Reducing Hazard Vulnerability through Participative Methods

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1. Introduction

In recent years the view that natural processes are the cause of disasters has largely been discarded. In place it is recognised that though many hazards are natural, disasters, in general, are not. They happen to people who are at risk because of their vulnerability. In addition, it is apparent though still not widely acknowledged that many livelihood practices, including industrial and food production systems are creating hazards that did not exist in the past. The impact of hazardous events, whether they are natural or man made, cataclysmic or slow acting, tends to be greater on poorer sections of communities simply because they are less able to protect themselves or recover.

Meanwhile, research is showing that poverty levels, particularly in many southern countries are increasing. Thus, though poverty and vulnerability to hazard are not synonymous, it is not surprising that hazardous events are claiming more lives and destroying more livelihoods than was the case 20 years ago. To some extent this is because the poverty that drives people to precarious and unsustainable means of survival actually causes the hazards that become disasters or at least aggravates what may have otherwise been minor natural calamities. An obvious example of this is settlement and farming on riverbanks prone to flooding. Increasing numbers of poor farmers have no option but to live and work on land they know to be unstable, but this practice may and often does result in flood where previously a river may not have breached its banks. A similar cycle of poverty leading to hazard is evident in urban slums which are frequently located on steep hillsides. Landslip is an increasingly common hazard in many cities.

Hazardous events will obviously continue to occur. Cyclones and earthquakes are unavoidable and whatever precautions are taken, casualties and property damage are inevitable. The most vulnerable will suffer most. However, it is vital that the blame for man-made hazards and the increasing toll of natural hazards is fairly apportioned. The Bhopal disaster and the rapid increase in childhood asthma caused by pollution in northern cities needs no explaining. Vulnerability and poverty is a societal issue and not exclusively an individual problem.

This paper offers evidence that a way out of the spiral of hazard, disaster and, eventually, poverty does exist. It proposes that the starting point is purposeful exchange of experience and working method between professionals engaged in both disaster mitigation and long term development. This proposal is not in itself new – the idea of linking relief and development is evident in literature dating back to the mid-1980's and the conceptual approach originates long before that. However this paper focuses on one aspect of the relief-development continuum that seems to have been ignored to date. It looks at the value of sharing methodological and modelling techniques between each field. And it concentrates on the potential benefits that may accrue to the disasters field by adopting participative research, planning and implementation methodologies that have been developed in the development sector. It focuses on the household and community level, recognising that institutional and political level mitigation work must ultimately aim to raise local capacity to withstand hazard shocks.

Hopefully the examples and arguments offered will be sufficient to encourage the exchange that does offer hope of reducing the impact of hazardous events.

2. Why are Methodologies and Models Important?

Disaster preparedness and management planning is informed by analysis of hazards and potential impacts. This analysis uses an extensive range of survey and study methods. It is obviously also based on knowledge of the impact of previous disasters. Thus current mitigation work is designed using packages of data which are then assembled to create a model. Similarly, various models are used to generate and interpret baseline information for long-term development work. These models are hypothetical and predictive tools which can only be proved by recording the impact of an event. Obviously this is only measurable in the context of an actual hazard; there are many different types of hazard. Households vulnerable to one type may not be vulnerable in the same way or to the same extent to another hazard type. The situation of someone's house, and the way it is built is very relevant with respect to an earthquake, but not very important in face of a biological hazard such as the Bhopal disaster. Similarly, the basis of a person's livelihood, whether they be farmer, fisherman, builder or labourer, will affect vulnerability to flood and cyclone, and in particular the quality and time of their recovery after the event.

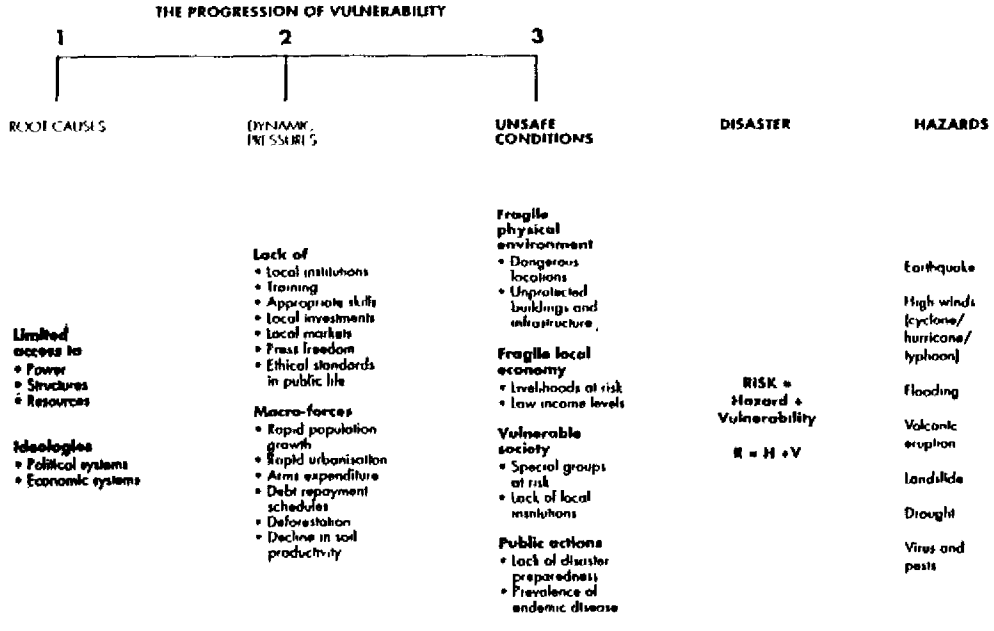
Hence it is apparent that the analysis methods and models which are used must be complementary to the context and objectives of the work they are intended to inform. However, although it is accepted that understanding vulnerability is now vital to hazard management, the techniques used by most disaster experts do not give an accurate picture and furthermore, do not reflect the latest thinking about reducing vulnerability. The next part of this paper looks at hazard analysis models currently in vogue.

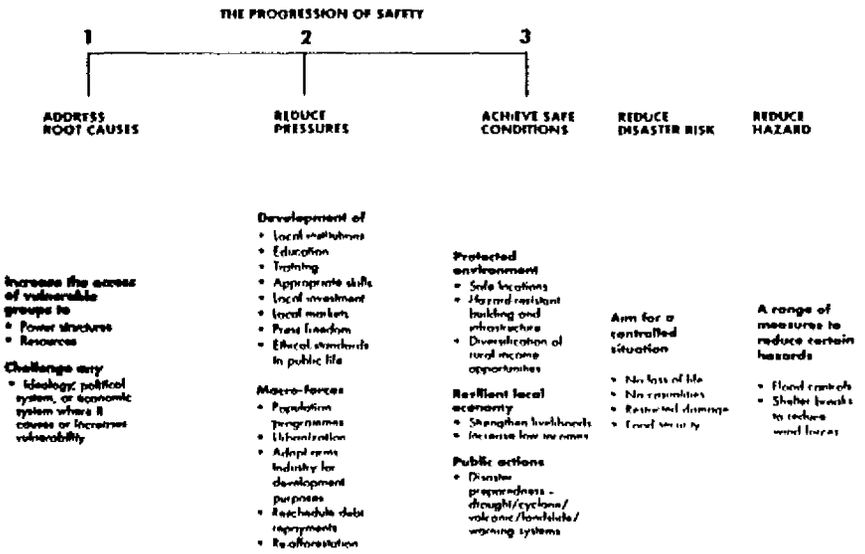
3. Vulnerability Analysis (VA)

Vulnerability analysis aims to describe and, where possible to quantify a person's or a group's exposure to the effects of a natural hazard, including the degree to which they can recover from the impact of that event. Several models of VA may be used, preferably all together to build up a more comprehensive picture.

3.1 The Pressure Model.

Two tables show features of the model. The first indicates the progression of vulnerability; the next the progression to safety.





All the information in each category on the chart is collated to create a full picture of vulnerbility. It is clear that the situation of a poor household, or of the community that this household is part of can be researched and analysed according to many of the features in these categories. Indeed, VA requires that this is done for each of the groups that may be affected by a hazard and also for groups that are professionally involved in hazard mitigation.

Seen from the perspective of a hazard prone community, the model may be likened to a sandwich, though one with a dry filling. The poorer (more vulnerable) you are the thinner the bread and relatively speaking, the thicker is the filling. In this snack the filling is the hazard. If your bread is sliced thin the disaster is bigger. Imagine the filling if you can't afford bread.

An example from India which looks at two cyclone prone families in Andrah Pradesh gives a picture framed according to this model. It is based on studies, in 1986 and then 1992 which compared the impact of a cyclone on a wealthy family to a poor family living only 100 meters apart.

"The wealthy household has six members, with a brick house, six draught cattle, and 1.2 ha of prime paddy land. The (male) head of household owns a small grain business for which he runs a truck. The poor family has a thatch and pole house, one draught ox and a calf, 0.2 ha of poor unirrigated land, and sharecropping rights for another 0.1 ha. The family consists of husband and wife, both of whom have to work as agricultural labourers for part of the year, and two children aged 5 and 2. The cyclone strikes, but the wealthy farmer has received a warning on his radio and leaves the area with his family and valuables in the truck. The storm surge partly destroys their house and the roof is taken off by the wind. Three cattle are drowned and his fields are flooded with their crops destroyed. The youngest child of the poor family is drowned, and they lose their house completely. Both animals also drown, and their fields are flooded and the crops ruined.

The wealthy family return and use their savings from agriculture and trade to rebuild the house within a week (cost 6,000 rupees). They replace the cattle and are able to plough and replant their fields after the flood has receded. The poor family, although having lost less in monetary and resource terms, cannot find savings to replace their house (cost Rs 100). They have to borrow money for essential shelter from a private money-lender at exorbitant rates of interest. They cannot afford to replace the cattle but eventually manage to buy a calf. In the meantime they have to hire bullocks for ploughing their field, which is too late since many others are in the same position and draught animals are in short supply. As a result, the family suffers a hungry period eight months after the cyclone.

The data used for this report is linked to the cyclone according to the pressure model. The main problem with this model is that it is static rather than dynamic. Firstly the livelihood strategies of the two families are not interpreted in the context of hazards they face. The data offers a parts but not the whole of the jigsaw of opportunities and constraints facing farmers. Secondly, although the longer recovery time of the poor family is reported, the model focuses down on one event, whereas this type of hazard has a frequent return period and vulnerable groups will surely be managing their affairs with this in mind. The temporal context cannot easily be incorporated in the pressure model.

In reality hazards are intertwined with the social and economic framework of society. We know that from everyday life in Bangladesh for so many people. Char land (temporary islands of usually very fertile land within river flood plains) is a classic example of why the pressure model is an inadequate tool. The intimate and dynamic relationship between livelihood of people who use char land for agriculture and the floods that create or destroy this resource is not drawn out sufficiently in the pressure model.

When the model is used in preparedness planning this separation tends to exaggerate what common sense tells us is a spurious separation between hazard, their frequency and the way people cope with them. Therefore mitigation plans are inevitably flawed.

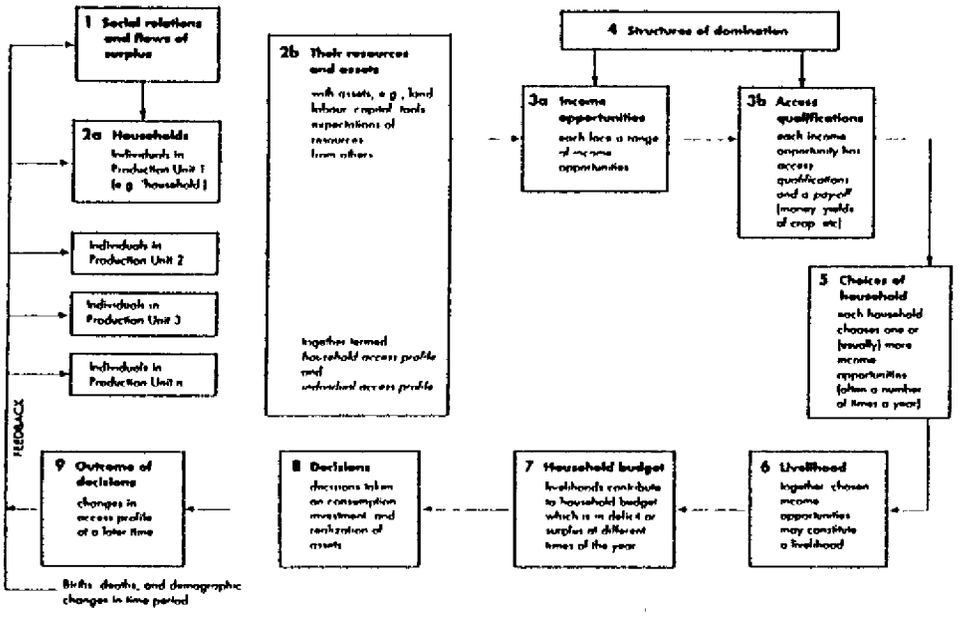
The second model, more useful I believe is the access model - this offers a way to look at the sandwich in a more realistic way. In this case the filling infiltrates the bread as it inevitably does.

3.2 The Access Model.

A simplified picture of this model allows information about a community to be presented in terms of vulnerability and capacity to withstand hazard. The diagram below (adapted from Woodrow and Anderson) shows in matrix form the way that information is gathered and analysed and presented.

	Vulnerability	Capacities
Physical/material productive resources, skills and hazards		
Social/organisational relations between people		
Motivational/attitudinal views of a community ability to create change		

A more complex and more useful version of the access model interprets vulnerability and capacity by looking at differential access to resources – skills, land, information, etc. In essence it aims to describe the situation of vulnerable groups according to differences between the groups in a society rather than the quantitative characteristics of individual households or groups of households. The chart below, describes the model.



The information generated by research is used to produce access profiles of families and groups. The full range of resources that a household has access to is called the access profile. This profile shows the range and limits (in the case of households with few resources) of choices. The model also allows interpretation of differential vulnerability within households. Households are not homogenous units. Within them access to resources and therefore vulnerability to hazard varies. Hence women and children are often more vulnerable. There are however pitifully few studies which analyse the real situation of women, especially in English. We know that hazards affect people differently, but how and why? In the case of women there is almost no analysis. An notable exception comes from Bangladesh, where an anthropologist (Rosalind Shaw) studied the situation of women affected by floods.

Similarly, households are not isolated units – each interacts with others. Access to social and institutional, and political structures also affects vulnerability.

By analysing all the characteristics of resource access a model is created to show the vulnerability of a household, of individual members within it and eventually of whole communities, up to the national and ultimately international level.

This model also allows the space to incorporate information about capacity to survive, to respond to recurring hazards and to the recovery time after disaster. In addition, the characteristics of the hazard can also be integrated. This is where the specialised skills of scientists such as seismologists and meteorologists are incorporated. A quantitative and qualitative measure of vulnerability can thus be created to inform planning and mitigation work.

A concise example of access to resources VA, with a flood hazard perspective, shows how changes over time and previous hazard prevention measures combine together with differential vulnerability data to produce a dynamic picture.

The Chandpur Irrigation Project in Bangladesh was completed in 1980. It was designed to protect rich agricultural land from flooding and to allow controlled management of river water for irrigation. A survey was carried out in 1986 and 1987 using the same methods to analyse the situation as were used for similar studies carried out before the CIP project. Thompson and Penning-Rowsell showed that the combined flood control/irrigation project had benefitted some households through increased agricultural production, but less than pre-project feasibility studies had indicated. They suggest that about half this increase appears to have come through irrigation rather than flood protection and these gains have not been available to marginal farmers unable to afford access to irrigation, and certainly not to landless labourers. Evidence indicates that if flood does breach the embankment then agricultural losses are likely to be greater than without the project.

Given the uneven distribution of benefits, the confirmed variation in agricultural performance between those who can get access to irrigation opportunities and those who cannot and the increased losses when projects such as this fail, (which they eventually do -one only needs refer to the massive engineering which has failed to hold back the Mississippi river), the author's assert that household vulnerability has clearly not been reduced by flood protection seems reasonable, even though there are valuable short term gains nationwide (increased total agricultural production).

4. What is wrong with VA?

Vulnerability analysis is primarily a research method. Although disaster management analysts have a adopted a toolkit of methodologies that provides what is deemed to be adequate sets social and economic data it is apparent that the resulting models are only tools for planning. Whilst the ultimate objective of resulting mitigation projects is vulnerability reduction at the household and community level, the process of gathering data is isolated, conceptually, from the implementation phase.

An opportunity is being missed. In other sectors of the development field research methodologies have been devised and are constantly being refined which do positively contribute to sustainable development.

5. Participative Methodologies in Development

Good practice in development work is based on three key assumptions:

a/ governments can't deliver resources to alleviate poverty and therefore people must.

b/ conventional research and analysis methods are inadequate as they do are unable to probe the capacity of people and communities. Therefore methods which draw on peoples' understanding of their on situation are vital.

c/ skills exists within people and communities that are often ignored in conventional approaches to development work. Further, indigenous skills and knowledge can be transferred to other tasks and other contexts.

Accepting these assumptions means acknowledging that the top-down approach to development is fundamentally flawed. Target groups are seen as objects of development

projects rather than the subjects. When individuals and groups are intimately involved in researching, planning and implementation of development projects success is not only possible but, eventually, almost inevitable.

Conceptually, the participative approach to development starts with deciding whom to ask and about what in order to establish three things:

1. the range of variables in space and time across the local environment and socio-economy,
2. an understanding of livelihood systems and the interaction of different enterprise, resource and labour requirements and benefits, and
3. identification, definition and ranking of producer/processor problems and opportunities that appear susceptible to change or intervention.

The participative process serves the researcher by producing data which is usually more comprehensive than can be acquired through formal subject-object methodologies. Intervention plans are thus more likely to be realistic and realisable. In addition, the process serves the community by structuring their own understanding of development options and impacts.

A typical 5 day research and planning process using the PALM (participatory learning method) may follow this pattern:

Day 1 – Introductory
- History of the village
- village layout
- village infrastructure

Day 2 – Exploratory (simple)
- study of resources
- livelihoods
- trends
- preferences, etc

Day 3 – Exploratory (complex)
- seasonality
- identifying resources
- wealth ranking
- class and caste stratification, conflict, etc
- causes and effects, etc

Day 4 – Covergence
- identifying opportunities
- listing priorities and best bets
- identifying roles and responsibilities (defining who should do what and what outside support is required)

Day 5 – Concluding
- Operational plan
- documentation, etc.

The typical PALM exercise has up to 30 participants, though not all join every session. Outsiders are present by invitiation, essentially as observers and as professional advisors when required. The facilitator has an arduous task. This role demands patience, diplomacy and detailed practical experience of carrying out this type of exercise. If informatioin that villagers are generally happy to give is not structured in a way they can

understand, and if the reason for giving it is not clear the process will fail. A useful entry point is to start the first day with what are called equalising exercises. The outsiders join villagers in some of their daily tasks. The fact that work like weaving, transplanting rise, building a house, etc, are not easy for the outsiders levels the status of all the participants.

Pretty and Chambers chart the characteristics of latest thinking about participative methods in development work in tabular form.

	From the old professionalism	To the new professionalism
Assumptions about reality	Assumptions of singular, tangible reality	Assumptions of multiple realities that are socially constructed
Scientific method	Scientific method is reductionist and positivist; complex world split into independent variables and cause effect relationships; researchers' categories and perceptions are central	Scientific method holistic and constructivist; local categories and perceptions are central, subject-object and method-data distinctions are blurred
Strategy and context of inquiry	Investigators know what they want; pre-specified research plan or design. Information is extracted from respondents or derived from controlled experiments; context is independent and controlled	Investigators do not know where research will lead; it is an open-ended learning process. Understanding and focus emerges through interaction; context of inquiry is fundamental
Who sets priorities?	Professionals set priorities	Local people and professionals set priorities together
Relationship between all actors in the process	Professionals control and motivate clients from a distance, they tend not to trust people (farmers, producers, urban dwellers etc) who are simply objects of inquiry	Professionals enable and empower in close dialogue; they attempt to build trust through joint analyses and negotiation, understanding arises through this engagement.
Mode of working	Single disciplinary - working alone	Multidisciplinary - working in groups
Technology or services	Rejected technology or service assumed to be fault of local people or local conditions. Careers are inwards or upwards - as practitioners get better, they become promoted and take on more administration	Rejected technology or service is a failed technology or service. Careers include outward and downward movement - professionals stay in touch with action at all levels

The approach espoused in this new professionalism is justified by case study evidence derived from project work in every sector of development work. The methodologies and techniques have acquired intellectual legitimacy through papers, articles and monographs and many international conferences. They are recognised in the development context as a tool to articulate the opinions, concerns judgements and perspectives of those who are conventionally ignored - the poorest and most vulnerable within communities. Their value is increasingly recognised as a cost effective method of survey -even World Bank officials have adopted them as conventional survey can take a long time (are expensive) and not necessarily accurate.

6. Participative Method Potential in Disasters Work

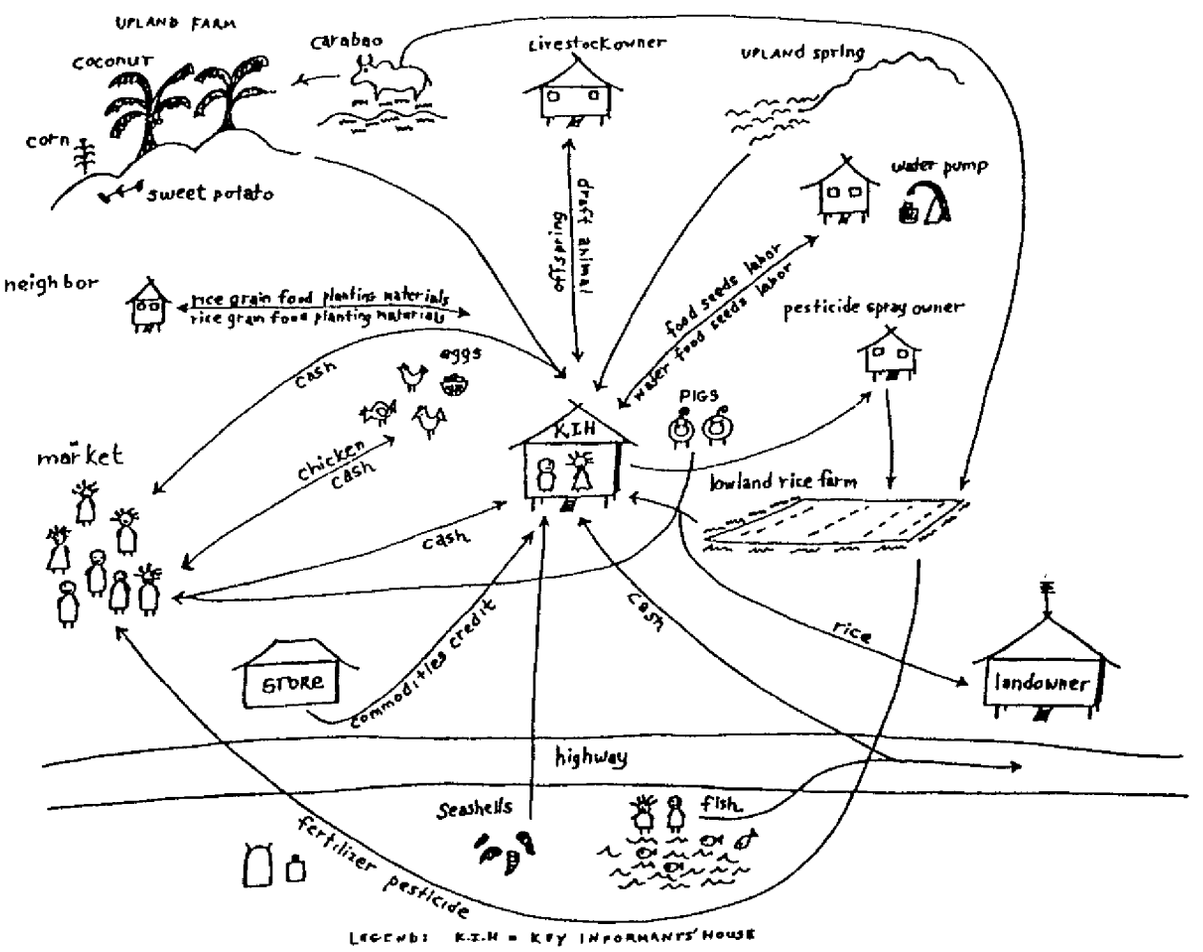
There are many different techniques that have been devised and refined through practical work. One recent count produced more than 37 formally documented methods. The following section describes several of these methods and presents examples of their potential value in hazard mitigation work.

6.1 Wealth Ranking.

Wealth ranking aims to identify groups or clusters of households according to relative wealth or well being. Informants sort a pile of cards or slips of paper, each with one household name recorded onto it, into piles.

The wealthiest are put at one end, the poorest at the other, and as many piles as desired are made. The process is repeated with at least 3 informants so that information is cross checked.
Wealth ranking can also be done on maps which have been created by the community with minimum interference from outsiders. These maps may take several days to complete, and they should always be done in a public place. They can be created using sticks and stone or beads and beans and, in time can incorporate physical, social, economic and cultural information. They can be quantitative - measuring land holdings and house sizes or qualitative to identify households or individuals who may be relatively poorer or more vulnerable to shocks or hazards.

Wealth ranking was used to create a resources map of a sample household in a Philippine village during surveys carried out in 1992. This was part of the baseline study work for possible external support to poor communities.



6.2 Participative Mapping

Mapping typically involves identification and appraisal of natural resources within a community and studying indigenous and adapted practices for resource control and management. At the village level this may look at many different categories of resource. Considering a drought or flood context, mapping of watersheds is obviously an essential exercise. Conventionally this would call on the expertise of surveyors and hydrologists; participative methodologies rely on people who are intimately familiar with conditions around their village. An appraisal (which may eventually lead to structural engineering works designed to modify existing vulnerabilities to hazard) typically involves a series of surveys which are then used sequentially and concurrently to explore options for change. They surveys may include:

a/ Base maps. These are prepared on the ground or on paper to show the location of landmarks, boundaries, drainage patterns, settlements and resources. They can highlight changing use patterns, the status of community and individual assets and infrastructure.

b/ Transect Walks. These are done by walking along a pre-determined route (identified on the base map) with local people to appraise different resources like private and public lands, grazing areas, forests, rivers, streams and rivulets, and so on. hey involve semi-structured interviews with local inhabitants to identify detail, for example about drainage patterns and to explore their perceptions of key hazard characteristics.

c/ Thematic maps. These are prepared by individuals or small groups of village experts who have specialised knowledge of local features related to drought or flood. They cover land use classifications, cropping patterns, aquifers and drainage patterns. These maps lead to questions which focus attention on possible solutions to particular problems and people are encouraged to suggest solutions which may or may not have been tried.

d/ Opportunity Identification matrices. These are diagrams produced during the transects showing local land-use classifications, the existing state of resources, constraints to effective management of those resources, solutions tried and options identified by local people. This matrix is used an entry point to other methods used subsequently.

e/ Equity appraisal and well-being ranking. This looks at equity aspects within a community. In this case the focus is on vulnerability to hazard. The idea is to identify those groups who may not have been represented in mapping or transect exercises.

f/ Focus Group Discussions. Semi-structured interviews are conducted with different groups within the community separately. These may be resource owners or users, resource non-owners and users, groups facing a common problem related t the hazard type, women, socially disadvantaged groups, etc.
The purpose is to build on information collected earlier so that particular issues may be explored in depth with affected groups. Within these groups people may indicate conflicts that may arise when pursuing options proposed in the opportunities matrix.

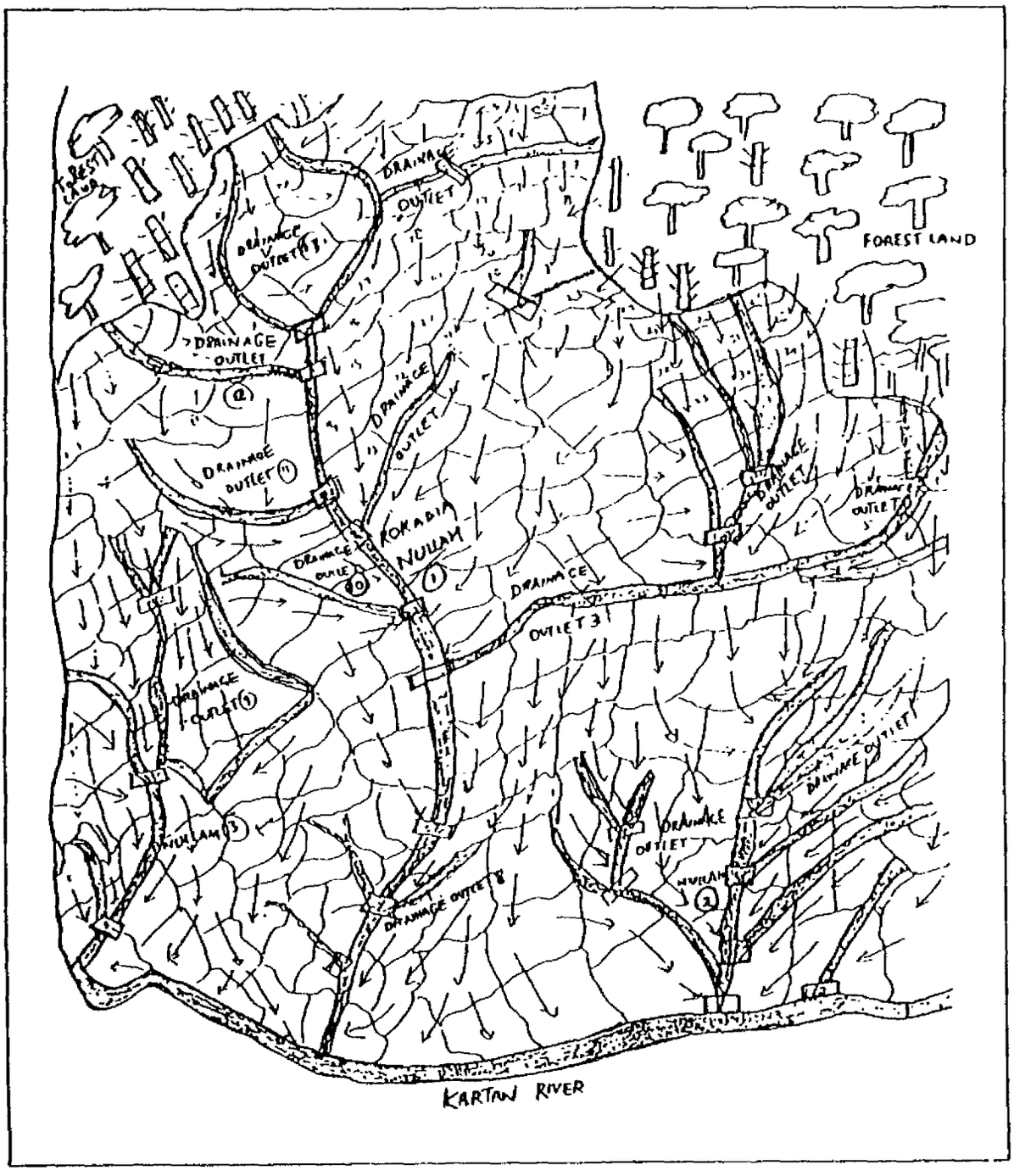
g/ Village or whole community meetings and presentations by focus groups. As focus groups have indicated priorities of particular groups it is important that these are discussed. Overlapping and sometimes conflicting visions may be resolved. The outputs are used to explain various solutions that aim to reduce vulnerability.

h/ Prioritization of options and appraisal. Discussions now aim to identify priority options for vulnerability mitigation. These may lead to more intensive mapping or transect exercises which will serve to assess technical feasibility of solutions, financial viability, the distribution of benefits and impact on the most vulnerable. They should also lead to

identification of specialised external support that may be required to carry out priority works.

i/ Preparation of proposals for presentation to external agencies. Some activities may be managed by the community. The process will have highlighted what is possible and desirable for local implementation. Where external support is needed proposal which have been endorsed by the community can be drafted confident in the knowledge that all costs and impacts have been explored and understood locally.

The diagram below shows a watershed status and treatment map prepared by extension volunteers which was aggregated from base and thematic maps and transect walks produced by villagers in Pangham Village, in Gujerat, India. The information was gathered in a matter of several days using local knowledge.



It is apparent that the information this map provides offers detail that could not be obtained by external professionals, and certainly not within the short time taken by participative methods. It is also very clear that local level hazard mitigation measures can be designed and implemented in the full knowledge that local interests are respected.

6.3 Participative Technology Development

A feature of these participative planning methods which is only just being recognised and has yet to be fully explored and taken advantage of is their value in the implementation phase of projects that are designed out of the information they produce. It is accepted that resulting projects will presumably have more chance of reaching their objectives since they are based on information that has come from the beneficiaries.

It is also acknowledged that the very process of dialogue with poor (vulnerable) communities frequently raises their awareness of their situation and their options. The dialogue broadens horizons and perspectives. Awareness raising or conscientisation is very often one of the first tasks in development work.

But it is a short step to the next stage. Participative technology development (PTD) is the generic term for development implementation work that builds on indigenous skills and capacities. It may or may not involve the introduction of new technologies; if it does the approach follows the new professionalism principles presented earlier in this paper.

In the PTD context 'technology' has a very broad definition. It includes physical artifacts, also skills and knowledge. And it also covers the social organisation needed to make use of the hardware. The forth factor is the product, and this may be a crop, a catch of fish or a roof tile. The sum of these is called technical capacity - ability to identify, adapt, innovate and utilize - the know-why as well as the know-how. In the disasters context this product may also be reduced vulnerability. This may come about through physical engineering works, new relationships between community members or better access to resources that may mitigate against hazard impact.
Raising people's capacity to survive in a complex world means helping them to identify and use suitable and appropriate technologies (in the broadest sense). Outsiders have an important role, but only as advisors to help people make informed choices. Facilitators are critical - people trained and patient in the use of various methodologies. The role of an engineer is to be an assistant to the facilitators.

A checklist of caveats in PTD runs as follows:

- do not begin with a fixed agenda. Users should start by defining their problems and then the process may move towards identifying, testing and evaluating options for possible solutions.

- Problems are identified and solutions defined and evaluated by working with people. Key decisions are not made by outsiders.

- Local skills, knowledge and organisational systems are recognised and built upon from the beginning of the process.

- If the process leads to a situation where hardware may be a solution then the engineers job is to provide a selection for people to try and evaluate before choosing.

Whilst PRA methods, in their original form may be associated with the development approach termed 'bottom-up', PTD methods shift the emphasis towards a 'bottom-bottom' approach.

7. Scaling Up

This paper has focused on local level initiatives and their potential for incorporation within the disasters field. The methods have been refined for use within close-knit communities, but the principles it is based on do not mean that the principles do not apply within a larger audience. Nor does it mean that the benefits of a micro-level impact arising out of a PTD initiative need stop at the village boundary.

The principles of participative methods have currency within any field of activity. This new professionalism calls first and foremost for prudence; according to its classical meaning rather than the current usage which suggests a small, mean and calculating attitude. Prudence, properly, implies a transformation of the knowledge of truth into decisions corresponding to reality. Much of what is apparent in disaster management approaches current in most countries seems based on expediency and narrow professional perceptions of what is desirable. In particular, short term political considerations override knowledge of the true problem.

Scaling up micro-level successes does not mean replicating them in detail. It means sharing the experiences, both successes and failures and their reasons, with a wider audience. Thereby, others may learn and, following the same principles, apply approaches which are suited to groups of people who interests and responsibilities extend beyond the village. It is clearly pointless to plan a flood management scheme that covers the entire watershed of a river on the lone advice of a hydrological engineer. Disaster managers have accepted this, but to date those involved with hazard mitigation have not found a way to incorporate diverse knowledge and interests in a prudent and truthful way. An attitudinal change is suggested, one that allows all interests to be represented fairly.

8. Conclusions

The frameworks used in the disaster context – vulnerability analyses – may be usefully absorbed into the portfolio of development professionals. This paper hardly explores the opportunities that the holistic modelling methods current in disaster thinking certainly offer to those who remain narrowly focused.

This paper, more importantly, stresses the vital need for those concerned with disasters to learn about participative analysis methods and take the next short and very logical step to participative technology development. By looking closely at the everyday elements of peoples' life and why they are vulnerable, analysis will point to actions which can be taken to reduce overall disaster vulnerability.

Absolute poverty may not be eliminated, but vulnerability can. Natural hazards are acts of God, but man-made ones are avoidable. And neither need add up to the ever increasing impact witnessed in the past few decades.

Sources of Information

Key Informant discussions with people in Bangladesh. Special mention to Saidur Rahman (chair of the Disaster Forum), Nayeem Wahra (Oxfam), Sylvia Aslam (UNDP), Md. Taher and Md. Aslam (ITDG), Abdul Matin (IVS), Richard Holloway (PRIP/PACT). Outside Bangladesh; John Twigg, Simon Croxton, Theo Schilderman (all ITDG), Diana Mitlin (IIED), Ruth Mcleod (Homeless International).

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