1. Seafaring
 2. Fruit picking
 3. Home care
 4. Other
 99. Don't know
-

3.04

If someone from your household migrates in the next year what would be the preferred employment option?

1. Seafaring
 2. Fruit picking
 3. Home care
 4. Other
 99. Don't know
-

SECTION 3. FUTURE MIGRATION

| To what extent do you agree or disagree with the following statements? | 1. Strongly agree | 2. Agree | 3. Undecided | 4. Disagree | 5. Strongly disagree | 99. Don't know |
|---|-------------------|----------|--------------|-------------|----------------------|----------------|
| 3.11 My household has the necessary financial means for a member of the household to migrate. | | | | | | |
| 3.12 My household has the necessary permit/visa for a member of the household to migrate. | | | | | | |
| 3.13 My household is sufficiently healthy for a member of the household to migrate. | | | | | | |
| 3.14 My household has the necessary contacts for a member of the household to migrate. | | | | | | |
| 3.15 At least one member of my household has the education or technical skills to migrate. | | | | | | |
| 3.17 Someone in my household is more likely to migrate if most of the people I discuss decisions with are in favour of migration. . | | | | | | |
| 3.18 Someone in my household is more likely to migrate if there is another member of the community in the destination area. | | | | | | |
| 3.19 If flooding becomes more serious or common someone in my household will migrate. | | | | | | |
| 3.20 If sea level rise becomes more serious someone in my household will migrate. | | | | | | |

SECTION 3. FUTURE MIGRATION

| To what extent do you agree or disagree with the following statements? | 1. Strongly agree | 2. Agree | 3. Undecided | 4. Disagree | 5. Strongly disagree | 99. Don't know |
|---|-------------------|----------|--------------|-------------|----------------------|----------------|
| 3.21 If saltwater intrusion becomes more common or serious someone in my household will migrate. | | | | | | |
| 3.22 If drought becomes more common or serious someone in my household will migrate. | | | | | | |
| 3.23 If there are fewer fish in the sea someone in my household will migrate. | | | | | | |
| 3.24 If it becomes more difficult to grow crops someone in my household will migrate. | | | | | | |
| 3.25 If the economy on my island becomes worse someone in my household will migrate. | | | | | | |
| 3.26 If my island becomes more crowded someone in my household will migrate. | | | | | | |
| 3.27 If it becomes more difficult to meet the financial obligations to the Church someone in my household will migrate. | | | | | | |
| 3.28 If someone in my household gets a tertiary education, then they will likely migrate. | | | | | | |

Annex 2: Correlation Sensitive Vulnerability Index (CSVI)

The Correlation Sensitive Vulnerability Index (CSVI) for this analysis consists of the six, equally weighted indicators listed in table 1. Hence, each dimension is included in the calculation of the CSPI with a weight of 1/6. Within every dimension, the weight per indicator depends on the number of indicators per dimension. While each indicator in the economic dimension is included with a weight of $(1/6)/5 = 1/30$, the indicators for the education dimension have a weight of $(1/6)/3=1/18$ and the indicators for the Health and Nutrition dimension have a weight of $(1/6)/4=1/24$ –subsequently normalized to a scale between 0 and 1. The CSPI per household is, accordingly, calculated by multiplying every household’s weight with the corresponding vulnerability dimensions. The final, overall CSVI score is the mean of the individual CSVI scores.

The first step is to create the normalized dimensions. This is done based on the standard normalization formula below.

$$ND_i = \frac{D_i - D_{i \min}}{D_{i \max} - D_{i \min}} = \frac{D_i}{D_{i \max}}$$

Where ND_i is the i^{th} normalized dimension, D_i is the i^{th} dimension, consisting of the sum of its indicators, and D_{\min} / D_{\max} are the lowest / highest value the dimension can possibly take. In this case, the formula can be shortened to the latter version, as the minimum value is always zero. Subsequently, the individual vulnerability weights for each household and its vulnerability are calculated respectively. The formula for the two calculations is similar:

$$W_H = \frac{1}{D_i} * \sum D_{(1,\dots,i)}$$

Where W_H denotes the weight attributed to the different households, D_i signifies the number of dimensions involved and $D_{(1,\dots,i)}$ represents the different dimensions. The same formula applies to the vulnerability weights W_V . The weighted households and vulnerabilities are then used to ascertain the vulnerability score for every household:

$$V_H = W_H * W_V$$

The Correlation Sensitive Vulnerability Index (CSVI), finally, is the mean of the household vulnerability score. To arrive at the incidence of poverty, the sample can be split into thirds, to test how many household vulnerability scores are contained in which third.

For a more detailed description and exhaustive elaboration on the methodology, please refer to Nicole Ripplin’s work (2011).

Table 1: The composition of the Correlation Sensitive Vulnerability Index

| Dimensions | Indicators |
|--------------------------------|---|
| Economic | 1. Less than 2 sources of income |
| | 2. Dependency Ratio below the sample mean |
| | 3. Household Head unemployed or inactive |
| | 4. No Property Ownership |
| | 5. Asset ownership (less than 2 assets) |
| Education | 1. Illiterate Household Head |
| | 2. At least one child in school age not attending school |
| | 3. No access to secondary education |
| Health and Nutrition | 1. No access to Healthcare |
| | 2. Permanently sick or injured household member |
| | 3. No access to drinking water at least once a week |
| | 4. Not have enough food for three meals a day |
| Housing and Environment | 1. No preventive measures against future hazards |
| | 2. No access to electricity |
| | 3. Dwelling's Walls & Roof not made from resilient materials |
| | 4. Household affected by environmental hazards in past 10 years |
| Social Capital | 1. No Mobile Phone |
| | 2. Cannot count on somebody for help |
| | 3. No access to formal credit |
| Social Inclusion | 1. Security issues in the last year |
| | 2. Discrimination in the last year |
| | 3. No access to informal credit |

ANNEX 3A: PARTICIPATORY METHODS

1. Introduction: What is PRA?

The aim throughout this project is to gain a greater understanding of the factors which contribute to current migration flows from Kiribati, Nauru and Tuvalu exploring the relationship between household socio-economic characteristics, attitudes and subjective norms towards human mobility and migration outcomes. This research also aims to model how environmental and economic alterations could impact on future migration flows from Kiribati, Nauru and Tuvalu. Therefore, this project aims to understand how projected salt water intrusion, ocean acidification and rainfall scenarios under a changing climate will impact on migration flows in the period 2015-2050. Participatory Rural Appraisal (PRA) methods will be essential tools which will enable us to do so. PRA methods create knowledge, contribute to understanding and facilitate discussion. They are useful and innovative tools which facilitate gathering data in the field.

Chambers (1996) defines PRA as “a family of approaches, methods and behaviours that enable people to express and analyse the realities of their lives and conditions, to plan themselves what action to take, and to monitor and evaluate the results.” PRA helps local participants evaluate the challenges and issues they face in their local setting. It can bring together different actors who do or do not usually interact such as local people, development practitioners, and government officials. It provides people who are often deprived of a say on programmes implemented in their area an opportunity to be heard and to then develop appropriate initiatives. It can help develop solutions or actions to respond to local challenges, empowering local people. Finally, it can help generate reliable qualitative data in the framework of research (Chambers 2007).

According to Bhandari, the principles of PRA are: “Using optimal ignorance” which means to optimize the trade-off between quality, relevance, accuracy and timeliness. Only important data will be collected in a relatively short amount of time. The second principle “offsetting biases” means listening to participants, trying to understand their way of life, learning from them and talking to people from all strata of society. The third principle, “triangulation” means cross-checking information by using two or better more sources of information. The fourth principle, “learning from and with rural people” means working face-to-face and learning from indigenous social, physical and technical knowledge. The last principle “learning rapidly and progressively” means being open to adjustments during the learning process, reacting flexibly and improvising according to changing circumstances (Bhandari 2003: 10).

2. Organization of the PRA exercises

For each PRA exercise there should be one facilitator and one note taker: one international researcher from UNU and one researcher from USP.

Ideally, for PRA groups with women, the facilitator (and translator, if there is one) should be female.

3. The role of the Facilitator

The facilitator will need to create a relaxed environment where each participant can freely discuss the issues brought up. The facilitator is the person who acts as the 'main thread' of each exercise, providing guidelines on the nature of the issue discussed as well as insuring coherence of the whole process and at the same time stepping back to allow participants to be the main actors. Leading a PRA session can be a challenging but also very enriching experience.

The researcher's behaviour and attitudes are crucial to the smooth progress of each session. Please keep the following points in mind while facilitating the discussion:

- Act as a convenor and catalyst
- Do not dominate the process
- Show full appreciation and respect to the participants
- Generally, do not interrupt and lecture participants but listen attentively (in case one finds an interruption inevitable, e.g. a participant dominating the discussion or taking the discussion out of track/context, do it very carefully without causing offence to any of the participants).
- Be open and flexible
- Show the participants that one is willing to listen to them and give them time
- Have confidence in the knowledge of local people
- If anything goes wrong during the discussion, try not to blame the participants but rather take the criticism on the side of the researcher.
- Encourage participation of all
- Pass on initiatives and responsibility to others

(Kumar 1996; Chambers 1996)

4. The role of the Note Taker

The note taker's role is essential to the research project. The note taker will be responsible for recording the whole session with the recorder provided (if culturally appropriate) as well as taking notes of what was said during the session. The note taker should also act as a process observer and take notes on the atmosphere of the gathering, problems encountered during the PRA session and any other observation on the behaviour of the participants which may be relevant for the analysis.

Please consider the following during the session:

- Fill in the worksheets with the essential information about the session (date, time, number and sex of participants, etc.)
- Take notes directly on the worksheet according to the format specified
- Write notes in the language that one feels most comfortable with (the local lingua franca or English) or another local language; it is recommended to take notes in the language spoken by participants)
- Try to capture as much as possible – remember the notes will be essential to the outcome of the research
- Do not try to edit notes during the process
- Try to distinguish between general arguments and individual opinions in notes
- Try to write the notes in a clear way so that you or another team member is able to go over them if needed
- Write up your notes on a computer at the end of each day

5. Typical challenges encountered in PRA

Below you will find a list of difficult situations which can happen during a PRA session and suggestions about how to deal with them.

Ensuring that the voices of the most vulnerable are present throughout the research

The voices of the most vulnerable layers of population such as the poor and women throughout the world have often been excluded from participation in processes and decisions which affect them. This research seeks to be as inclusive as possible and therefore emphasizes the importance of adapting the research in the field in such ways that makes it possible for all layers of the population to be able to participate in an open and free discussion. Researchers should be sensitive and non-judgemental about the local context of the research. In ensuring that the most vulnerable are being included, the research methods have been devised accordingly. Prior consultations with ESCAP, USP and local partners will help ensure that sample groups are representative and inclusive of all structures of society.

What if a participant monopolizes conversation preventing others from speaking?

The facilitator must observe and identify the different dynamics of the session. If someone is preventing others by continuously speaking, the facilitator must step in, thanking the participant for his contribution and start asking if anyone would like to add anything to what has been said, reminding everyone that the objective of the exercise is an open conversation involving all participants and emphasizing that everyone's contribution is crucial to the outcome. Once the facilitator has reminded participants of the importance of having everyone speak, s(he) should give the floor to someone who has not been given the opportunity to do so. However, this does not mean that the participant who has been singled out for speaking too much should be prevented from speaking during the rest of the session.

What if a participant is silent during the session?

The facilitator must observe and identify the different dynamics of the session, particularly if one or more participants are not speaking. For some people it takes lots of courage to speak up and share their opinion with others. Therefore, the facilitator should identify the 'silent' participants and ask them a question related to the topic of discussion. The question must be an easy one which should not overwhelm and pressure the participant (for instance whether she agrees or not with what has been said).

6. Material needed for the PRA exercises

The material required will be:

- The biggest and second biggest sheets of paper available
- Note taking paper
- Lots of marker pens (wide variety of colours)
- Different smaller size, shape and colour of papers
- Chalk (in case there is nowhere available to write)
- Be imaginative and use local “natural resources” such as: stones, twigs, leaves, etc.
- Camera with batteries
- Voice recorder with batteries
- Refreshments for participants (depending on the local context)

7. How long does a PRA session last?

Conducting PRA is a long process and there is no precise time of how long each session should last. However, keep in mind that it can roughly last between 2 to 3 hours.

8. Guidelines for applying the PRA methods

Every PRA session will be conducted through the following steps:

1. Word of welcome (local facilitator)
2. Introduction of all participants (name tags should be handed out both to the research team and session participants)
3. Presentation of the project (international/senior researcher)
4. Presentation of the PRA exercise (PRA facilitators)
5. Group work
6. Once you are done, discuss the outcome and ask participants whether they feel the result is true to their vision of the issue.
7. Take pictures of the finished session (if possible)
8. Concluding remarks

8.1 Transect Walk with Resource Mapping and Wealth Ranking

- Step 1:** Introduce yourselves, the research project and thank the participants for their attendance.
- Step 2:** Explain the aim of the exercise: to understand the village's special dimensions including all important natural resources, habitation, important buildings and a local classification of wealth groups.
- Step 3:** Walk around the village and its agricultural and livestock-breeding areas and ask the key informants to explain the surroundings. Mark all important spatial dimensions on the map.
- Step 4:** Ask the key informants to explain local indicators and criteria of wealth and well-being. Ask them to register the relative position of the households in the community on the map in different colours according to their classification.
- Step 5:** Thank everyone for their time, participation and congratulate them on the outcome of the session.

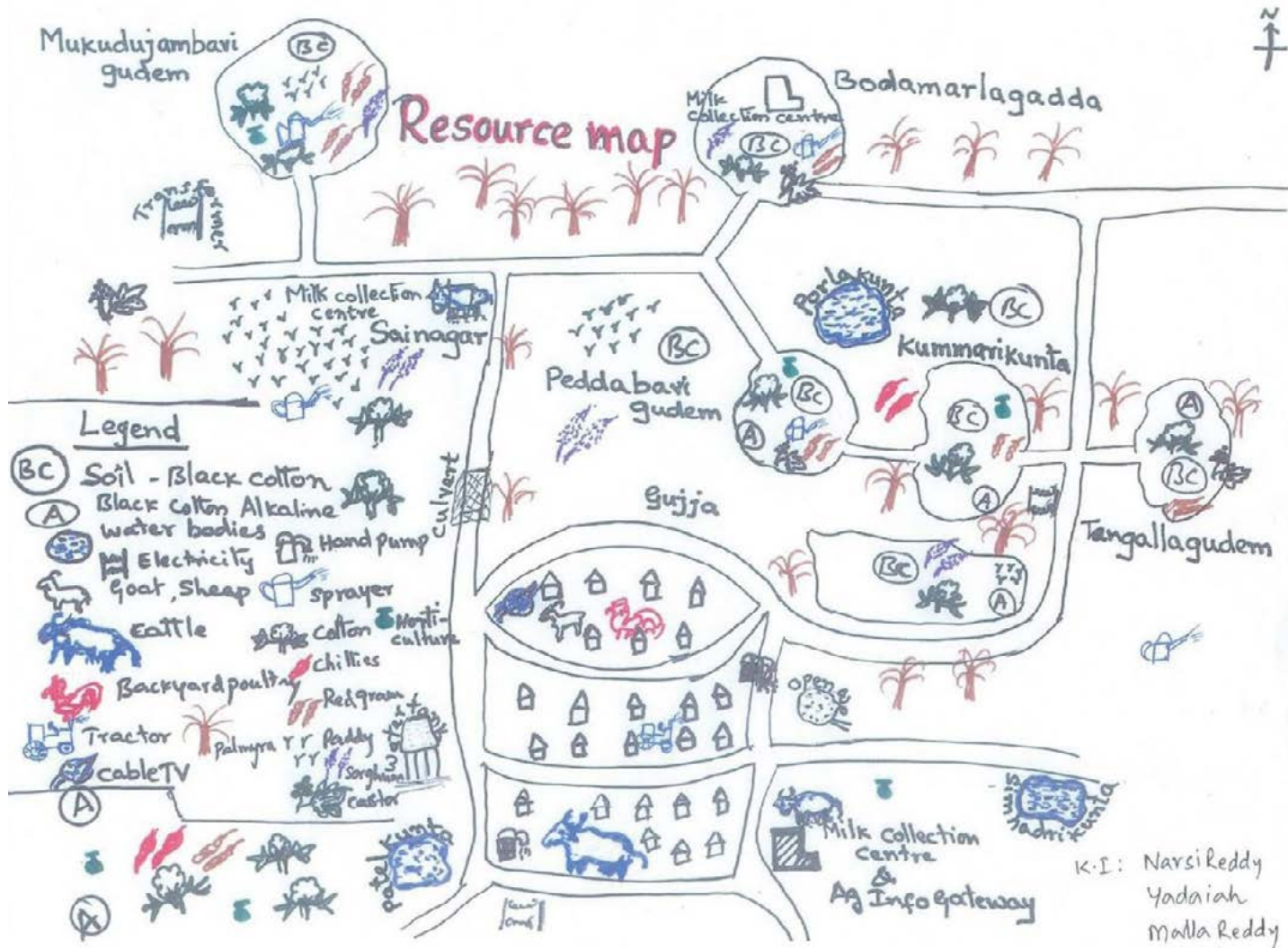


Figure 1: Resource Map.

Source: Emaze (2016).

8.2 Livelihood Risk Ranking and Coping Strategies Ranking

8.2.1 Livelihood Risk Ranking

Objective: The objective of the exercise is to get an overview of issues that are considered to be a risk to the way people make a living and to understand the severity and frequency of such risks.

Group size and selection of participants:

A group of 5-6 persons, including:

- somebody whose main livelihood activity is natural resource based (agriculture, fishing, cattle herding etc.)
- somebody whose main livelihood activity is not natural resource based
- somebody who comes from households that are considered most vulnerable in the local context (identified by wealth ranking exercise)
- at least two women
- at least two youth

Material required: Pen and marker, big sheet of paper, record cards

Facilitation and questions to initiate discussion

Step 1: Introduce yourselves, the research project and thank the participants for their participation.

Step 2: Explain the aim of the exercise: to understand what livelihood risks local people identify as being of relevance to the research area.

Step 3: Ask participants which events, factors, processes etc. they consider as a risk for the way they make their living. Note down every problem on a sheet of paper, one sheet of paper per risk.

QUESTIONS TO INITIATE DISCUSSION: What are the main risks for livelihoods in this community? Why do you consider them as a problem? How do they affect you?

Step 4: Repeat to the participants the noted points and probe if any other risks are missing.

Step 5: Ask participants to write on cards the points that have been mentioned. They should note down one issue per card; if illiterate participants are present, symbols should be drawn to illustrate the issues. Either the facilitator or another participant can write the issue down next to the drawing of the illiterate participants. Explain the symbols and ensure that they are understood by all participants.

Step 6: Rank by Severity ▼ draw on three cards the following facial expressions: smiling, serious and crying [need to be prepared in advance]. Put the cards down and explain that the facial expressions are displaying levels of severity. Ask the people what risks they consider as very severe (crying card), severe (serious) and not so severe (smiling) and ask them to put the card next to the facial expressions. Ask them why they are rating the risks like that.

QUESTIONS TO INITIATE DISCUSSION: Among the mentioned risks, which ones do you consider as the most severe? Which risks do you consider as severe? Which ones do you consider as not so severe?

Questions to initiate discussion after the draft ranking is complete: Why do you consider (severe risks) more severe than (intermediate risks)? And so forth ...

Step 7: Reshuffle the cards and explain that now you would like to ask them to order the risks by the frequency of occurrence.

Step 8: Rank by Frequency ▼ Ask participants to order the risks according to frequency. Start with the issue that is happening most frequently. Arrange the cards accordingly. Give room for participants to discuss among themselves. Make sure that a consensus is reached.

Questions to initiate discussion: What risk is the most frequent? What is the second most frequent? ... Why is risk 1 more frequent than risk 2? ...

Step 9: Thank everyone and congratulate them on the outcome of the session. After a short break you will look at how they deal with these risks.

8.2.2 Ranking of Coping Strategies

Topic: Coping with livelihood risks

Objective: The objective of the exercise is to get an overview of how people cope with risks to the way they make a living.

Group size and selection of participants: same as 8.2.1

Material required: cards, bold marker

Facilitation and questions to initiate discussion

Step 1: Explain the aim of the exercise: to understand how people cope with climatic events.

Step 2: Ask participants how they cope with each of the risks identified in the exercise above. Note it down. Read the noted points and ask if participants want to add, modify or delete any points. Ask them to draw and write down the points down on cards – one per card.

QUESTIONS TO INITIATE DISCUSSION: When you are affected by these risks, how do you cope and adapt to them?

Step 3: Repeat to the participants the noted points and probe if any other risks are missing.

Step 4: Ask participants to write on cards the points that have been mentioned. They should note down one issue per card; if illiterate participants are present symbols should be drawn to illustrate the issues. Either the facilitator or another participant can write the issue down next to the drawing of the illiterate participants. Explain the symbols and ensure that they are understood by all participants.

Step 5: Rank by Severity → draw on three cards the following facial expressions: smiling, serious and crying [need to be prepared in advance]. Put the cards down and explain that the facial expressions are displaying levels of severity. Ask the people what coping strategies they consider as very severe (crying card), severe (serious) and not so severe (smiling) and ask them to put the card next to the facial expressions. Ask them why they are rating the strategies like that.

Questions to initiate discussion: Among the mentioned strategies, which ones do you consider as the most severe? Which strategies do you consider as severe? Which ones do you consider as not so severe?

Step 6: Thank everyone for their time, participation and congratulate them on the outcome of the session.



Figure 2: Example of a coping ranking.

Source: Rademacher-Schulz et al., 2012.

8.3. Timeline & Seasonal Calendar

8.3.1 Timeline

Objective: The objective of the exercise is to get a general overview over events that the people consider to be important events in the history and development of their village.

Group size and selection of participants: 1 group (8-10 person) of male and female elders and middle aged persons.

Material required: cards, chalks, chart paper, bold marker

Facilitation and questions to initiate discussion

St Introduce yourselves, the research project and thank the participants for their participation.

Step 2: Explain the aim of the exercise: to get a temporal overview of events that the participants consider being important for the history and development of the village.

Step 3: Facilitate the beginning of the exercise by asking key questions about the history of the locality such as:

QUESTIONS TO INITIATE DISCUSSION: When was the village established? What are the major events in the history of the village? When did the community convert to Christianity? When was the village affected by natural hazards or environmental events? What major changes took place and what are the reasons for these?

Step 4: Ask participants to write on cards in bold the major events brought up during the discussion.

Step 5: Ask participants if there are additional major events they wish to add. At this point again ask if there are any environmental events which are missing, asking them particularly to think about the last 10 years.

Step 6: Draw a line (on the ground or paper) and ask participants to order the cards chronologically. Check they agree with the order.

Step 7: Once the cards are in chronological order ask the participants to write the year they occurred on the cards (it is very important that these years are as accurate as possible, so give them time to confer and agree).

Step 8: Launch a discussion on the mentioned events.

Questions to initiate discussion: Why do you consider this as an important event? What was the impact of the event on the village?

Step 9: Thank everyone for their time, participation and congratulate them on the outcome of the session. After a break, you will continue with the Seasonal Calendar.

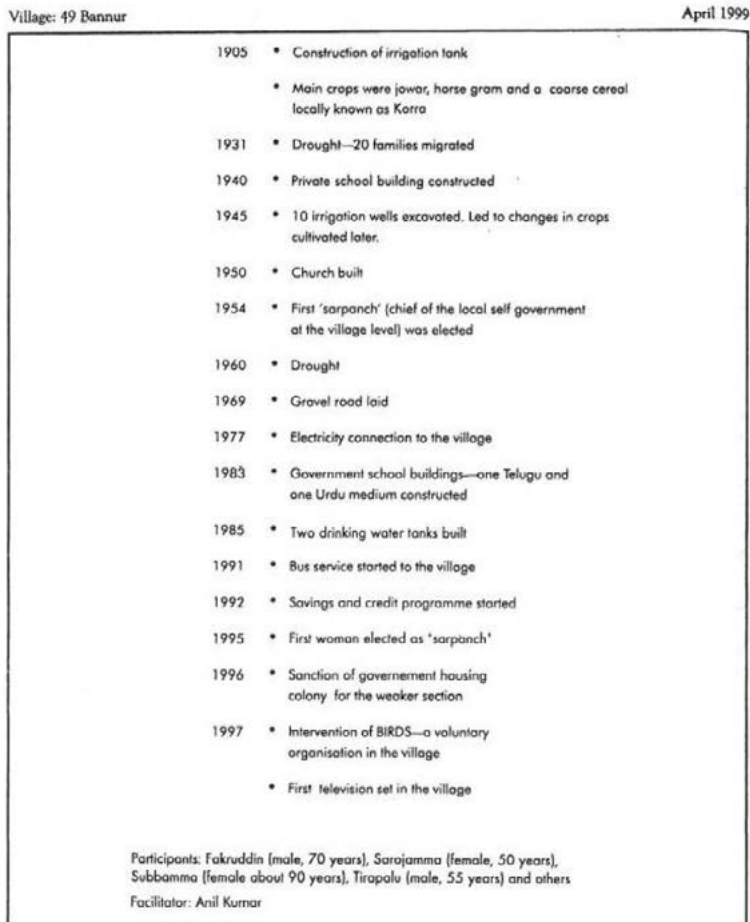


Figure 3: Example of a timeline. Source: Kumar 2002

8.3.2 Seasonal Calendar Regarding Livelihood, Rainfall and Food Security

Group size and selection of participants: same as 8.3.1

Objective: Understand the different seasonal patterns with regard to livelihood activities (planting and harvesting) and related issues (rainfall, hazards etc.) as well as food security.

Group size and selection of participants: 1 mixed group of 7-10 persons including elders and other age groups

Material required: cards, chalks, chart paper, bold marker

Facilitation and questions to initiate discussion

Step 1: Explain the aim of the exercise: to understand the different seasonal food security patterns and understand how these relate to the general activities of the research area.

Step 2: Draw a table with 12 columns and explain that these correspond to the months of the year. There should be four rows: weather, farming activities, non-farming activities, migration.

Step 3: Ask participants to list the times of hazards such as droughts, floods, periods of food scarcity (weather row/difficulty catching fish), sowing seeds, harvesting and other agricultural activities (farming activities row) availability of non-farming activities (non-farming activities row), times of migration (migration row) Subsequently, mark or draw these accordingly on the table.

QUESTIONS TO INITIATE DISCUSSION: Which meteorological seasons characterize this area? Which climatic extremes tend to occur in different periods? What are the busiest months of the year? When is most agricultural work carried out by women and men? When is most non-agricultural work carried out by women and men? Which could be the most appropriate season for additional activities for men and women? When do people migrate and return to the community?

Step 4: Discuss the outcomes of the exercise, row by row.

Step 5: Ask the participants if these patterns have been constant or changing over the last 10 years.

Step 6: Thank everyone for their time, participation and congratulate them on the outcome of the session.

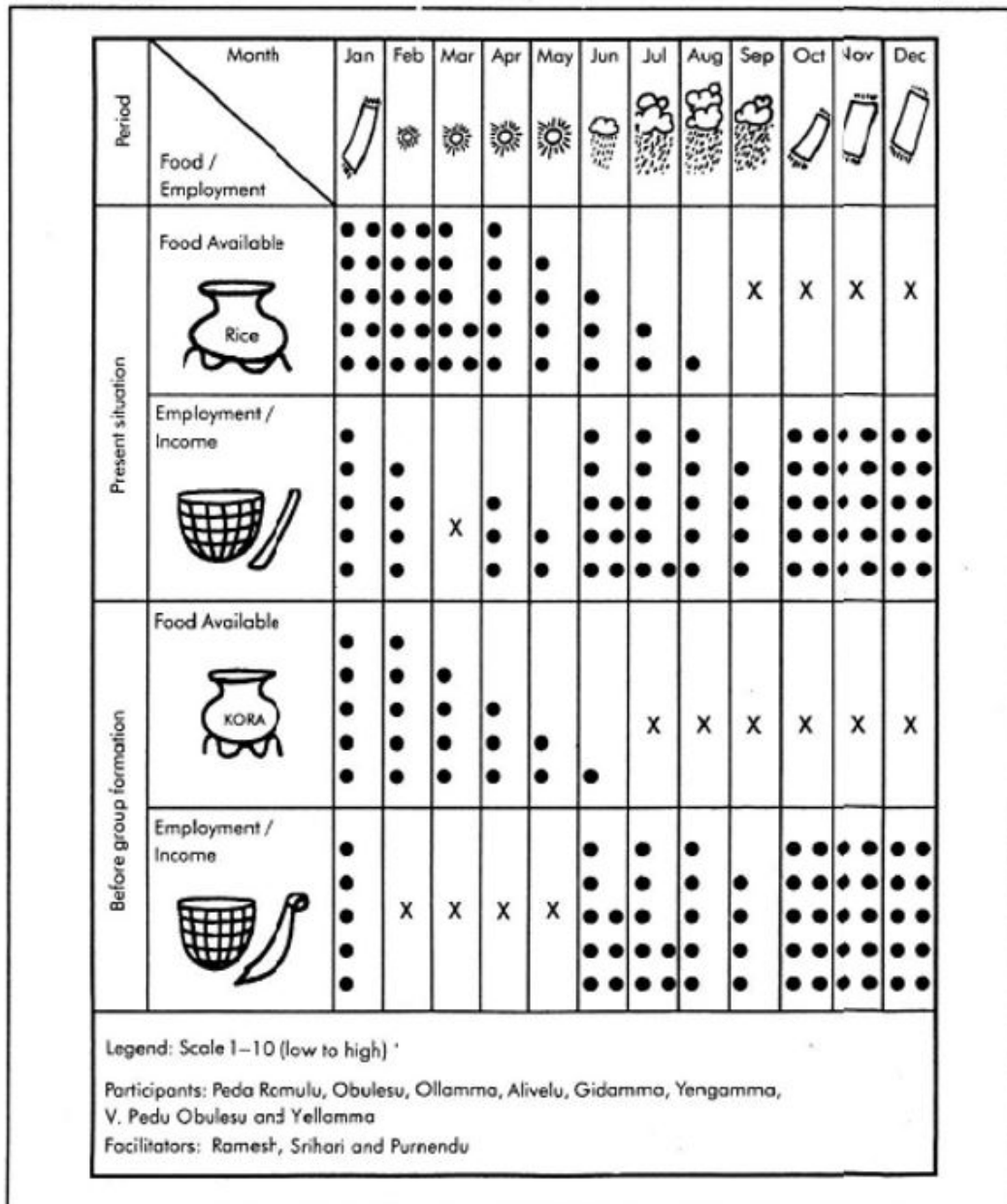


Figure 4: Example of a seasonal calendar. Source: (Kumar 2002)

8.4 Fuzzy Cognitive Mapping & Mobility map on migration

8.4.1 Fuzzy Cognitive Mapping

Objective: To understand how different factors influence migration and to understand inter-linkages of different factors.

Group size and selection of participants: 1 group (8-10 person) both from migrant and non-migrant households

Material required: cards, chalks, chart paper, bold marker

Facilitation and questions to initiate discussion

Step 1: Introduce yourselves, the research project and thank the participants for their participation.

Step 2: Explain the aim of the exercise: to understand how different factors influence migration decision-making.

Step 3: Ask the participants to explain the key factors (social, economic, environmental) determining migration decision-making. Note them down.

QUESTIONS TO INITIATE DISCUSSION: What are the reasons people migrate from here? What are the main reasons people migrate? Are these reasons changing? Are there any obstacles to migration? Who makes decisions about migration (individuals, households, communities?)

Step 4: Use each concept for further discussions. Ask participants to draw the factors and to write them down in bold letters on cards. Put them in the centre. Ask the participants to concentrate on these factors.

Step 5: Read out the list of the identified factor and ask them whether anything is missing, need to be added or deleted.

Step 6: Ask the participants about the causal influences or links between the factors and whether an increase in one factor causes an increase or decrease in another factor to which it is causally connected.

QUESTIONS TO INITIATE DISCUSSION: How are these ideas connected? Does one situation cause another situation?

Step 7: Ask the participants to rearrange the cards and link the cards with lines drawn with chalk, showing the causal connections. Encourage participants to add new factors or influences at any time and make modifications.

Step 8: Ask participants to explain the diagram. Ask questions if issues are unclear.

Repeat the exercise: one time for "normal times" and one time for "critical times" (which could refer to the environmental, economic or social stresses).

Step 9: Thank everyone for their time, participation and congratulate them on the outcome of the session.

8.4.2 Mobility Map

Objective: To get an overview of the migration flows from the study village.

Group size and selection of participants: Same as 8.4.1

Material required: cards, chalks, chart paper, bold marker, stones (or any other symbol).

Facilitation and questions to initiate discussion

Step 1: Explain the aim of the exercise: to understand where and when migration is taking place and discuss migration related issues.

Step 2: Destinations of migration → Ask participants where community members have migrated to.

QUESTIONS TO INITIATE DISCUSSION: Where do people from your village migrate to? Does anybody also migrate internationally? Write down the areas on cards – only one destination per card! Probe if there are any destinations not mentioned.

Step 3: Distance → Draw (on paper or on the ground) an area which represents the village and ask participants to place the cards in relation to the village. The further the destination is away from the village the further the cards should be placed from the village

Guiding Instruction: We would like to know how far the migration destinations are away from your village. Please place the cards in relation to the village, the nearer the destination, the nearer you should put the cards to the drawn village symbol.

Step 4: Number of migrants → tell the participants that we would like to know how important (in terms of numbers of migrants) each destination is. Explain that the number of people drawn displays the number of migrants. To the destination where more people are migrating to, they should draw more people on the cards, to destinations where only less people are migrating to, they should draw less people.

QUESTIONS TO INITIATE DISCUSSION: When you compare the different destinations mentioned, where do more people from the village migrate to, where do less people go? Why do more people go to some destinations and less to others? [Enquire about concrete destinations].

Step 5: Activity in the destination area → Ask the participants what the migrants do in the destination of migration.

QUESTIONS TO INITIATE DISCUSSION: What do the migrants do in [name of the destination]? Why do they migrate there? How are the labour conditions and income opportunities at the different destinations? Do they work on contract basis or not? Whom do they know at the destination? How do they find the job? Are they hired for example by employers? What are the problems people are facing on the way to the areas of destination? What problem are migrants facing in the destination areas?

Try to express this visually in the cards (e.g. if people go fishing, draw a fish)

Step 6: Seasonality → Ask participants to which destinations people are migrating seasonally. Note down on the cards.

QUESTIONS TO INITIATE DISCUSSION: To which destinations do people migrate mainly seasonally? To which destinations do people migrate more long term? Are there mixed areas?

Step 7: Cost → Ask the participants about the cost of migrating to the different destinations.

QUESTIONS TO INITIATE DISCUSSION: We would like to know about the cost that is involved when migrating to the different areas. Put more stones on areas where the cost of migration is higher and less stones where the cost of migration is low. What do you have to pay for when migrating to [destination]?

Step 8: Remittances → ask them about the remittance flow from the different destination areas. Draw a thicker line between the village and the destination areas from areas where the amount of remittances is high and a thinner line where the amount is lower.

QUESTIONS TO INITIATE DISCUSSION: From which areas are migrants able to send the most money back to the village? [Draw the thickest line between this destination and the village] From where do they send the least amount? [Draw the thinnest line between this destination and the village] [Draw the other lines with reference to the thickness of these two lines].

Step 9: Thank everyone for their time, participation and congratulate them on the outcome of the session.

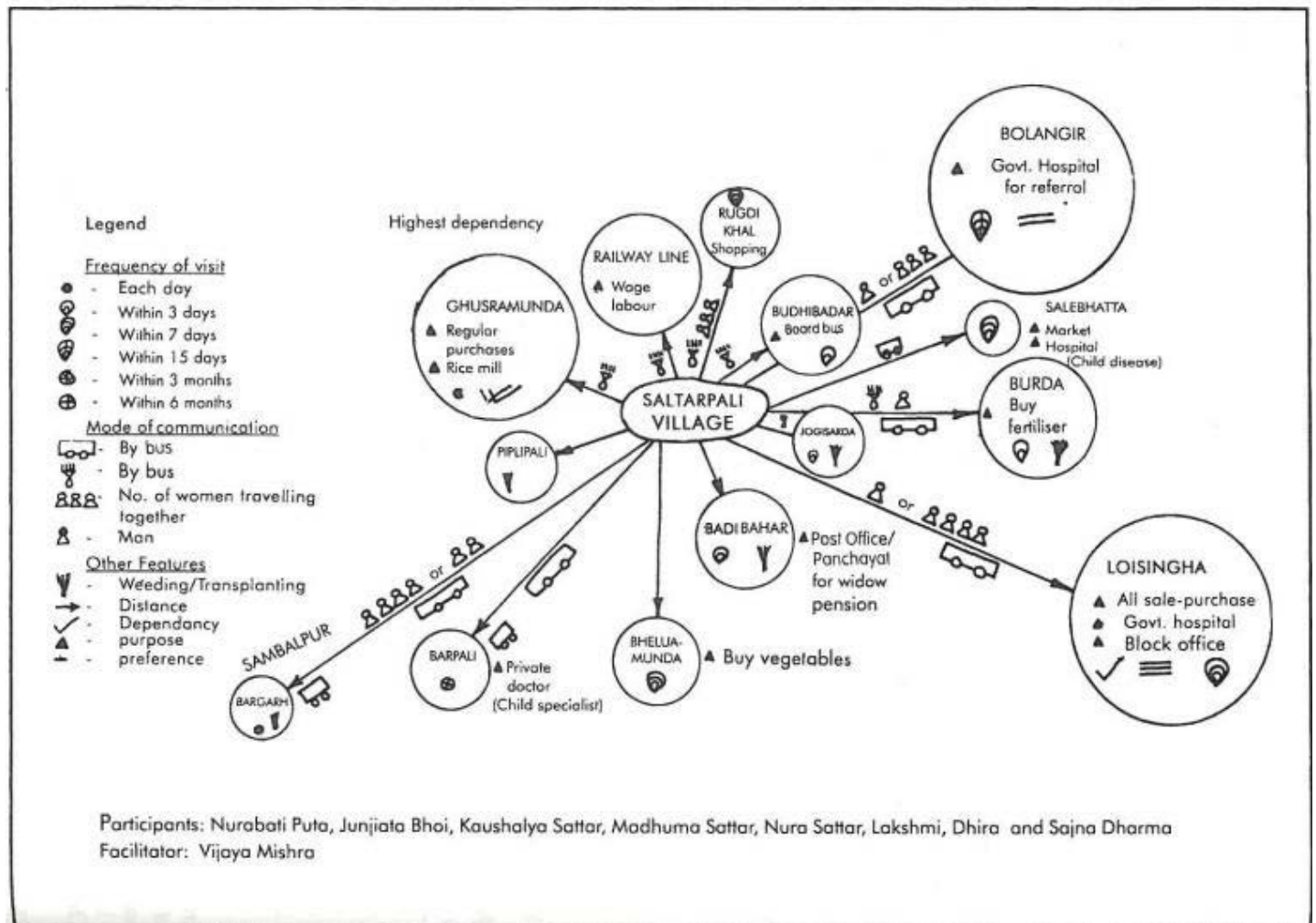


Figure 6: Example of a mobility map. Source: Kumar 2002

8.5 Venn Diagrams on Livelihoods and Migration “Support Systems” or Networks

Objective: To understand which actors, groups of persons, organizations and institutions (this could be formal and informal organization, rules and laws, social norms) are most important in the community

Group size and selection of participants: 1 group (8-10 person) both from migrant and non-migrant households

Material required: BIG sheet of paper, pencils, and markers, glue (or if drawing on the ground: soft ground, sticks and local material or symbols)

Facilitation and questions to initiate discussion

Step 1: Introduce yourselves, the research project and thank the participants for their participation.

Step 2: Explain the aim of the exercise: to understand the institutional context in relation to the area.

Step 3: Ask participants to identify major organisations, groups, firms or people, which they think have a strong influence in their locality, in particular in times of crises.

Questions to initiate discussion: What are the organisations and groups which have a strong influence in the local community? Can these organisations and groups help in times of crisis?

Step 4: Write on circles each of these taking into account importance/impact on local food security according to the size of the circle (i.e. the most important should be written in a bigger circle and the less in important in a smaller circle).

QUESTIONS TO INITIATE DISCUSSION: Why have you put this organisation as a large circle? Why have you put this group as a small circle?

Step 5: Draw the village (on paper or on the ground) and ask participants to arrange the circles taking into account distance as a representation of the access to these organisations and their services in the village (i.e. the closer, the easier to benefit from their services, the further away, the more difficult).

Step 6: Discuss the results with the participants.

QUESTIONS TO INITIATE DISCUSSION: Why is this placed far away from the community? Why is this placed close to the community? What is the relationship between these groups?

Step 7: Thank everyone for their time, participation and congratulate them on the outcome of the session.

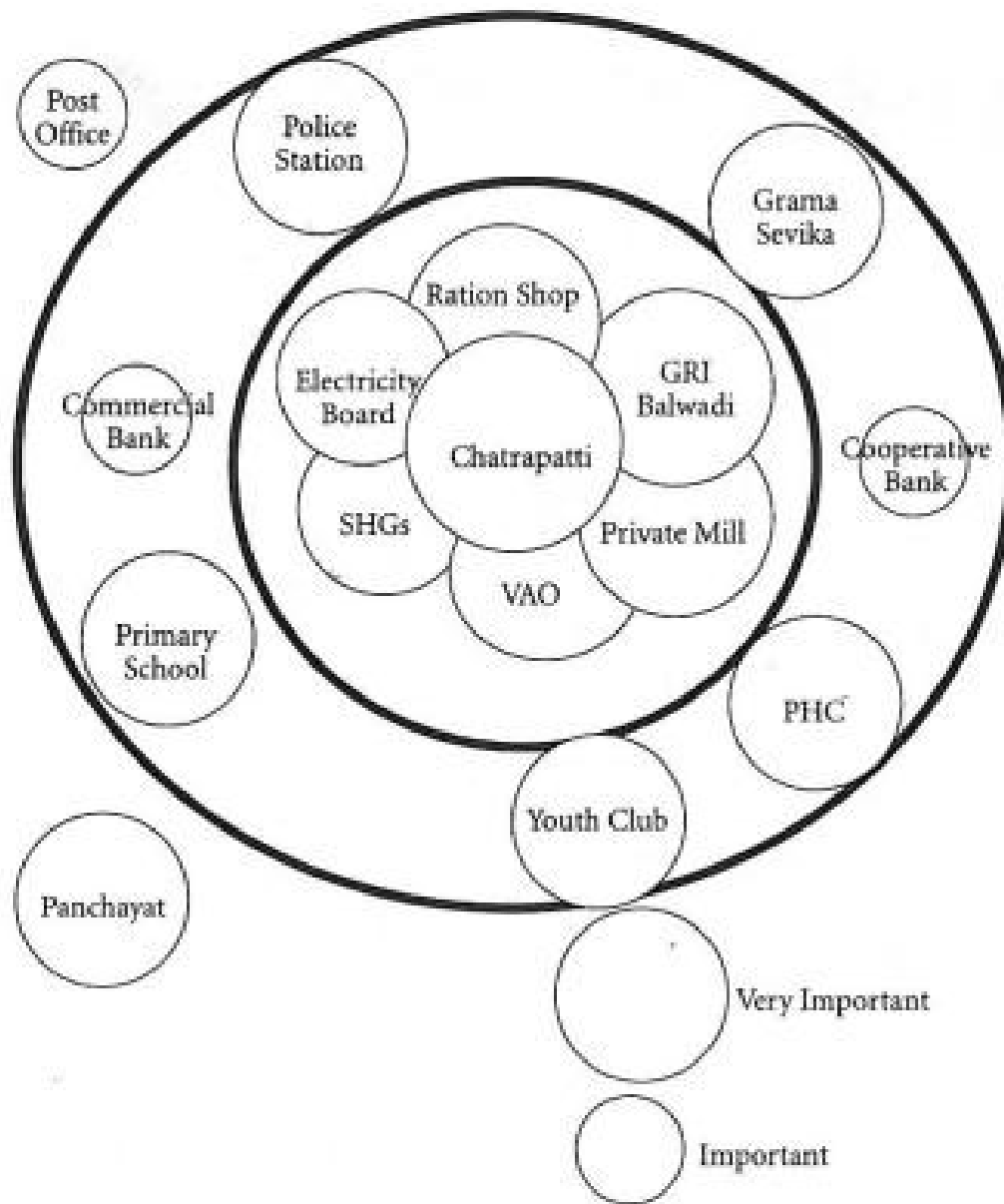


Figure 7: Example of a Venn Diagram. Source: Narayanasamy (2009:116)

9. Worksheet template for note taking

Section 1. Socio-Economic Profile of the Household

Place:

Date and Time:

Name of Note Taker:

Name of Facilitator:

Number of participants:

Number of males:

Number of females:

Notes:

ANNEX 3B: THE Q SORT

Island discourses relating to climate change and migration were researched using news articles, social media, mainstream media, government reports and academic articles. Verbatim quotes were used where possible to preserve the essence of the opinions on the issues. The opinions were subdivided into 9 salient themes. Firstly, there are statements which are related to climate change, labour migration and adaptation. These are the primary areas which the PCCM project focuses on and as such it was necessary to include islanders' opinions on these areas. Secondly, in order to understand the context of the study, it was decided to include statements which address the three pillars of sustainable development; the environment, the economy and society. Finally, three further themes deemed of particular importance in the Pacific islands were included (resettlement, land and culture and religion). Four statements were selected for each issue with the objective of covering each issue from every possible angle.

THE SAMPLED STATEMENTS

CLIMATE CHANGE

1. I believe everyone on the island will be saved but with the help of others.
2. The angry sea will kill us all.
3. There are the high tides, but other than that not much is changing. Things have been pretty much the same for 30–40 years. So people are not very worried.
4. On our island there is nowhere to move back to – you'll either be in the lagoon or the ocean.

LABOUR MIGRATION

5. Here, a man might catch lots of fish one day and sell it, and the next day he can relax, sleep, visit friends and loaf around for the whole day. You can't do that in New Zealand.
6. The young people go to the capital or Fiji, New Zealand, Australia or Samoa to study or to try to find a job. The old stay where they are.
7. If I could move temporarily to Australia or New Zealand then I would, but I wouldn't want to move permanently.
8. If people move then they should send money back so that their families can remain at home.

RELOCATION

9. Our reefs are healthy and can grow and rise with the sea level, so there is absolutely no need to buy land in Fiji or anywhere else.
10. Relocation will always be viewed as an option of last resort.
11. Resettlement in some other location may be the only permanent and definite solution...there is no other alternative.
12. Relieving population pressure through migration could help to enhance the quality of life for those who remain.

ENVIRONMENT

13. High tides and unseasonal storms are more and more frequent.
14. We are really not protected in any sustainable way at the moment.
15. Life is becoming impossible; either too much rain or long time of drought and lack of safe drinking water.
16. Higher water temperatures and ocean acidification are damaging the marine ecosystems that we depend on for food

ECONOMY

17. Family ties are really close here. That helps the inhabitants of the islands overcome many of the hardships and difficulties of living here.
18. Not everybody can migrate, so it's not a choice for the poor people. It's just a choice for the rich people.
19. The economy is picking up now but really slowly, but I reckon that we will get there.
20. There's no point getting a qualification if there isn't going to be a job for you at the end.

SOCIETY

21. The population pressure is now so great that a health catastrophe is coming. I would move to get access to better healthcare.
22. Houses are in bad condition because they cannot keep up with the costs of maintenance. They try to feed first their families.

23. Food security in the medium to long term is a serious concern as there is little agricultural activity.
24. Climate change will cause populations to move and perhaps exacerbate this problem of urbanization and overcrowding.

LANDS AND CULTURE

25. I don't want to leave because I was born here. But if climate change affects me I will have to leave. I feel very sad. It hurts to leave where you come from.
26. Our people will be scattered, and the survival of our unique culture, lifestyle and even our language, may be lost forever.
27. Our lands define who we are. Without a land, you are nobody.
28. We have the right to control our own destiny and resources.

ADAPTATION

29. First people will adapt to climate change, but if they can't do more they may then migrate.
30. We need to do more to protect our coasts and water resources threatened by thoughtless pollution.
31. We look upon technology as our new salvation. But technology is not a creation of God. It is a creation of our own hands and in the end technology will turn around and become our greatest enemy.
32. If there is no food in the shop, we can eat pandanus, banana or coconut.

RELIGION

33. Climate change is not God's curse, but a blessing in disguise. It comes to test your faith and to produce in you the quality of endurance.
34. The current changes in the weather and floods are signs of God punishing wrongdoing.
35. If God says today is the day, then we stay here and go down with it.
36. Just as the chosen people of God got their land, I believe that we were placed here and that the land is a gift from God.

INSTRUCTION SHEET

INTRODUCTION

This exercise is about your opinions on migration and climate change. During the exercise place the cards in a square which represents your opinion.

1. Instructions

2. Read through the cards and divide them into three sections:

a) Cards you agree with

b) Cards you disagree with

c) Cards you feel neutral about

2. Place the cards you **most agree** with at **3 or 4**.

Place the cards you **agree with a little** at **1 or 2**.

Place the cards you **feel neutral** about at **0**.

Place the cards you **disagree with a little** at **-1 or -2**.

Place the cards you **most disagree** with at **-3 or -4**.

After you have finished, please look again at the grid and check the cards are in the correct place. Move the cards until you are happy the grid represents your opinions on migration and climate change.

Q STUDY RECORD

| | | | | | | | | |
|---------------|----|----------|----|---------|-------|---|------------|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| Most disagree | | Disagree | | Neutral | Agree | | Most agree | |

Statement I most agree with

Number

Please explain

Statement I most disagree with

Number

Please explain

ANNEX 4: THE AGENT BASED MODEL

Two agent based models were produced, one for Tuvalu and one for Kiribati. Four distinct geographical zones are simulated in each model in order to get a balance between complexity and simplicity. For Tuvalu, Funafuti and Vaitupu were selected as the islands with significant in and out migration. Data from Nanumea is used to represent the “Outer Islands” of Tuvalu. For Kiribati, South Tarawa and Kiritimati are represented plus North Tarawa, Butaritari and Marakei represent the outer islands. There is also a zone termed “Exterior” in both models which represents other countries which migrants can migrate from and to. In addition to these areas, agents can also travel from the three domestic zones to their respective seafaring zones.

DEMOGRAPHIC INPUTS

The models begin in 2005, as the household surveys cover the period 2005-2015. The population is initially dispersed among the four geographic regions in their respective proportions according to census data. In order to include those people who were abroad at the time of the census and to have a population of agents who are able to migrate into Tuvalu or Kiribati, an additional 10% of the population is placed in the exterior at the start of the model. The population is assumed to be 50% male and 50% female and the age distribution is taken from the respective census. The fertility rate for each country is taken from World Health Organisation data and is assumed to be constant throughout the course of the model. The life expectancy for the agents is also derived from WHO data, with appropriate distributions for males and females and for agents who are alive at the start of the model or are born into the model. Each month agents age by one month and have a probability of dying and migrating. This means that, even with no other changes as time progresses the number of deaths and migration trips changes. In addition, each month the fertility rate and the population determines the number of births. The models run until 2055.

REASONS FOR MIGRATION

Agents can move for Educational, Economic, Health, Environmental, Peer pressure (the influence of their social network) and Seafaring motivations and are given baseline probabilities for these movements. Although Seafaring can also be considered an economic movement it is treated as a distinct movement as it is a distinct destination. For Tuvalu, instead of using the household survey data for seafaring, census data was used which shows seafaring to have been relatively constant over the last two decades. Not all motivations are relevant for all migratory routes. Reasons for migration are differentiated demographically as the young are more likely to migrate for education, seniors for health and those of working age for economic reasons. Social networks are assumed to be the same for each agent and account for the “don't know” reason given for migration from the household survey. The social network connects agents who are local to each other. After agent migrate, they send a message to the members of their social network encouraging them to also migrate. All of these motivations, with the exception of environmental are assumed to be uniform over time. Environmental related migration is modelled by using projected rises in sea level as a simple proxy for the impact of climate change. Three scenarios are presented; low, medium and high according to the Representative Concentration Pathways

(RCP). Each month the desire to migrate is related to sea level rise as agents are deemed to be impacted by the environment if a random number is generated which is lower than the current sea level. Therefore the probability of migration increases as time progresses.

THE CSVI

The agents are assigned a CSVI in accordance with their island of origin. This is done through a normal distribution with minimum and maximum values. Those households with higher CSVI (higher vulnerability) are less likely to migrate. This is simulated by through the desire to migrate only being realised if a generated random number is higher than the current CSVI. In addition to the CSVI acting as a brake on migration, migration also affects the CSVI. After a migration trip the CSVI of the agent and his/her social network is decreased by 0.01; further enabling future migration. This is because it is assumed that migration will result in remittances, better education, improved health or other living conditions which reduce vulnerability.

THE TIMING OF TRIPS

The majority of migratory trips are assumed to be round trips, and the return rate is set at 0.8 as 20% of migrants are assumed not to return, although it is possible they take another trip to their original zone. The length of the migration trip is determined by a distinct PERT distribution (Clark, 1962) for each type of migration which considers the observed minimum, maximum and modal (most common) length of each type of trip as revealed by the household survey data.

VALIDATION

The Pacific Climate Migration Model uses a history friendly approach which emphasizes the use of empirical data, or “concretization” to validate and calibrate the model. To this end each model was initially parameterized to accurately simulate the flows of migrants from 2005 to 2015. A Keep It Simple Stupid (KISS) approach was used for parameterization, whereby initially the impact of the vulnerability index was not included. As a result the degrees of freedom in the model were curtailed by directly calibrating the model with observed data. Once the model was effectively representing the observed data the impact of the more theoretical CSVI was introduced.

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