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# Willingness to Pay for Flood Risk Management: A Case Study of Jammu and Kashmir

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## ABSTRACT

All parts of the world are vulnerable to natural disasters. Flood hazards are the most typical causes of damage. People act preventatively up to the point where the predicted advantages (avoiding losses) outweigh the expenses, and this is influenced by knowledge (most of which is embedded in pricing) and limits on their resources. In addition, people vary in how much danger they're willing to take. This study analyses risk perception and attitudes that determine the flood risk response of the people in Jammu and Kashmir. A stated preference survey is carried out, with the potential impact of information being taken into account. Results indicate that several wealth composition variables, including housing value and annual income, have favorable impacts on risk perception. Whereas other factors, such as land value and durable goods value, negatively influence people's perceptions of risk. Additionally, other variables such as 'floods are exogenous to human control' show a very poor correlation with the willingness to pay for flood risk in the area. By their very nature, those who often engage in risky behavior include a need to cope with the occasional positive results.

**Keywords**: Risk, disaster management, willingness to pay, climate change, floods.

## INTRODUCTION

Flood disasters profoundly influence life on Earth. Humans experience them every day, and these activities influence the socioeconomic and environmental aspects, which brings the most pressing sustainability problem. The grounds for flood disasters in market economies are fundamentally economic, and they are bi-product externalities of growth and development [1]. Likewise, the consequences of flood disaster problems have critical economic dimensions. Given that both causes and consequences of disasters have key economic dimensions, it should not be surprising that an economic perspective can provide valuable insights into sensible solutions. Given extensive examples of links between the spheres, the practical challenge is to produce a cohesive and comprehensive framework that considers sustainable development, disaster risk reduction, and environmental issues. Disaster risk reduction (DRR) and climate change adaptation (CCA) share common global milestones [2]. The Sendai Framework for Disaster Risk Reduction

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(2015-2030) was approved by the United Nations General Assembly in 2015. Understanding the interconnected nature of disaster risks and climate change is central to sustainable development, which both the SFDRR and the Paris Agreement acknowledge. The SFDRR emphasizes DRR investment as a top priority [3].

In order to reduce the massive societal harm and build a more sustainable society, improved flood management strategies are required. Resilience, the ability of social entities to deal with risky situations that pose severe threats, can also be enhanced by these strategies. Social resilience takes into account not only the physical infrastructure that maintains society but also the socio-ecological-political environment of societal/global risk. [4]. The SFDRR 2015-2030 also added an emphasis on the relevance of resilience-building, indicating that disaster management (especially flood management) would be one of the future's most pressing duties[5]. To make a community more resilient to natural disasters, its members need to be informed about the dangers they could be exposed to and supplied with the tools they'll require to lessen the impact of potential calamities. It is of the utmost significance to improve disaster preparedness and mitigation education and promote risk reduction methods for individuals, families, and communities. In this sense, it is essential to investigate people's risk perceptions and relevant attitudes about disasters to build disaster mitigation programs that are more appealing to the public and increase societal resilience.

When examining the impacts of flood management strategies, there are two major problems that should be thoroughly investigated. Having complete knowledge of the region is the first thing to consider, especially in regard to how people there deal with flood disasters. Second, it is essential to investigate whether or not individuals pay attention to low-probability dangers and whether or not this changes if the probability of flooding increases as a result of climate change.

Without the assistance of the local population, the government won't be able to come up with viable solutions while dealing with natural disasters. The possible differences in understanding and perception that existed among people were a significant obstacle to risk management. From the empirical study that has been done before on the topic, there are primarily two different findings that one might draw. The actual threats that a community faced were taken into account by communities that had flood preparedness plans in place. On the other hand, the second group reported that communities are willing to compensate for future losses in the event that they take precautionary measures to reduce the risk [6]. This issue commonly arises due to the fact that different communities have varying levels of knowledge and awareness about how to prepare for and respond to disasters. However, there is rare and comparatively limited research on how different information may affect people's risk-reduction actions. As such, the purpose of this research is to learn about people's major risk perceptions and relevant attitudes in Jammu and Kashmir with respect to flood risk. To learn more about the factors that could influence people's decisions, a thorough survey of flood risk is conducted. Here, we employ the concept of Willingness-To-Pay (WTP) to put a monetary value on individuals' subjective judgments of their own flood risk. The survey also asks how different sorts of information regarding flood disasters might affect respondents' risk assessment and how to best help with risk reduction.

As far as the available academic studies are concerned, this is the first case study to systematically analyze people's willingness to pay in connection with flood risk reduction in Jammu and Kashmir. The study identifies areas in need of further research and offer suggestions for how individuals should be more responsive to flood risk reduction

## Review of Literature

### An examination of how Individuals react to flood management

Existing communities in flood-prone areas can benefit from private, preventative efforts that minimize the impact of flooding. Damage can be mitigated in a number of ways that households and businesses can do [7]. Precautions can be taken in and around vulnerable

buildings, and in advance, people can do things like learn about flood risk and flood protection, or get involved in neighborhood relief efforts, to better prepare them to respond in the event of a flood. Building precautions decrease flooding damage. Past research has demonstrated that first-hand knowledge of the effects of flooding is a powerful motivator for adopting flood safety measures; for example, it has demonstrated that people who have regular and recent experience with flooding are much less likely to suffer substantial damage[8]. Strong connections between the reported annual number of flood incidents and the number of implemented measures further demonstrate that flood experience heavily influences the adoption of preventative measures. Individuals and businesses might be encouraged to invest in their own security by offering financial incentives. Insurance policies, public programs, or government grants that subsidize private safety measures are all viable options for providing the motivation that is needed. Studies also present a comprehensive assessment of the elements (including risk perception) that influence flood mitigation behavior. It shows that there is very little correlation between people's perceptions of flood risk and the implementation of private flood damage control measures. Multiple studies have used psychological theories, like the Protection Motivation Theory, to clarify how people make choices when faced with potential danger (PMT)[9].

**Risk Attitude**

Understanding people's risk perception and relevant attitudes toward flood disasters is critical to forming better management strategies and strengthening the resilience of society. To evaluate the monetary equivalent of community effects or preferences, nonmarket valuation approaches are applied. It is common practice to estimate values by adding up what people would be willing to pay (WTP) to increase (or decrease) the supply or quality of a nonmarket good or asset. Willingness to Pay (WTP) is a method for eliciting people's risk attitudes that is distinct from revealed preference and choice experiment methods. WTP is defined as the maximum price that a customer is willing to pay for a product or service. In terms of natural disasters, WTP can be used to measure the maximum price that an individual will pay for loss reduction[10]. Although the measure of WTP may not completely represent people's risk attitudes, significant correlations exist between the two measures, implying that people's WTP can reflect their favorable or disagreeable attitudes toward the subjects of interest [11]. Earlier studies built a partial least squares structural equation model to investigate the variables of risk perception, revealing that risk perception has a substantial impact on the WTP for hazard insurance. WTP has been used in the past to put a numerical value on people's disaster preparedness and mitigation actions. The willingness-to-pay (WTP) concept can be used to assess people's financial commitment to disaster relief initiatives, investigate the factors that impact people's decisions to purchase catastrophe insurance, and analyze how individuals feel about the possibility of being flooded [12]. As for earthquake disasters, Asgary et al. estimated the WTP for warning systems, which suggests that education level and the number of children are positively related to the WTP. Furthermore, the investigation into the WTP for disaster rehabilitation and insurance demonstrated the impact of risk perception, housing features, and socio-demographic characteristics [13]. Understanding the impact of the extremely low chance of disaster occurrence on people's WTP for risk reduction in the case of low-probability natural disasters is an essential component [14]. For instance, in view of property loss, homeowners have little tendency to invest in preventive actions because they may underestimate the probability and/or ignore the possibility of disaster occurrence [15]. To raise public awareness of disaster risk and inspire risk reduction measures, communities need to be provided with the tools they need to build risk communication strategies and access relevant catastrophe information. People's risk perceptions and attitudes are intrinsically linked to their personal experiences, which might be triggered by learning about past disasters [16].

**Flood risk in the Jammu and Kashmir**

Future estimates of climate change for Jammu and Kashmir suggest an increase in flood danger due to a shifting climate pattern, more extreme precipitation, and increasing cloud bursts. In order to deal with the increasing dangers in the Kashmir valley, numerous investments are being made and planned, including the dragging of rivers and the reinforcement of river dikes. Widening and deepening rivers, elevating buildings in flood-prone locations, and providing flood insurance are all helpful actions that can reduce the likelihood of flooding. Because of its geography, the Kashmir Valley in Jammu and Kashmir has faced a significant risk management challenge related to flooding for decades. Over 53 percent of Valley residents are estimated to have their homes in mountainous or hilly regions. Floods, avalanches, earthquakes, and other hydro-meteorological disasters have often struck the Kashmir Himalayan region, causing countless deaths and devastating property damage, as documented by historians.[17]. Losses of lives, property, crops, infrastructure, etc., are common results of floods in the southern Indian Himalayas. As a result, they have lasting repercussions for the social and economic conditions of the people who inhabit the areas around and in the Himalayas. Numerous flash floods have occurred in and around the Himalayas in the past decade due to high precipitation events [18]. At the same time, these elements have an impact on the severity and frequency of flood occurrences, issues directly connected to the process of flood control, such as poor execution of traditional structural measures, a failure to properly implement schemes, and inadequate oversight of flood management programs and practices, guarantee only limited safety [19]. Several large tributaries of the River Jhelum flow north into Pakistan, putting this region at risk of flooding from both sudden rainfalls and the resulting flood. In the Valley, the flood was caused by the complex interaction of heavy rainfall, the Valley's rugged geomorphic setup, and human factors such as floodplain urbanization, reduced river channel capacity due to siltation, and the loss of wetlands; however, the studies also made an important discovery about the event's cause by describing the south valley tributaries as having very high stream profile gradients, making them fast discharging waters [20]. After a rain, the Vishav catchment releases a lot of extra water into the Jhelum, making it the most flood-prone area. About 11.31% of the Vishav watershed is comprised of floodplains, putting 168,853 people in 117 villages at risk. The watershed was also submerged for nine days during the 2014 flood [21]. In the past, managing the dangers of flooding in the Valley has been the government's job. To prevent floods, communities employ a network of dikes, sluices, running dams, and flood channels, all of which must meet specific standards of reliability. Numerous floods have occurred in the past, including a devastating storm surge in 1992, devastating floods in 2014, and minor floods in 2017, 2018, and 2022[22].

**Methodology and data**

The most popular stated preference method, the contingent valuation method (CVM), was employed in this study. To determine how much individuals would be prepared to pay for environmental or natural resource services in a hypothetical market, one technique is known as contingent valuation, which uses surveys as its main data source. It could be challenging to calculate the economic value of these conveniences because they are nonmarket goods. Since they are not sold in the conventional manner of a priced good in a market but nonetheless provide individuals with economic benefits, economists refer to these objects as "nonmarket goods." Other "expressed preference approaches", including "conjoint analysis," "stated choice analysis, "and" choice experiments", are closely connected to this technique [23].

Inhabitants of district Kulgam were surveyed regarding their perceptions of flood risk for this study. Floods, snow avalanches, snow storms, cloudbursts, forest fires, earthquakes, and landslides are some of the natural calamities that have previously struck the Kulgam district [24]. Trails of death and damage have been left across the district by recent flood disasters. The Kulgam district is situated on the Vishav stream, which is notable

due to its unique physicochemical characteristics. The Vishow watershed is a well-known, perennial left-bank tributary of the Jhelum River. The large population in the district has a significant reliance on this stream for numerous fundamental needs, including fishing, farming, and human consumption; this gives the district its own distinct identity compared to the rest of the Valley [25]. The economic growth in the areas where this stream flows is intrinsically tied to the stream and is perpetually threatened by natural calamities, such as flooding.

The District Disaster Management Authority Kulgam has divided the district into three flood zones: A, B, and C. Zone B is the most vulnerable, zone C is the least, and zone A is moderately vulnerable (24). Based on this vulnerability classification, zone B has been chosen for sampling. There are 15 villages in Zone B, and five of them were randomly selected for the study. Using the Taro Yamane formula, a sample size of 334 was obtained based on the total number of households in five villages, which is 2030 [26]. The sample size has been increased to 350 to reduce the error margin. The researcher used the same random sampling technique to select respondents from each of these five villages.

To gather information, the researchers reviewed both primary and secondary sources. Before conducting the main study, a small group of participants (7%) were asked to try out the interview questions to see if they were understandable. Necessary adjustments were made based on their feedback to make sure the questions were clear and relevant. The main study then used these improved questions to ask people about their experiences with floods and how they deal with the risk of flooding. The questions included both optional types and Likert's five-point scale was used to collect data about the participants' behavior and attitudes towards flood risk. Each household was interviewed using the same set of questions. The recipients were selected to be the eldest person of the household between the ages of 18 and 75. It began with questions regarding general information on individual and household socioeconomic variables such as age, gender, education level, and living status. Cronbach's Alpha revealed that the reliability of the scales constructed ranges from 0.70 to 0.798, indicating that the scales constructed for this purpose are reliable. The questionnaires included questions about the respondent's experience of floods, opinions about flood protection measures, willingness to pay for flood protection, flood-related information, and socioeconomics. The main interest was determining whether the respondents had implemented any private flood mitigation measures and if they knew or assumed they already had flood coverage in their existing insurance or might consider purchasing such insurance. These latter valuation questions were constructed in the contingent valuation method style, which is the most frequently applied method in valuing environmental assets.

The CVM is a necessary and appropriate valuation approach since it can be used to the value of any commodity. It also has various problems, the most prominent of which are customers may lack the essential knowledge to appropriately estimate the value of the items they are being asked to determine the merits of because of their asymmetric information. The so-called "embedding effect" is a similar problem. Individuals may fail to identify a good's worth when it's entrenched in a system of connected or related items. Then, it might be assumed that the WTP for a fraction of a resource is the same as that for the full resource. Further, participants in the CVM rarely have preferences for the goods being valued, and they frequently disregard their financial limitations in the hypothetical situation in which the CVM is used. As a result, the study used a very ethical approach to resolving this issue by assisting participants whenever unsure how to answer the survey questions.

In-person interviews were conducted to collect this information, and participants were given a chance to ask any questions and share relevant observations or insights.

## Result

### Sample Characteristics and Descriptive Statistics

Table 1 shows the statistical information collected from a survey where most of the participants were from families with four to eight members and had an average age of 48 years. Only 16% of the participants were

women. However, 89% of the participants were literate, which is higher than the literacy rate of the Kulgam area, according to the recent census report. Education is important in reducing the risk of disasters, and it was emphasized during the UN World Disaster Reduction Campaign and the Hyogo Framework for Action

To be considered "Below the Poverty Line," a household must have an annual income of ₹27,000 or less. However, the lowest income category observed in the study had an estimated annual income of ₹30,000. Nearly half of the households in the study belonged to the middle class. Indian middle-class families tend to spend a significant portion of their income on monthly expenses, with an average monthly income ranging from ₹15,000 to ₹35,000. The study assumed that the median monthly expenditure for a family was ₹25,000. The lowest income group had a monthly income range of ₹2,000 to ₹5,000.

**Table 1:** Socioeconomic condition of respondents

| Variables | Mean/ Median | SD | Min | Max |
|---|---|---|---|---|
| Age | 47 | .538 | 18 | 75 |
| Gender | .16 | .367 | 0 | 1 |
| Education | 2.28 | 1.19 | 0 | 4 |
| Living Status | 1.02 | .150 | 1 | 2 |
| Occupation | 2.41 | 1.34 | 0 | 4 |
| Monthly Income | 2.75 | 3.0 | 0 | 3 |
| HH expenditure | 2.28 | .84 | 1 | 3 |
| Flood Risk | .95 | .277 | 0 | 1 |
| Housing insurance | .57 | .496 | 0 | 1 |
| Flood experience | 1.02 | .130 | 0 | 1 |
| Adaptation measures | .38 | .481 | 0 | 1 |
| Trust on Authorities | 1.77 | .130 | 0 | 1 |

Source: computed

43% of the population had housing insurance, but 98% of respondents experienced floods. Out of 350 participants, 218 took adaptive measures during floods, and 77% trusted authorities for flood mitigation.

**Willingness to Pay.**

**Social, wealth, and risk factors influenced WTP.**

The results of a multivariate regression analysis that was used to investigate the relationship between various social factors and respondents' willingness to pay for different types of flood mitigation measures are given in equation (1)

WTP= constant + b1AG + b2Gn + b3Oc + b4Edu + b5LS + b6 FS + b7TST……. (1)

The regression model included independent variables such as age, gender, occupation, education status, living status, family size, and trust in authorities. The dependent variables were the willingness to pay for different types of insurance (livestock, life, housing, durable goods, and alternative shelter).

Table 2. showed that age was negatively related to willingness to pay for life insurance as a flood mitigation measure, meaning that younger respondents were more likely to purchase this type of insurance. Gender and occupation were positively correlated with willingness to pay for life insurance, indicating that respondents with higher levels of these two variables were more aware of the risk of flooding and the need for life insurance. Family size had a weak negative relationship with willingness to pay for life insurance. It was not considered an important determinant of households' decisions to purchase this type of insurance.

Education and occupation were found to be important factors influencing households' decisions to purchase housing insurance. The data suggested that entrepreneurs, farmers, and government employees with a high level of education were more likely to be interested in purchasing housing insurance as a flood mitigation measure. Living status was also positively related to willingness to purchase housing insurance, indicating that respondents who owned houses were more likely to be interested in this type of insurance.

**Table 2:** Social factors influenced WTP

| variables | WTP livestock (LSI) | | WTP life insurance (LI) | | WTP housing insurance (HI) | | WTP (DGI) | | WTP Alternative Shelter (AS) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | β | t | β | t | β | t | β | t | β | t |
| **Constant** | .69** | 3.021 | .158 | .391 | 1.058 | 2.88 | 1.95** | 11.34 | 2.40** | 12.2 |
| **(AG)** | .013 | .239 | -.029 | -.332 | -.191 | 1.47 | -.005 | -.095 | -.037 | -.570 |
| **(Gn)** | -.044 | -.840 | .252** | 2.011 | .10** | 4.02 | .059 | 1.930 | -.026 | -.581 |
| **(Oc)** | -.29** | -4.11 | 273** | 3.753 | .48** | 8.310 | .048 | .651 | -.25** | -3.705 |
| **(Edu)** | .100 | 1.36 | -.040 | -.561 | .198** | 3.463 | -.17** | -2.40 | -.19** | -2.904 |
| **(LS)** | -.028 | -.539 | .011 | .207 | .04** | .961 | -.049 | -.913 | -.023 | -.464 |
| **(FS)** | -.005 | -.094 | -.072 | -1.347 | -.012 | -.274 | .112** | 2.062 | .12** | 2.404 |

**At a 5% significance level

The results further showed that education had a negative effect on willingness to pay for durable goods insurance. Respondents with higher levels of education were less willing to pay for this type of insurance as a flood mitigation measure. The regression model accounted for only 17% of the variance in the willingness to pay for durable goods insurance, indicating that other factors not included in the model might have a more significant impact.

Trust in authorities was found to have a negative association with willingness to pay for livestock insurance, but this relationship was not statistically significant. The analysis of willingness to pay for alternative shelter showed negative coefficients for all social factors, indicating a negative association with willingness to pay for this type of mitigation measure. The regression model accounted for 20.4% of the variance in the willingness to pay for alternative shelter.

**Wealth and Risk Factors influence willingness to pay.**

The wealth factors analyzed include land value, monthly income, monthly household expenditure, housing value, and livestock value. Table 3. The results show that there is a statistically significant positive relationship between land value and the willingness to pay for livestock insurance. Similarly, there is a positive relationship between land value and the amount that individuals are willing to pay for alternative shelter. The study also reveals that monthly income is important in

dealing with flood disaster risk. Respondents with higher monthly incomes are more willing to pay for life and housing insurance. However, there is no significant relationship between monthly income and willingness to pay for livestock insurance and alternative shelter. The coefficient of household expenditure is positive but small in association with willingness to pay for life insurance, housing insurance, and durable goods insurance. This suggests that there is a positive but small relationship between household expenditure and willingness to pay for certain types of insurance. The housing value coefficient is positive and significant regarding willingness to pay for housing insurance, indicating a meaningful and statistically significant association between housing value and willingness to pay for housing insurance. The estimated coefficient is negative but significant regarding durable goods, suggesting that there is a negative relationship between the value of these commodities and individuals' willingness to pay for insurance to cover them. The coefficient of livestock value is positive and significant in association with insurance, indicating that individuals who own livestock are more willing to pay for insurance to protect their livestock and their income from potential losses due to accidents, disease, or other risks.

**Table 3: Wealth and Risk Factors Influenced WTP**.

| **Variables** | WTP livestock insurance | | WTP life insurance | | WTP housing insurance | | WTP durable goods insurance | | WTP alternative shelter | |
|---|---|---|---|---|---|---|---|---|---|---|
| | β | t | β | t | β | t | B | t | β | t |
| **Constant** | .215 | 1.383 | .60 | .849 | .099 | 1.37 | 2.49** | 57.8 | 2.54** | 39.6 |
| **(LV)** | .166** | 2.807 | .005** | .079 | -.118** | -2.4 | -.99** | -2.54 | .103** | 2.24 |
| **(MI)** | -.020 | -.269 | .198 | 2.51 | .285** | 4.52 | .018 | 1.75 | -..58 | -3.41 |
| **(HHE)** | -.103 | -1.084 | .052 | .052 | .132 | 1.69 | .027 | 1.52 | -.28 | -3.16 |
| **(HV)** | -.221 | -2.034 | .054 | .503 | .162** | 1.18 | .-.09 | 1.31 | -.20** | -2.46 |
| **(DGV)** | -.089 | -1.281 | -.001 | -.015 | .158 | 2.77 | -.02** | -1.89 | -.179** | -3.32 |
| **(LS)** | .144** | .2.68 | .004 | .068 | .036 | .82 | .006 | .006 | -.03** | -.78 |
| **DR** | -.029 | -1.549 | .085 | 1.617 | .085 | 1.682 | .011 | .206 | -.120 | -2.25 |
| **RFD** | .071 | 1.329 | .195** | 3.74 | .350** | 6.98 | -.029 | -.538 | -.188 | -3.55 |

**At a 5% significance level

The risk factors analyzed include the risk of flood damage and the distance from the major river. The results show that the level of flood damage in the past is a significant predictor of people's willingness to pay for actions to reduce the risk of future flood damage. Respondents who lived in an area with a higher risk of flood damage were more likely to invest in livestock insurance. However, the relationship between the risk of flood damage and livestock insurance is not strong enough to be statistically significant. People are less concerned about insurance for their secondary belongings and finding alternative shelter options in the event of flood damage. The positive coefficient of distance from the major river for willingness to pay for life insurance, housing, alternative housing, and durable goods insurance suggests that households located farther away from the river were more willing to invest in flood risk mitigation measures.

**Discussion**

The study examines how residents of a part of Jammu and Kashmir feel about the threat posed by flooding, a natural disaster that occurs frequently. While many studies highlight the societal and economic effects of floods, to our knowledge, very few have ever looked at how individuals can mitigate their own risk [27]. In India, compared to other nations, the proportion of private funds spent on ensuring the safety of people's lives, homes, and other areas is far lower than the government's spending on disaster preparedness. This reflects on significant financial burden on the government. Indeed the disaster management expenditure has been reduced by 1 percent under the National Disaster Relief Fund (NDRF) and State Disaster Relief Fund (SDRF) in India during the 2022-23 budget (Ali Jan et al., 2022). In this particular investigation, the WTP concept has been utilized to examine the risk management and modeling factors that influence the risk management behavior of individuals. Based on the results of this study, the negative regression coefficient of the variable age (AG) indicates that younger respondents were more likely to purchase life insurance (LI) as flood mitigation measures. A negative coefficient suggests that as the age of the respondent increases, the likelihood of purchasing life insurance as a flood mitigation measure decreases. Younger respondents were more likely to be in the process of setting up their households and financial plans and therefore be more focused on taking proactive measures to protect themselves and their families from potential harm [28]. Additionally, younger respondents were more aware of the risks associated with flooding and the potential financial impact of flood damage. Therefore, they are more likely to take proactive measures to mitigate this risk.

Gender disparities exert powerful differences within societies worldwide, even in disasters. A positive and statistically significant correlation was found between gender (Gn) with life insurance (LI), indicating that these variables have helped raise respondents' awareness of the danger of flooding and how life insurance can protect against it. The positive correlation suggests that as the gender gap increases, the likelihood of purchasing life insurance as a flood mitigation measure also increases. This is because men are more aware of the potential financial impact of flood damage and are more likely to take proactive measures to mitigate this risk [29]. Men may also have greater access to flood management and flood insurance information, making them more likely to purchase life insurance as a flood mitigation measure. The regression analysis's negative coefficient of family size (FS) indicated a weak negative relationship between family size and the willingness to pay for life insurance as a flood mitigation measure. This finding aligns with previous research that has shown that larger families may have limited financial resources, making it more challenging to prioritize expenses such as insurance [30]. Individuals with certain occupations and higher education levels are more likely to prioritize the purchase of housing insurance to protect against flooding. The regression analysis showed that entrepreneurs, farmers, and government employees with a higher level of education were more likely to be interested in purchasing housing insurance as a flood mitigation measure. This finding is consistent with previous research that has shown that individuals with higher levels of education and certain occupations tend to better understand the risks associated with natural disasters and the importance of mitigating these risks through insurance [31]. These individuals may also have higher incomes and greater access to financial resources, which may make it easier for them to purchase insurance. A positive relationship exists between living status (LS) and the willingness to purchase housing insurance (HI) as a flood mitigation measure. This means that people who own houses are more likely to be interested in buying housing insurance to protect against flooding compared to those who do not own homes. This finding is consistent with the idea that individuals who own homes might have a greater financial stake in protecting their property against flood damage and might therefore be more likely to invest in housing insurance as a flood mitigation measure. A negative coefficient for education (Ed) suggests that respondents with higher levels of education were less willing to pay for durable

goods insurance (DGI) as a flood mitigation measure. This could be due to several reasons, such as a perception of lower flood risk or a preference for self-insurance through savings or other means. However, it is important to note that the negative relationship between education and durable goods insurance (DGI) might not hold in all contexts, as factors such as income, asset value, and prior experience with flooding might also influence willingness to pay for DGI [32]. The availability and affordability of livestock insurance, the perceived flood risk, and the cost of these measures also influence an individual's decision to invest in them [33]. Overall, these findings suggest that respondents in the survey did not express a strong interest in paying for alternative shelter and that their social characteristics shaped their attitudes towards this type of flood mitigation measure.

There are disparities in the distribution of flood management resources and services among different socioeconomic groups. The wealthier population has access to better flood management measures, while the less wealthy population may be left with less effective or no flood management measures [34]. The study found that there is a positive and significant relationship between land value (LV) and the willingness to pay for livestock insurance. This means that people who own land with higher values are more likely to be willing to pay more for livestock insurance compared to those who own land with lower values. In addition, individuals who own land with higher values are expected to have a higher willingness to pay for life insurance. One way to lessen the impact of flooding is to seek alternative shelter in high-risk areas. Those who could afford to have their belongings moved to higher ground have done so in an effort to lessen the impact of the flooding [35]. The result of the study demonstrates a positive correlation between land value (LV) and the amount one is willing to spend on alternative shelter. Monthly income is an essential factor in dealing with the risk suggesting that individuals with higher incomes might be more able to afford insurance premiums and might therefore be more likely to purchase insurance [36]. Further, a respondent's monthly household expenditure (HHE) is directly associated with primary consumption, such as daily food consumption, but has an opposite relationship with secondary expenditures [37]. The result estimates of the study revealed that the coefficient of household expenditure (HHE) is positive but small in association with willingness to pay for life insurance, housing insurance, and durable goods insurance" suggests that household expenditure is related to both primary and secondary consumption and that there is a positive but small relationship between household expenditure and willingness to pay for certain types of insurance. However, the opposite relationship with secondary expenditures suggests that as household expenditure increases, individuals might spend proportionally less on discretionary items, such as entertainment or luxury goods. Individuals with higher-valued homes have more assets to protect and might be more willing to pay for life insurance to ensure their families are cared for in case of death. Alternatively, individuals with higher-valued homes might have higher incomes, which might also be associated with a higher willingness to pay for life insurance [38]. The housing value (HV) coefficient is positive but insignificant regarding willingness to pay for life insurance, suggesting that there is some relationship between housing value and willingness to pay for life insurance, but it is not strong enough to be considered statistically meaningful. Some individuals might perceive the risks associated with these durable goods to be relatively low, or they might feel that the cost of insurance premiums is too high relative to the value of the goods being insured [39]. It's also possible that individuals felt that they could self-insure by setting aside funds to cover the replacement or repair of these items in the event of damage or loss [40]. The estimated coefficient is negative but significant regarding durable goods such as cars, motorcycles, refrigerators, and other small items on willingness to pay for insurance, it suggests that there is a negative relationship between the value of these commodities and individuals' willingness to pay for insurance to cover them. However, it's important to note that even with a negative coefficient, there might still be some individuals who are willing to pay for insurance to

cover these durable goods. Additionally, the reasons for individuals' decisions to purchase insurance might be complex and influenced by factors beyond just the value of the goods being insured. Livestock is a valuable asset for families who rely on it for their livelihoods, so it makes sense that they would be more willing to invest in insurance to protect that asset. The positive coefficient suggests that as the value of their livestock increases, individuals might become more willing to pay for insurance to protect that value.

The study aimed to identify risk factors that affect people's willingness to pay for actions to reduce the risk of flood damage (RFD). The positive and statistically significant coefficient of risk of flood damage (RFD) suggests that the level of flood damage in the past is a significant predictor of people's willingness to pay for actions to reduce the risk of future flood damage. This means that people who have experienced flood damage in the past are more likely to be willing to invest in measures to reduce the risk of future damage. Additionally, people's attitude towards risk reduction is highly favorable towards life and housing where they reside, suggesting that people are more willing to invest in risk reduction measures for their personal well-being and for the protection of their homes. This is consistent with the idea that people might be more willing to invest in measures that directly impact their own lives and property.

The negative and insignificant relationship between the risk of flood damage (RFD) and willingness to pay for durable goods insurance and alternative shelter suggests that people are less concerned about insuring their secondary belongings and finding alternative shelter options in the event of flood damage. This could be because respondents might perceive their durable goods, such as appliances or furniture, as less valuable or replaceable than their primary assets, such as their home or life. As a result, they might be less willing to invest in insurance coverage for their durable goods or to find alternative shelter options in the event of a flood. It is also possible that respondents might not be aware of the potential risks associated with flood damage to their durable goods or have a clear understanding of the costs and benefits of investing in insurance coverage for these belongings. Overall, these findings suggest that people's attitudes toward risk reduction and their willingness to invest in measures to protect their assets might vary depending on the perceived value and importance of those assets. The positive coefficient of distance from the major river (DR) for willingness to pay for life insurance, housing, alternative housing, and durable goods insurance suggests that households located farther away from the river were more willing to invest in flood risk mitigation measures. However, the fact that the coefficients are statistically insignificant suggests that the relationship between distance from major rivers and willingness to pay for flood risk mitigation measures was weak or inconsistent across the sample. It is possible that other factors, such as perceived flood risk, might play a more significant role in shaping people's attitudes towards flood risk mitigation measures than the distance from major rivers alone.

To summarize, the study found that factors such as age, occupation, education, homeownership, land value, monthly income, and household expenditure all played a role in individuals' decisions to purchase insurance. Other factors, such as risk perception, personal beliefs, and access to insurance options, might also influence individuals' willingness to pay for insurance. The study suggests that targeted interventions can be developed to address the specific needs and preferences of different groups of households.

**Conclusion**

These facts emphasized that strengthening the household is an essential task in natural hazard mitigation. Therefore, this research focuses on how much people are willing to pay (WTP) for disasters like flood prevention and mitigation methods. The study on willingness to pay for flood management assumes much significance from both academic and policy perspectives. So the study employed data from a sample of households in the Kulgam district of Jammu and Kashmir (representative with regard to age, education, gender, and occupation), given that there are no pre-existing markets that would

place a value on household safety, and since there are a wide variety of personal and objective factors that influence how one handles risk. Confidentially, the information is derived from the contingent valuation method. In the first part of this investigation, the study measured the socioeconomic standing of individuals with their willingness to pay. Second, it determined that persons who had insurance were at a higher risk than those who did not have insurance, and they built risk reduction measures despite the fact that flooding in Kashmir is a hot zone of natural disasters, particularly floods, according to the World Band Report 2005. The most recent flood, which took place during the past ten years, was responsible for around ₹5000 crore worth of damage throughout the Valley. The recovery phase then cost more than the damage, and the state government even paid the Indian army ₹500 crores for the evacuation of civilians during that time [41]. The cost of different insurance services has a significant influence on WTP. So this inference might provide a lot of insights for the policymakers.

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# الاستعداد لدفع تكاليف إدارة مخاطر الفيضانات: دراسة حالة لجامو وكشمير

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## ملخص

كل أنحاء العالم معرضة للكوارث الطبيعية. مخاطر الفيضانات هي الأسباب الأكثر شيوعًا للضرر. يتصرف الناس بشكل وقائي إلى النقطة التي تفوق فيها المزايا المتوقعة (تجنب الخسائر) النفقات، ويتأثر هذا بالمعرفة (معظمها جزء لا يتجزأ من التسعير) والقيود المفروضة على مواردهم. بالإضافة إلى ذلك، يختلف الناس في مقدار المخاطر التي يرغبون في تحملها. تحلل هذه الدراسة إدراك المخاطر والمواقف التي تحدد استجابة الناس لمخاطر الفيضانات في جامو وكشمير. تم إجراء مسح للتفضيلات المعلنة، مع أخذ التأثير المحتمل للمعلومات في الاعتبار. وتشير النتائج إلى أن العديد من متغيرات تكوين الثروة، بما في ذلك قيمة السكن والدخل السنوي، لها تأثيرات إيجابية على تصور المخاطر. في حين أن عوامل أخرى، مثل قيمة الأرض وقيمة السلع المعمرة، تؤثر سلبا على تصورات الناس للمخاطر. بالإضافة إلى ذلك، تظهر المتغيرات الأخرى مثل "الفيضانات الخارجية التي لا يمكن السيطرة عليها من قبل الإنسان" ارتباطًا ضعيفًا للغاية مع الرغبة في دفع تكاليف مخاطر الفيضانات في المنطقة. بحكم طبيعتها، فإن أولئك الذين غالبًا ما ينخرطون في سلوكيات محفوفة بالمخاطر لديهم حاجة إلى التعامل مع النتائج الإيجابية العرضية.

**الكلمات الدالة**: المخاطر، إدارة الكوارث، الاستعداد للدفع، تغير المناخ، الفيضانات.

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