

Vulnerability, Human Behaviour, Hazards and Expected Utility in the Context of Risk Management

“The case of Limpopo River Basin in Mozambique”

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Abstract - In this paper we use four main dimensions: Vulnerability, Human Behaviour, Hazards and Expected Utility to analyze their impact in scenario planning when cross-matched with Human Development Adjusted, Gender Inequality and Multidimensional Poverty Indexes within flood risk management strategies. We argue that the four dimensions are among the central factors behind the poor quality of life. Hence, we propose a backcasting method for a scenario planning and based on sustainable principles at long run to provide a desired and better quality of life as a contribution by the human beings in reducing vulnerability to risk and exposure to hazards. In doing so, we address best practices toward utility improvement and behaviour paradigm shift as a novel approach for participatory strategic thinking in the Multicriteria Decision Analysis for integrating flood risk management strategies related to Limpopo River Basin.

Keywords – Vulnerability, Human Behaviour, MCDA, Backcasting and Scenario Planning.

1. Introduction

The concepts “vulnerable” and “vulnerability have often been associated with field of hazards, particular the ones related to natural disasters. In Mondlane (2004) [1] we discuss, extensively, those terms as well as their relationship to fragility, marginality, susceptibility, adaptability, risk and resilience. Jon Twigg [2] defines vulnerability as “the extent to which a person, group or socio-economic structure is likely to be affected by a hazard”, while Wisner [3] posits that it as “the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of natural hazards’ an extreme natural event or process”.

Both definitions stress what Wisner [4] argues to be an opportunity for awareness. In addition, Dankova (2009)

[5] argues that vulnerability “describes the potential damage to the exposure, corresponding to varying degrees of hazard severity, while risk is expressed in terms of the probability of exceeding specific levels of direct losses ‘in physical and monetary terms’”. The authors developed a framework that provides the vulnerability assessment through exposure data, as indicated in Figure 1. (Dankova 2009).

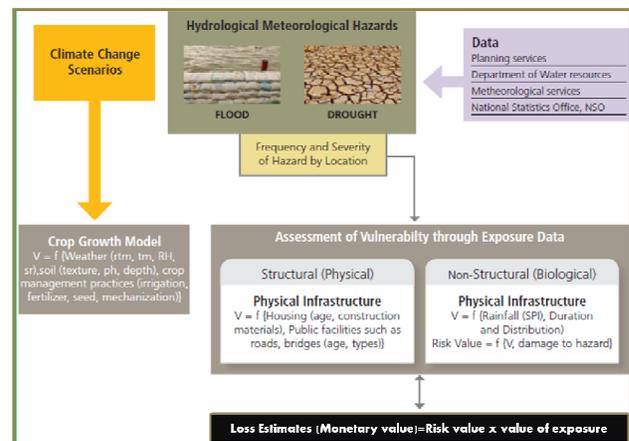
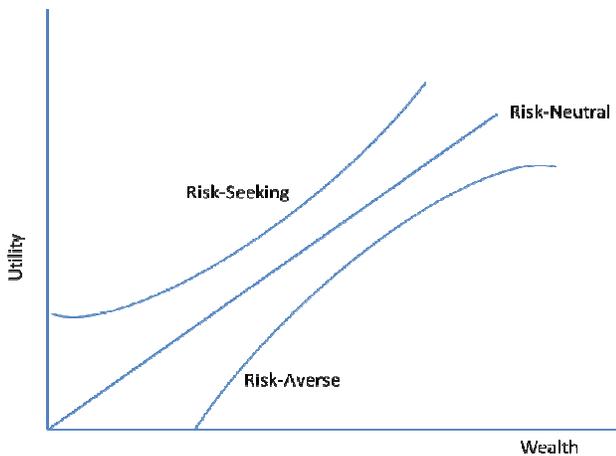


Fig. 1 Flood and drought risk modeling framework [5]

The same Figure 1 depicts the modeling process of flood and drought within the context of the economic vulnerability and disaster risk assessment. Economic adverse situations are among the main causes that force people to settle themselves within hazardous places such as river floodplains, volcanic slopes and earthquake prone zones [3]. Nonetheless, one may find it still arguable that there is a distinction between risk and vulnerability, since the risk reduction does not necessarily imply a reduction in vulnerability [6]. Furthermore, Wisner [3] defines disaster as a mix between natural hazards and human actions,

giving the side effects of war as the practical examples similar to the propagation of diseases, famine and displacement of people to safe, yet hazardous, areas.

Human attitudes towards risk, as shown on the Graphic1, also play a major role in the definition of future scenarios. Moreover, the utility toward ones monetary attitude is extensively discussed in the field of expected utility, ([7], [8], [9] and [10]).



Graphic 1: Risk attitude scenarios [7]

Scenario planning and analysis within risk management might not only result from the extent of perception and human behaviour, but also from the attitude toward risk. Graphic 1 illustrates the three scenarios of risk attitude, namely risk-seeker, risk neutral and risk averse. Within settlements, people demonstrate the last two scenarios of behaviour, while the first one characterizes the case of persistent people, who are living within risk prone zones. Limpopo River basin, especially Chókwe district, has shown such scenarios with floods repeatedly trapping the same group of people.

Our goal in this paper is to investigate the risky behaviour and expected utility of inhabitants in this region, given a certain scale or magnitude of exposure and the corresponding vulnerability to hazards. For this purpose we have chosen the Human Development Index (HDI) as a driving variable for the analysis. We look at the impact of eight criteria randomly chosen from the HDI for Mozambique within the four dimensions under consideration such as hazards, vulnerabilities, human behaviour and expected utility (VHBHEU) which is illustrated on Figure 2. In order to fulfill the goal, we intend to investigate to what extent the impact of the different criteria can influence the four dimensions to attain a better quality of life and strengthen sustainability towards a higher HDI. We use Multi-criteria Decision

Analysis (MCDA) tools to develop the required analytical scenarios.

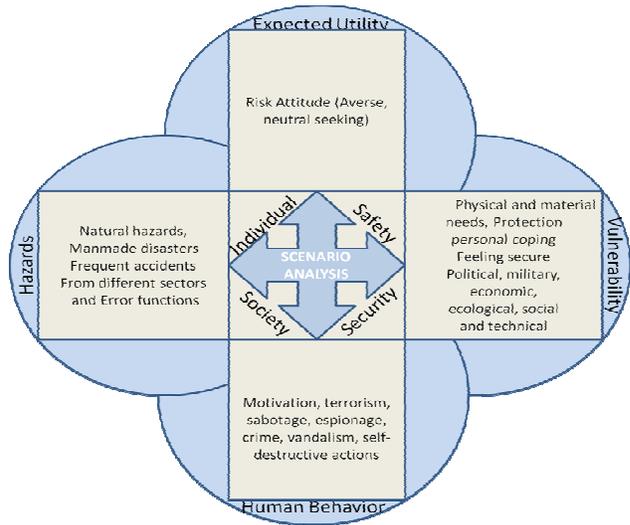


Fig. 2 Expected Utility and Human Behaviour perspective on risk management combined with types of Hazards and Vulnerability Source: Adapted from [11]

Figure 2 shows how human behaviour and expected utility within poor environment can impact the vulnerability and the exposure to a hazard risk. Poor management of these attributes can create direct implications on individual security and societal safety, and consequently influence the human development index at local community levels.

The approach we take is by building strength on the four dimensions VHBHEU, one can eventually develop a new paradigm, by improving utility and human behaviour, for the people living in risk prone zones and thus possibly minimize vulnerability and the exposure to hazards. Developing long term planning strategic decisions to deal with the VHBHEU dimensions can lead to best practices in development, and consequently will help define and design the Desirable Quality of Life (DQL) with sufficiently high Human Development Index (HDI).

1.1 Background information

The year 2011 ranks as one of the worst in natural hazards and human induced calamities with estimated USD 370 billion economic losses as discussed by Swiss Re [12]. The data found in Topics in Munich Re (2012) [13] show that about 91% of the world's natural catastrophes were weather related with 300 storms and 310 floods.

In general, Mozambique has a long history of both floods and droughts, and particularly within Limpopo River Basin. This basin is a complex ecological system, considering the magnitude of exposure to hazards and being a part of the

international ecosystems that is shared by different countries. The complexity comes from the lack of infrastructure defense mechanisms at the low lands and human settlements within the basin. Fresh are the memories of floods from the years 1975, 1977, 1981, 1996 and 2000 [14]. The year 2000 floods surpassed the 1997, which was considered the worst in magnitude and impact so far [15]. The floods in January 2013, which are the most recent, had also huge both economic and social impact. Chókwe district and other regions of lower Limpopo Basin are constantly hit by floods and droughts; failing resettlements schemes that have been in place with desperate inhabitants almost always returning to the hazard areas [16].

According to the UNDP [17], the country witnessed the worst disaster ever registered that affected about two million of people, resulted in 700 casualties, and economic losses evaluated on 20% of Country's GDP in 2000 c.f. [17] and [18].

2. Human Behaviour and Decision Making

Natural hazard risks are not static neither simple. The events behind them are caused by natural conditions and also influenced by human behaviour.

The urbanization of a floodplain, including inappropriate settlements on unstable tropical hill-slopes, the deliberate exposure of anti-hazard infrastructure codes, the rapid rise in populations of coastal areas that are susceptible to hurricanes, all represent ways in which risk increases from the human side. However, the lack of knowledge related to natural hazard zones contributes to the extent of how local residents are impacted. Quite a few examples can be taken from December 2006 Asian tsunami, the Japanese and Haiti earthquakes, and 2000 and 2013 floods in Mozambique.

These examples once again demonstrate the limitations of human beings to deal with natural hazards on a global scale and the pressing need of integrative strategies.

Decision making has its roots in the application of mathematics to economics, as well as other areas such as medicine, biology, cybernetics, military science and social science [19]. Within risk management, decision making is one the key subjects. Risk and vulnerability are strictly associated. Vulnerability can be seen as potential for losses and/or other adverse impacts [1]. Infrastructures, human and social assets exposed to hazards are vulnerable as Alexander et al. [20] argue; in some cases there is undoubtedly a failure to generate appropriate knowledge. Pratt et al. (2008) [8] introduce an additional element that might play a central role within the concept of

vulnerability and decision making: the "option". The authors define option as an alternative that helps in decision making given that one has additional relevant information for such a decision. Furthermore they suggest that an option is pertinent to different fields of life, including personnel decision making. One should bear in mind that decision making is a demanding process. And it is intrinsically linked to culture, policies, local context and ethics as shown on Figure 3.

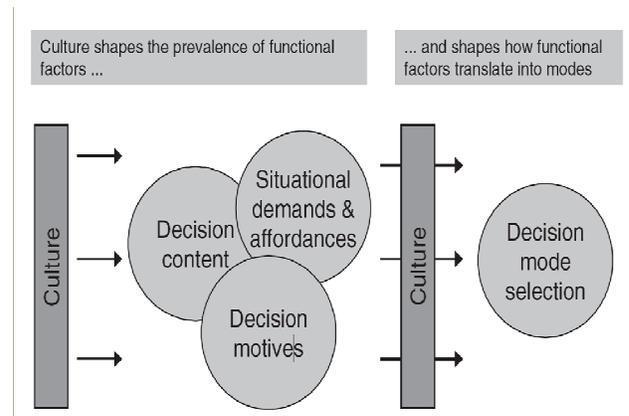


Fig. 3 Functional Model of Decision Mode Selection: The Influence of Culture. Source: [11]

With Figure 3 we represent a functional model of a decision mode where culture plays a decisive role. It depicts how the contents, decision motives and the context shape the mode of the decision under influence of culture. The way one frames a problem in order to address constrains, evidence and influence are activated by culture in the process of judgment and decision making [21].

Furthermore, the authors characterize culture as behavioural traditional thinking and practice that frame in one's personality the schemas, categories, rules, procedures, goals that involuntarily are associated with his/her behaviour. Ross [22] recalls that *"to be part of a culture it means to share the propositional knowledge and rules of inference necessary to understand whether certain propositions are true 'given certain premise'."*

It is evident that decision making is a complex and culture related process. Culture provides identity to people. Oliveira [19] reinforce the definition of culture as a man-made conventionalized process of passing knowledge through generations on one hand and as patterns for problem solving within a certain group of people as a correct way of living. Decision making is also bounded by uncertainty. Within the same work, the author elaborates a concern about a lack of research on decision-making models within the topic, with particular emphasis on stakeholders approach, culture and ethical issues. Special

attention is called to the research by Tecker et al. [23] in [19], which discusses a decision-making model represented by a knowledge-based approach to policy governance. The authors call it a leadership consultative model and it holds a strong ethical issue to be considered before any decision is addressed and more details about the models are exposed [19]. Munier [24] elaborates a list of four entities that should be taken into consideration when a decision making has to be performed:

- The decision entity refers to a person or group of people together with the stakeholders, who holds the power for the actual decision process
- Technical team: the people who have both qualitative and quantitative information
- The analytical team; a person or a group of people who manage and process the knowledge and the procedures
- Inhabitants: those are the beneficiary to the process and for this specific case are the human at risk

Similar to Patt [16], who discusses the failure of floods resettlement program in Chókwe, Mozambique, Munier [24] elaborates a set of failures in project implementation due to lack of consistent decision making procedures. The 2009 European grand Prix circuit for F1 in Valencia Spain divided eternal values between people from maritime district and the Nazaret area. In Argentina a reallocating house for people living in shantytowns failed and people have returned to their old premises within unconventional settlements and possibly substandard place for living.

Some of the reasons for such *unusual behaviour* as the authors discuss are related to: proximity of sources of income, long term relationships, and close proximity to the basic facilities. This could contribute to a paradigm shift and help people to think in a different ways. Some of the strategies used by the Government of Mozambique in addition to the operations of seek and rescue, such as after an extreme event resettlement are strongly considered although most of the times people do return to the areas where they originated from.

Hershey and Schoemaker [25] address utility theories for decisions based on two main assumptions (1) maximization, and (2) expectation. They mainly examine issues related to decision making under objectivity or known risk by looking in the nature of risk preference for losses by the people and the corresponding expected utility compatibility. Here, the traditional expected utility theory is examined as a descriptive model and risk taking losses addressed as inconsistent with theory by von Neumann-Morgenstern [26]. The authors describe in details the contributions by Schoemaker and Kunreuther [27],

Bernoulli [28] and Karmarkar [29] within expected utility theory.

Utility analysis and theories of choices for decision making are extensively developed within decision theory, where individual choices are investigated under different courses or action. Insurance and gambling under a set of certain conditions constitute the main illustrative examples of the process [30]. Heath and Tversky [31] in their analytical research on preference, state the limitations of standard theory of choices, given the dependence of people on both uncertainty and precision of assessments of people's choices. The author justify their argument with the concept of "*competence hypothesis*", using both cognitive and motivational explanations. By competence hypothesis is meant how people learn from daily experience and to what extent that influences their behaviour based on known facts.

This might explain why people always run back to the original hazardous prone zone regardless of safety limitations and exposure to risk. Evidence or expertise act as backup for people's competence to take a credit in case of success and protection in case of failure, while ignorance or incompetence protect people from taking credit for success and eventually provide opportunities for blame in case of failure [31]. Therefore, people living in vulnerable and hazardous zones are safe as far as an event does not occur. The manifestation of such behaviour of flood victims who are persistent in going back to the vulnerable and hazardous zones is so often. Apart from the justification by Munier [24], fits well within the argument by Gordon [32] that stems from behavioural economics, which states that choices of the people are based on comparative rather than absolute values, namely, people's preferences are based on what really exists rather than a consensus or an ideal situation. Behavioural economics reinforces the concept of choice that makes decisions feel easy and automatic. The author calls this "*a no-brainer*" choice or "*a choice architecture that shows that there is no neutral way to a present choice*" [32]. Gordon reinforces his argument with importance contextual influences that each time a decision has to be made a new framework has to be developed by answering contextual questions on who, how, where and when. These questions of:

- Who? People's decisions are usually based on the previous existing experience. Since people who have survived extreme events tend to come back to their origins after the floods have ceased regardless of the degree of exposure and vulnerability to hazards;
- How? This aims to respond to the immediate action: people tend to direct themselves towards for a relative safe environment in their zones of origin rather than stay in community

settlements with poor environments of health, sanitation and access to other basic facilities;

- When? “People are more likely to procrastinate when given a choice about the timing of an unpleasant task”. Actually, most people think about today’s gain rather than comes in the future, in other words “the future matters less than today’s security”; and
- Where? “this simple fact influences the outcome”: This reinforces the choice of suffering back home where one can develop additional source of income such as farming and small business, rather than to stay in the settlement where never know when the next meal will come.

The discussion in this section provides some hints on why human behaviour, influenced by the expectations, contributes to the failure of resettlement programs (Limpopo river basin is case in point).

Our position to overcome this situation is that long term planning process is needed. We challenge the decision makers to go through a strategic thinking for decision making toward a defined stage of “Desired Quality of Life (DQL)” that mirrors new mindset, less vulnerability and safer living conditions.

2. 1 Criteria and Value Tree Measurement

To model our research toward a stage of “Desired Quality of Life (DQL)” in the long run, we define a set of criteria that have to be managed under best practices and good governance in order to influence the quality of life. Paradigm shift in both local communities and central governance is needed to improve Human Development Index Inequality Adjusted (HDIIA), maximize the standards of Gender Inequality Index (GII) and minimize the Multidimensional Poverty Index (MPI).

In doing so, people will be able to concentrate their efforts to minimize vulnerability and lower the impact of hazards, hence reinforce the individual and societal security as framed in Figure 2. This process can be developed based on the stakeholder inclusion approach where an open brainstorming procedure is carried out with a participant facilitator, whose role is rather neutral but inclusive. This process is tedious but important and it is beyond the scope of our research. A summary of similar action can be depicted in a value tree measurement as shown in Figure 3 developed within “VISA” a Decision Support System (DSS), one of the interactive systems applicable for such purpose.

The value measurement tree brings advantages if a hierarchical structure for the application of Multicriteria Decision Analysis (MCDA). The decomposition of evaluating alternatives within a subset of criteria and aggregating these gives a preference ordering according to each dimension. One can also either substructure or congregate in (HDIIA), (GII) and (MPI) separately [33]. Belton and Stewart [34] provide MCDA as tool for “feeling of unease” category by giving more emphasis on structuring, analytical and resolution of decision making problems.

We use the concept of option from Pratt [8] to address vulnerability within natural disaster risk management in developing countries. Usually, in the developing world natural disasters target the same segment of people who are both vulnerable and poor. Our analyses show that there is a direct link between poverty and vulnerability.

Vulnerable people are mostly exposed to hazards and their coping mechanism and strategies are limited. Hence, the probability to become poorer is higher and progressively rising when a disaster occurs. According to Pratt [8] “an option affords us at least the possibility of adjusting our decisions in the light of experience. The value of the option derives from the likelihood and benefit of such adjustment”.

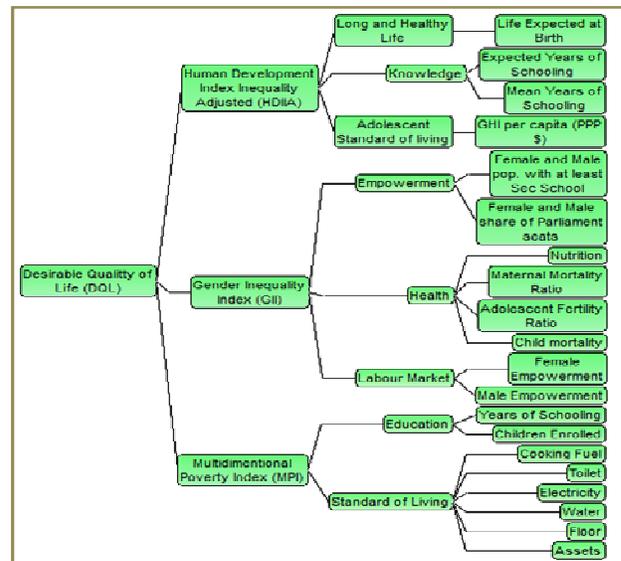


Fig. 3 Value tree measurement for Desirable Quality of Life (DQL)

In Figure 3 we depict the desired quality of life, which derives from a combination of three key criteria: (HDIIA), (GII), and (MPI). The value tree can be either structured from “top-down” or from “bottom-up”. In the top-down approach, one starts by identifying broad concerns (HDIIA, GII and MPI). An attempt is made to rank order

the alternative courses of action in terms of these. If this is achievable with a little controversy then the identified concerns are defined as “criteria”.

Different scenarios can be drawn from the value tree measurements of MCDA, when cross-matched with the four dimensions that constitute the core study of the present paper as illustrated in Figure 2, viz. Vulnerability, Human Behaviour, Hazards and Expected Utility (VHBHEU).

3. Building MCDA

The three criteria of (DQL): *HDIA*, *GII* and *MPI* can be analyzed in an isolated way as shown Figure 4, where MPI includes health, education and standard of living. For this purpose, we use a DSS (V.I.S.A.) to develop a qualitative classification ranked on (Low=L, Medium=M and High=H) and we made a pair wise comparison with Figures provided by the Human Development Report 2013 [35]. The value measurement tree for the DQL, Figure 3, is the key activity that drives all scenarios planning from which we can extract the profile for each sub-criteria and the respective scores. Additionally, we can also extract graphic illustrations depicted of Figures 6a, 6b, 7a and 7b.

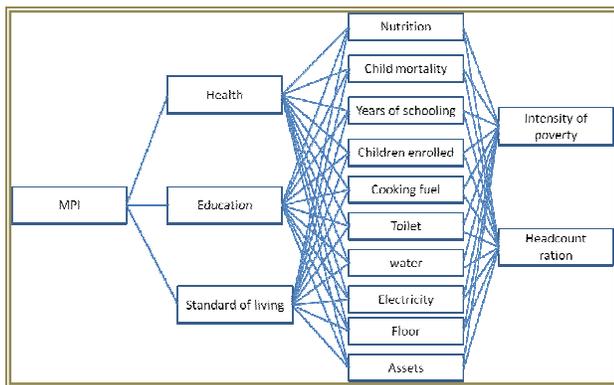


Fig. 4 MPI MCDA Selection Model with Health included

Figure 4 shows how MPI sub-criteria can influence the quality of life, given different options of stakeholders’ involvement. These Figures play an illustrative role, given the limitations of action learning process in real life. The gender index has its unique role in the human development, since it touches upon three key areas: health, empowerment, and labor market. Both female and male gender indexes are determined to minimize the impact of hazards and reduce vulnerability by improving the utility and human behaviour. Traditionally, the Gaza province in Mozambique is a female dominated household, given the fact that males migrate at earlier stage of life to the main towns looking for better job opportunities. Nevertheless, statistics from [36] show that Chókwe has economic dependency ratio of 1:1.3 i.e. for each group of 10 children

and/or older people exist 13 people in active age. The district has young population 44% below 15 years old that is mainly female. The total population by January 1st 2005 was about 214.183 with 91.995 males and the remaining majority of 122.188 females [36]. Figure 5, illustrates an MCDA where sub-criteria such as the female reproductive health index, female and male empowerments indexes, female and male labor indexes can influence both the inputs and the outcomes of the decision tree.

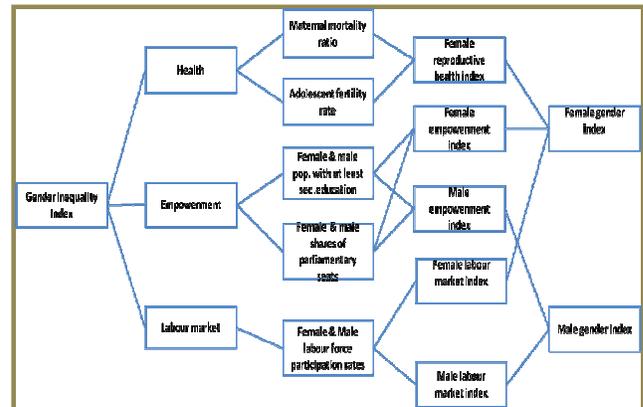


Fig.5 Gender Inequality index

4. Scenario Planning and DSS

Vulnerability, Human Behaviour, Hazards and Expected Utility (VHBHEU) are four dimensions that can be manipulated and ranked for scenario analysis process through the integration of the stakeholders given their preferences and knowledge management of their daily lives. In this section we illustrate two outputs of simulation processes of both general profile of (DQL) for sub-criteria and the respective scores for each dimension under analysis.

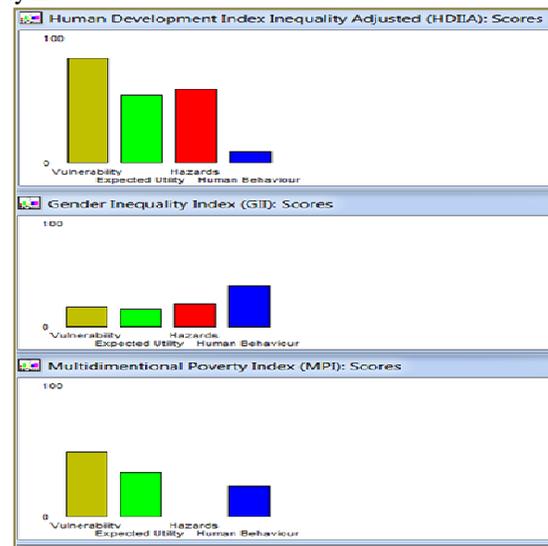


Fig. 6a Four dimension Scenario I

Figure 6a illustrates the first scenario of DQL, where the alternative Vulnerability dominates the process, given the strong impact played by its own alternatives within Human Development Index and Multidimensional Poverty Index. The scenarios in Figure 6a, and Figure 6b, show different behaviours of the criteria derived from Figure 7a and Figure 7b over Desired Quality of Life, where the dimension hazards again dominates the process in two indexes (HDIIA) and (GII), but absolutely disappears on (MPI), while the dimension human behaviour stays stable in all three criteria.

In this scenario the human behaviour plays decisive role in Gender Inequality Index and Multidimensional Poverty Index. This provides a positive output for scenario I, where we have the minimized impact of hazards output.

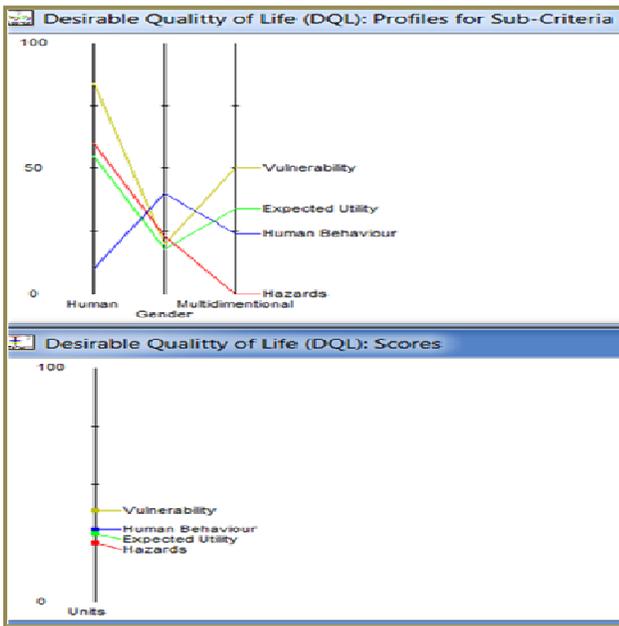


Fig. 6b Profiles and Scores of DQL

Figure 6b on another hand provides the profile and overview of real quality of life as an output of Scenario I, showing the behaviour of four dimensions, based on real data converted to quality classification within VISA.

By the time the preliminary assessment about coping strategies over Chókwe district was made, at least 30 thousand people were still depending on additional sources of livelihood at Chihaquekelane settlement between Macia and Chókwe. The output of our research about DQL of those who have return to their zones of origin after the January 2013 is depicted in both Figure 7a and Figure 7b. They represent situations where there is a paradigm shift in the mind set based on improvement of expected utility and new positive behaviour toward risk, which results with

reducing vulnerability and better capacity to manage hazards. Such scenarios are possible based on the backcasting concept, which is addressed by developing a visionary and a desirable notion of the future on a long term.

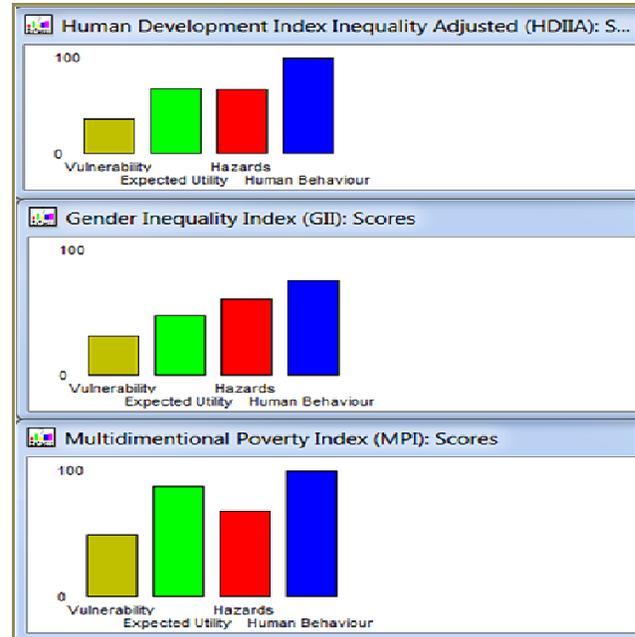


Fig. 7a Four dimension Scenario II

Comparing the profiles of DQL on Figure 6b and Figure 7b one can see that vulnerability dominates, in scenario I, the Human development index and multidimensional poverty, while in scenario II human development index is dominated by hazards and human behaviour and multidimensional poverty is led by human behaviour and expected utility. As we can see in Figure 7a and Figure 7b they illustrate part of possible state of desired quality of life by the inhabitants, for research concerning Chókwe district on a long run as indicated by Diagram 1.

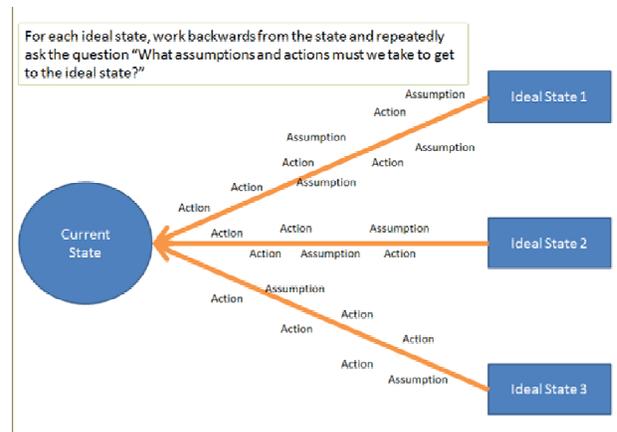


Diagram 1 different scenarios of ideal state of life [37]

Diagram 1 depicts the dynamic process of strategic thinking about ideal state of quality of life [37] with the key question addressed in the box within the diagram.

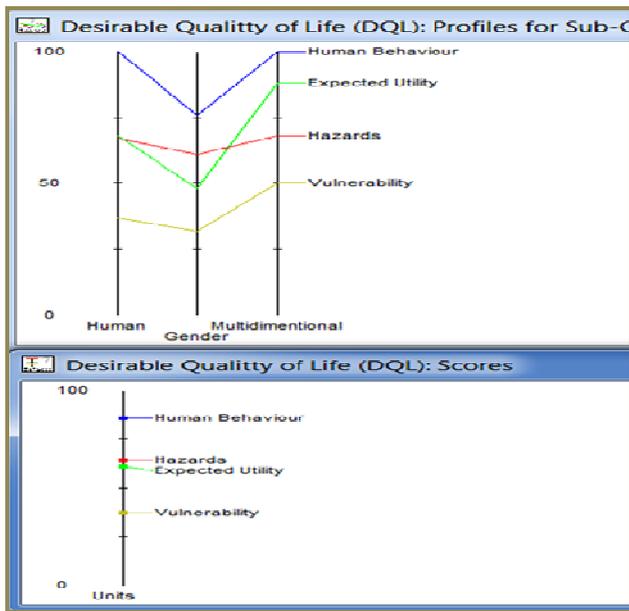


Fig. 7b Profiles and Scores of DQL

The above scenarios although play a representative role, are a direct outcome of a real life with a low profile and desirable quality of life. Such qualifications are similar to those for Mozambique in the field of human development, given the low indexes and high ranking vulnerability and exposure to natural hazards.

5. About Backcasting Approach

The Natural Step Project [37] is a well-known worldwide in the process of backcasting, which “*is central to a strategic approach to planning for sustainable development and innovation*”. An ideal future is framed and thereafter the following question is posed “*what do we need to do today to reach that vision of success?*” [37], Backcasting can be developed based on both scenario planning and or starting from a set of predefined principles for sustainability. As a concept, backcasting is different from forecasting and there is a lot of research on the topic that highlights these differences [38], [39], [40] and [41]. Natural Step Project [37] demonstrates how backcasting can be developed using a planning method based on the so called ABCD framework of safe environment development sustainable society (more details could be found at the Natural Step home page [37] as shown in Diagram 2). Using the same framework, we can draw a big picture of sustainability over the flood risk management strategies in Chókwe particularly and Limpopo River

Basin in general. This is done by developing the backcasting concept, either by scenario planning (Diagram 1) or through the development of sustainable principles illustrated in diagram 2.

Robison [33] addresses backcasting for future planning over a period between 20-100 years into the future and applies the method for analyzing environment and development problems at national levels under the issues of Human Dimensions of Global Change Program. The author provides an outline of generic backcasting methods, which describes a step-by-step approach.

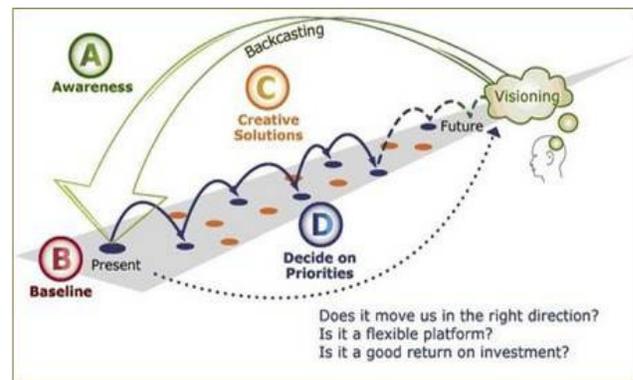


Diagram 2 ABCD Planning Method [37]

Using this method in stage A, a community can develop a goal approach based plan with long visioning step in a desired future that can frame new ideas and actions as whole. A common vision is stated and a new paradigm is assumed. The Second step is the definition of “Sustainable Gap” between today and the visionary end step which the community has a desire to achieve. Here a master plan must be design toward the endpoint. Wang and Guild [35] address backcasting as tool in competitive analysis and distinguish backcasting from forecasting. The authors address a key question for backcasting in the business context such as “*where would the organization like to be in the future (desirable futures) and how can one prepare him/herself to get to where would like to go*”.

Stage C will be characterized by an action learning for a scenario planning based on the assumed vision and the needs to overcome vulnerability and minimize the impact of hazards. The actual local planning process needs to be reframed with a vision of sustainability and setup a combination of both local and central strategies among all stakeholders. This is the stage were the Natural Step Project [37] introduces the “*backcasting*” concept, which prevent people to address strategies with short time frame. Vergragt and Quist [39] examine different backcasting for sustainability in specific issues by analyzing a variety and diversity of backcasting studies and backcasting

methodologies in different countries under contextual environment.

For this specific case, the research provides possibilities for positive and successful application of such method if common efforts are put together thus positing the need for a holistic approach. Finally, stage D indicates the implementation programs where, priorities and cost effective actions are put in place towards achieving the intended goals [37]. At the community level, one should implement all actions illustrated in Figure 7a and Figure 7b, where human behaviour and expected utility play the leading role in minimizing vulnerability and less exposure to risk. An incremental implementation program is required during the normal or eventless periods, and a real breakthrough when extreme events occur. One sustainable and well planned program for reducing vulnerability and ensuring successful resettlement program should be based on participatory actions that does not depend on the emergency and seek and rescue programs.

6. Findings and Results

The four analyzed dimensions have direct impact on the desired quality of life for many people living in risk prone zones. While vulnerability can be minimized, it looks to be linked to poverty intrinsically and hence it shapes the human behaviour and expected utility of people. The failure of resettlement program is a fact and if the strategies continue to be linked to emergency events it will become a cyclical routine based on seek and rescue operation whenever an extreme event occur.

The concept of Flood Risk Management Strategy is a complex problem area since it deals human sensitivities such as policies, culture and ethical issues that frame the decision making processes. The development of scenario planning may be one of the productive ways to prevent the implementation of a single objective oriented decision. Therefore, there are needs of handling and accommodating multiple and conflicting points of views. Strategies are multi disciplinarily, and given the importance of handling such important issue we address the introduction of backcasting method toward long term sustainable approach.

Handling vulnerability to risk and exposure to hazards within the backcasting method needs a paradigms shift that might shape new behaviour based on improved utility. The backcasting process might be implemented on a long run based on both scenario planning and using sustainable principles such as those developed within Natural Step Project [37]. Most natural hazards target the same segment of people because they are more vulnerable and exposed to risk. New frameworks that can contribute and induce new

types of behaviour are needed including various and innovative sources of income, cultural and ethical issues.

There is a pressing need to empower communities in order to include them as part of the solutions to their problems and not just remain a part the problem. Many resettling actions have failed because people are not adequately involved through the whole process, from the very beginning to the end. In most of the cases, the victims are only resettled during the periods of risk only. The findings indicate that holistic and sustainable approach in dealing with vulnerability to risk and exposure to hazards must be part of the general political agenda on national level.

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