Vol. 2 No. 4 (2024)
Journal of Social Signs Review
Print ISSN: 3006-4651
Online ISSN: 3006-466X

Journal of Social Signs Review

Investigating the Inter-Relationships among Humanitarian Issues Arising Out of Floods in Pakistan

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Abstract

The study aims to investigate the inter-relationships among humanitarian issues arising from floods in Pakistan. The study's overall design comprises a review of relevant literature, primary data collection, structural modeling, and analysis of the phenomena. The method of modeling is “Interpretive Structural Modelling (ISM)” and the process of analysis is “Cross Impact Matrix Multiplication Applied to Classification (MICMAC)”. The population under study comprises the folks of stakeholders. The study follows a purposive sampling design (i.e. focus group consisting of a panel of experts) and the sample size is nineteen experts. The result of the literature discourse reveals that fifteen major humanitarian issues arise from floods. Results of ISM modeling show that issues namely: shelter loss of masses, agriculture damage, food shortage, community restoration, protection difficulties, education disruption, mal-nutrition, logistics disruption, coordination difficulties, and camp management difficulties occupy Level-I. Issues namely: problems of

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Print ISSN: 3006-4651
Online ISSN: 3006-466X

water and sanitation, health issues for affectees, food prices soaring, exacerbating fears of a new round of high inflation, and submerged lands occupy Level-II. Whereas, scale-centric MICMAC analysis shows that all the issues fall in the linkage cluster, whereas, data-centric MICMAC analysis shows that: problems of water and sanitation, health issues for affectees, food shortage, exacerbating fears of a new round of high inflation, and submerged lands results of analysis fall in the independent cluster; community restoration and coordination difficulties fall in the dependent cluster; and shelter loss of masses, agriculture damage, protection difficulties, education disruption, mal-nutrition, logistics disruption, camp management difficulties fall in linkage cluster. Whereas, there is no factor in the autonomous cluster, both in scale-centric and data-centric analysis. It is an original valuable study because it is based on real-time experimental first-hand data collected by authors who have hands on job of data collection for decades. It also uses unique and different methodologies to collect data, modeling, and analysis. This methodology is simple but unique, and understandable by a wide range of folks of stakeholders. Its results are also logically appealing and realistic corresponding to ground realities. The study will enrich the understanding of national/local governments, regulators, industry representatives, landowners/farmers, the general public (including households, local communities, village committees, community workers local labor, disabled people, minorities, senior citizens, and women, etc.), the scientific community and others contributors to system, institutions engaged in disaster management, international donor agencies, academia, politicians & political parties, flood-prone communities, NGOs, volunteers, regional institutions, media, suppliers of goods & material, civil organizations, private institutions and other affected, interested or vulnerable groups (like social beneficiary groups, non-social beneficiary groups, social adversely affected groups and non-social adversely affected groups) by way of deeper insights into the conundrum issue of floods.

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Print ISSN: 3006-4651
Online ISSN: 3006-466X

Keywords: Humanitarian Issues, Floods, Pakistan, ISM, MICMAC

Introduction

The accelerating pace of urbanization, excessive use of natural resources, significant climate changes, and ecological disturbances have led to an increase in the frequency and severity of natural disasters including floods (Zia et al., 2023; Shehzad, 2023; Adnan et al., 2024; Aslam et al., 2022). Floods are rather more common and frequent natural disasters that have five known major effects i.e. threatening lives, inundating properties and businesses, destroying belongings, damaging vital infrastructure, and limiting access to essential public services (Khan et al., 2021; Clark, 2022; Rana et al., 2021). The problem of humanitarian issues arising from floods is paramount, for the challenges that strike at human dignity and survival (Ahmad et al., 2024). Investigating and analyzing humanitarian issues arising from floods is crucial, the reason being, that they bring to attention the intense and multifaceted impacts these disasters have worldwide on communities (Ahmad & Afzal, 2024a; Ullah et al., 2021; Hasan & Sadat, 2023). Inadequate shelters, food shortage, submerged lands, and the health risks associated with floods are significant, as contaminated water can become a reason for outbreaks of diseases, and standing water promotes the spread of mosquito-borne illnesses (Raza et al., 2023; Alied et al., 2024). There are also staggering economic losses from flooding, with damage to homes, infrastructure, and businesses ultimately leading to disruption of trade (Singh, 2020; Ismail & Ali, 2020; Modupe, 2021; Huang et al., 2023; Quader, 2024). All countries including Pakistan encounter humanitarian issues arising from floods, however, the intensity of these issues differ notably (Audi & Al-Masri, 2024; Baig et al., 2024; Memon, 2023). Pakistan comparatively faces more significant challenges due to vulnerable infrastructure, economic constraints, and relatively ineffective disaster management systems (Ahmad & Afzal, 2024b; Nudzor, 2023). Humanitarian issues arising out of floods in Pakistan are one of the rarely studied issues. It is vital by nature, and it needs

Journal of Social Signs Review
Print ISSN: 3006-4651
Online ISSN: 3006-466X

more immediate attention against certain over-attended aspects (Jammzazi & Mokni, 2021; Shah et al., 2023). The research literature well addresses technical issues concerning floods but ignores certain primary areas. The dimensions of this phenomenon concerning humanitarian issues are neglected despite of primary importance. Therefore, the research objectives of the study are: i) to ascertain an array of humanitarian issues arising out of floods in Pakistan, ii) to investigate the inter-relationships among these issues, iii) to build a theoretical structural model of the relationships of these issues, iv) to classify them into the order of dependence and v) to formulate the policy guidelines for affectees. The research questions include: i) Which humanitarian issues arising out of floods need high priority? ii) Which issues are relatively less important? iii) What are the contextual relationships among humanitarian issues arising out of floods? There are many methods in literature to answer these questions. An array of methodological choices has been considered to achieve the objectives of the study.

That includes considering Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Stepwise Weight Assessment Ratio Analysis (SWARA), VIekriterijumsko KOmpromisno Rangiranje (VIKOR), DEcision MAking Trial and Evaluation Laboratory (DEMATEL), Wavelet Analysis (WA), Structural Equation Modelling (SEM), Analytical Hierarchy Process (AHP), Analytical Network Process (ANP), Data Envelopment Analysis (DEA), Grey Relational Analysis (GRA), Interpretive Structural, Modelling (ISM), Cross Impact Matrix Multiplication Applied to Classification (MICMAC), Total Interpretive Structural Modelling (TISM), Modified-TISM, Polarized-TISM, Fuzzy-ISM/TISM, Artificial Neural Networks (ANN), Multi-Objective Optimization on the basis of Ratio Analysis (MOORA), etc. as possible methodological choices. It is also considered to use the methods in combination as mixed methodology. ISM in combination with MICMAC is the most appropriate because of its simplicity and ease of application & understanding. It is convenient for examining the complex

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Print ISSN: 3006-4651
Online ISSN: 3006-466X

interconnections of variables. For qualitative analysis, it is considered one of the best tools because it articulates the entangled inter-relationships of variables into explicit models. Using the ISM technique as a methodology is justified because this study inculcates a complex phenomenon and ISM outperforms statistical techniques in studies like that in hand. After capturing the mental models, these are transformed into binary models that are eventually modified into graphical models making use of ISM. MICMAC is incorporated with ISM considering its potential to corroborate the results of ISM and categorize the humanitarian issues arising out of floods in a classification diagram based on their driving-dependence power (Abbass, et al., 2022; Basit, et al. 2021; Fu, et al. 2022; Niazi, et al. 2021; Niazi, et al. 2023; Rasheed, 2020; Qazi, et al. 2020; Qazi, et al. 2022; Wali, 2018; Raja & Iqbal, 2019; Qazi, et al., 2019; Kabir & Rashid, 2019; Modupe, 2021; Niazi, et al., 2021a; Niazi, et al., 2023c). Therefore, in this study, ISM with MICMAC is used as the methodology. The remaining part of the article is arranged as a review of the literature, methodology, modeling, analyses, discussion, and conclusion.

Literature Review

Since literature review provides the foundation of knowledge on the topic, prevents duplication, and helps to give credit to other researchers, uncovers questions left from other research, verifies justification of further research, the relationship of works in the context of its contribution, and places the research study within the context of existing literature, therefore, it is always advisable to review the contemporary relevant literature in a bit depth. It is also important that the reviewer should mention the extent of access to literature it has got in fact. A survey of contemporary literature has, therefore, been conducted by way of exploring the renowned research databases of the world to which the Higher Education Commission of Pakistan has provided official access to Higher Education Institutions (i.e. Wiley Online Library, Taylor & Francis Online, Springer Link, Emerald Insight, Elsevier-ScienceDirect, JStor, etc.) through

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Print ISSN: 3006-4651
Online ISSN: 3006-466X

advanced search tab with appropriate filters. The keywords used for the search include flood early warnings, social obstacles to implementing flood early warning systems, early warning systems of floods, floods in Pakistan, issues of floods early warnings, social issues of flood warnings, humanitarian issues arising from floods, problems created by floods, the impact of floods, effects of floods, etc. The search resulted in thousands of research papers that have been screened based on relevance. Highly relevant research articles have been critically reviewed and reported to set out the very outset of the study. Plethora of studies has been conducted in Pakistan regarding challenging conditions arising out of floods i.e., health-related challenges (Ochani et al., 2022), Cholera spike following monsoon floods (Malikzai et al., 2023; Wang & Ahmad, 2018; Yinusa & Ogoun, 2024), access to safe drinking water (Tufail et al., 2024), livelihood vulnerability (Khan et al., 2024), household losses (Yaseen et al., 2023) and socio-economic impacts of floods (Ashraf et al., 2023) etc. All these studies focus on a specific issue. To the best of our knowledge, no study has been found that addresses a multitude of issues, lists them, and prioritizes them. However, certain studies have concerns about the phenomenon from different perspectives. Ochani et al. (2022) asserted that mortality and illnesses have increased significantly due to flood catastrophes. Regarding various risks and calamities, floods have made life more vulnerable.

Being faced with a significant population, outbreaks of contagious and infectious diseases are serious challenges. Mental and reproductive health issues are the other problems faced by people amidst floods. The fight against illnesses such as dengue fever, etc. gets worse, specifically in places where there is a lack of sanitation and clean water supply. Women going to give birth to babies lose access to clinics and hospitals (Malik & Najmul-Islam-Hashmi, 2022). The situation becomes more difficult because of the massive damage done to the roadways and communication systems. In addition, the newborn children in flood-affected areas suffer from malnutrition (Agabiirwe et al., 2022; Haq et al., 2021). It is difficult to

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Online ISSN: 3006-466X

ensure the hygiene of feeding equipment for preparing infant formula due to the polluted setting in the flood-affected area. Since there is a lack of privacy for women in flood-affected areas, breastfeeding may also become less effective. Supplemental feeding may also deteriorate. The lack of resources in affected areas also creates hindrances for the mothers to prepare supplemental diets for kids, which further harms the babies (Ochani et al., 2022). Tufail et al. (2024) asserted that the effects of floods are more severe in developing countries even though they occur globally. The inhabitants in flood-vulnerable areas are adversely affected by floods (Akbar & Aldrich, 2024). Floods disrupt the water supply system as well as damage properties and crops (Gulzar et al., 2021). Water supply is interrupted by the damage to water infrastructure ultimately making an impact on water quality of surface and groundwater resources. Since water treatment plants and freshwater supply systems are dependent on mechanical devices, electronic machines, and electricity, these are highly susceptible to flooding. With frequent hydro-meteorological occurrences, Pakistan is among the worst-affected countries by climate change, (Ali & Audi, 2016; Ali & Zulfiqar, 2018; Hadipour et al., 2020).

Many areas in Punjab, Sindh, and Khyber Pakhtunkhwa province have been left desolated by floods since 1937, including the districts of Nowshera, Charsadda, and Peshawar (Ait-Kadi, 2016, Khan et al., 2013; Akhter et al., 2023). Major flood events are experienced by Nowshera district in 2010 and 2022. These flood events have created many problems such as shelter loss for masses, submerged lands, and agricultural damage (Qamer et al., 2023; Mahmood et al., 2021). It also asserted that ninety-eight percent of drinking water sources in these regions were contaminated by flooded water.

Yaseen et al. (2023) argued that Pakistan has encountered destructive flooding, leading to a great number of fatalities, the destruction of homes at a large scale, and millions of displaced or otherwise affected individuals. A significant threat is posed by climate change to agricultural systems worldwide (Akbar et al.,

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Print ISSN: 3006-4651
Online ISSN: 3006-466X

2024; Saqib et al., 2021). For livelihood in Pakistan, the majority of the population relies on agriculture as it is an agrarian country (Nepal et., 2024; Usman et al., 2023; Aftab et al., 2021; Shah et al., 2021). The destruction of livestock, crops, and land translated into the highest level of inflation e.g. in 2023 since the 1970s (Aqib et al., 2024; Manzoor et al., 2022). It also asserted that before the issues arise from the devastations of the floods, early warnings concerning the outcomes of flood disasters should be ensured by utilizing digital media to prepare people for early and safe evacuation (Rana et al., 2021; Ali et al., 2022). It should be done to avoid outbreaks of infectious diseases. Issues like lack of habitable shelter facilities, water contamination and sanitation, and lack of accessibility to health services, should be evaluated for making policies and to prepare plans of action for the control of infectious outbreaks (Sajid & Bevis, 2021). Heavy rains are followed by mosquito-borne diseases like dengue and malaria and their prevention requires ensuring the availability of medicines including antimalarial drugs as well as rehydration fluids in health centers near high-risk areas. From the critical literature discourse, a total of fifteen major humanitarian issues have been identified (Table 1).

Table 1: List of Issues Arising out of Floods

Code	Issues Arising out of Floods	Source
1	The problem of water and sanitation	(Tufail et al., 2024)
2	The Health issue for affectees	(Ochani et al., 2022)
3	Shelter loss of masses	(Yaseen et al., 2023)
4	Agriculture damage	(Aqib et al., 2024)
5	Food shortage	(Devi, 2022)
6	Community restoration	(Akbar et al., 2024)
7	Protection difficulties	(Yaseen et al., 2023)
8	Education disruption	(Shah et al., 2022)
9	Mal-nutrition	(Ochani et al., 2022)

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10	Logistics disruption	(Jamshed et al., 2021)
11	Coordination difficulties	(Ochani et al., 2022)
12	Camp management difficulties	(Ochani et al., 2022)
13	Food prices soaring	(Aqib et al., 2024)
14	Exacerbating fears of a new round of high inflation	(Aqib et al., 2024)
15	Submerged lands	(Yaseen et al., 2023)

Methodology

The study follows the qualitative paradigm of research and interpretivism as the research philosophy research approach is inductive by design. Overall design of the study is envisaged on to review of contemporary literature, data collection by field survey, structural modelling, and analysis. The method of modeling is "Interpretive Structural Modelling" and the process of analysis is "Cross Impact Matrix Multiplication Applied to Classification (MICMAC)". The population under study comprises the folks of stakeholders. The study follows a purposive sampling design (i.e. focus group consisting of a panel of experts) and the sample size is nineteen experts. Several multi-criteria decision-making (MCDM) techniques have been utilized by noteworthy studies conforming to various decision criteria (Niazi, et al., 2019; Niazi, Qazi, & Basit, 2019a; Basit, et al., 2023; Niazi, et al., 2019a). Since this study focuses on bridging the gap by identifying the potential humanitarian issues arising out of floods and analyzing their contextual relationships, none of the methodologies seems appropriate except Interpretive Structural Modeling (ISM). The study under focus involves variables having intricate inter-relationships. To develop a comprehensive understanding concerning their direct and indirect relationships and describe them accurately, ISM is perceived to be best suited as a researcher should make use of an appropriate methodology according to the nature and requirements of the study (Gay et al., 2006; Leedy & Ormrod, 2005; Issac & Michael, 1981; Rashid, et al., 2021; Qazi, et al., 2020a; Qazi, Niazi, & Inam, 2019). Since the population under

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Print ISSN: 3006-4651
Online ISSN: 3006-466X

study consists of social beneficiary groups affected by floods, non-social beneficiary groups affected by floods, socially adversely affected groups affected by floods, and non-social adversely affected groups affected by floods, therefore, a panel of experts is constituted from the stakeholders. That includes national governments (i.e. Policy makers, planners, project executors, plethora of departments and ministries like: planning and development department, housing and town planning department, environmental protection agencies, revenue authorities, forest and wildlife departments, water and power development authorities, canals, rivers and lakes management departments etc.), regulators, local government and other employees (Ashraf et al., 2024), industry representatives, landowners, farmers (who have lost their crops), general public (including households, local communities, village committees community workers local labor, disabled people, minorities, senior citizens and women), scientific community and others contributors to system, institutions engaged in disaster management, international donor agencies, academia, politicians & political parties, flood-prone communities, NGOs, volunteers, regional institutions, media, suppliers, of goods & material, civil organizations, private institutions and other affected, interested or vulnerable groups. The sampling design consists of a focus group that best represents the population under study (Niazi, Qazi, & Basit, 2021; Basit, Qazi, & Niazi, 2020a). A panel of experts has been constituted from the population under study according to the predetermined criteria given below in the section titled *Panel of Experts*. The sample size is nineteen experts. The data has been elicited from the minds of the experts using VAXO-based classical type of $n(n-1)/2$ matrix instrument of measurement (Abbass, et al., 2022a; Niazi, et al. 2023a; Niazi, Qazi, & Sandhu, 2019; Basit, et al., 2019; Basit, Qazi, & Niazi, 2020). The data are collected in the office (field) setting of experts. The background of the study is first briefed to them and face to face one on one method of completing the questionnaire is used to be in exact. The field survey is administered by the

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Print ISSN: 3006-4651
Online ISSN: 3006-466X

authors themselves in the field. The data collected from the field is aggregated using some functions of MS Excel sheet. The method of aggregation used is the 'mode' i.e. rule: minority gives way to the majority (Niazi, et al., 2020; Niazi, Qazi, & Basit, 2019b). Interpretive Structural Modelling is used as a technique for structural modeling, whereas, Cross Impact Matrix Multiplication Applied to Classification is used for structural analysis.

Panel of Experts

The data is collected from panel of experts from the field. Panel is constituted when data is either limited or unreliable. An experts' panel is outperforms the statistical data gathered from the masses. An ideal size for the heterogeneous panel is 8-10, whereas, for the homogeneous panel size is 15-25 experts (Clayton, 1997; Jena et al., 2017; Tariq, et al. 2023; Shaukat, et al., 2023; Qazi, et al., 2023; Qazi, et al., 2023a; Qazi, Niazi, & Basit, 2020;). A heterogeneous panel of nineteen experts (Annexure-A, Table-A1) is constituted for the study. (Basit, Khan, & Qazi, 2021; Basit, Qazi, & Khan, 2021). The panel of experts is constituted according to the classical process of inclusion/exclusion of experts on the panel as detailed in Clayton (1997) and Shen et al. (2016). The criteria for taking expert on panel is devised according to the norms of ISM modeling. The for the study are set as: i) minimum experience 10 years, ii) minimum education should be university graduation, iii) potential candidate must show some acumen for research, iv) willing to participate in the research study, v) comes of stakeholders community, vi) comes of the areas generally affected by floods in Pakistan, and vii) clear general understanding of floods (Farid, et al. 2023; Niazi, Qazi, & Basit, 2019). The panel of experts consists of a total of nineteen people i.e. 2 agriculturists, 1 co-coordinator, 2 directors from the government sectors, 1 doctor, 1 engineer, 1 flood affectees, 1 general public, 2 lecturer, 3 managers from business houses, 3 researcher professors, 1 student, and 1 volunteer. Data are elicited from experts on "one-to-one, face-to-face in-depth interview" basis that took more than three

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Print ISSN: 3006-4651
Online ISSN: 3006-466X

months. VAXO symbols are used to take data on paired relations of the issues at ij part of the matrix questionnaire (Annexure B). Respondents were instructed i) to fill white cells leaving grey and the black, ii) lead to = contextual relationship, iii) if you think column influences row, insert A, iv) if you think row influences column, insert V, v) when column and row both influence each other, insert X, vi) when no relation exists between column and row, insert O (Niazi et al., 2020; Niazi, et al., 2020a; Niazi, et al., 2020b).

Modeling, Analysis, Results and Discussion

Modeling

ISM modeling procedure is applied to data collected through a survey and as an initial step the data are aggregated by applying the underlying principle of mode (i.e. one of the popular measures of central tendency) (Shaukat, et al. 2021; Qazi, et al., 2021; Qazi, et al., 2021a; Qazi, Niazi, & Basit, 2021; Niazi, et al. 2023b). As a result, thereof, Structural Self-Interaction Matrix (Table 2) is obtained.

Table 2: Structural Self-Interaction Matrix

Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1		V	A	V	A	V	V	V	V	V	O	V	O	O	X
2			O	V	X	O	A	X	X	O	V	V	X	O	O
3				O	X	V	X	X	O	O	O	X	A	O	X
4					X	A	X	O	X	O	O	O	X	A	V
5						O	O	V	X	O	O	O	V	A	O
6							A	A	O	X	X	O	O	O	V
7								A	O	V	X	X	O	A	O
8									A	O	X	O	O	V	A
9										X	V	O	X	A	O
10											X	X	X	O	O
11												X	O	O	A
12													O	O	A

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Print ISSN: 3006-4651
Online ISSN: 3006-466X

13														V	O
14															O
15															

Table 2 (Structural Self-Interaction Matrix) is transformed into Table 3 (Reachability before incorporating transitive relationships) by applying the rules customarily used in converting VAXO symbols of ISM data into binary codes (i.e. 0, 1).

V: i → j	A: i ← j	X: i ↔ j	O: i ↛ j
1	0	1	0

Table 3: Reachability (Before Incorporating Transitive Relationships)

Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	1	0	1	0	1	1	1	1	1	0	1	0	0	1
2	0	1	0	1	1	0	0	1	1	0	1	1	1	0	0
3	1	0	1	0	1	1	1	1	0	0	0	1	0	0	1
4	0	0	0	1	1	0	1	0	1	0	0	0	1	0	1
5	1	1	1	1	1	0	0	1	1	0	0	0	1	0	0
6	0	0	0	1	0	1	0	0	0	1	1	0	0	0	1
7	0	1	1	1	0	1	1	0	0	1	1	1	0	0	0
8	0	1	1	0	0	1	1	1	0	0	1	0	0	1	0
9	0	1	0	1	1	0	0	1	1	1	1	0	1	0	0
10	0	0	0	0	0	1	0	0	1	1	1	1	1	0	0
11	0	0	0	0	0	1	1	1	0	1	1	1	0	0	0
12	0	0	1	0	0	0	1	0	0	1	1	1	0	0	0
13	0	1	1	1	0	0	0	0	1	1	0	0	1	1	0
14	0	0	0	1	1	0	1	0	1	0	0	0	0	1	0
15	1	0	1	0	0	0	0	1	0	0	1	1	0	0	1

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Print ISSN: 3006-4651
Online ISSN: 3006-466X

Table 3 (Reachability before incorporating transitive relationships) is converted into Table 4 (Reachability after incorporating transitive relationships) by checking and incorporating transitive relationships and replacing 0s with 1*.

Table 4: Reachability (After Incorporating Transitive Relationships)

Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Driving
1	1	1	1*	1	1*	1	1	1	1	1	1*	1	1*	1*	1	15
2	1*	1	1*	1	1	1*	1*	1	1	1*	1	1	1	1*	1*	15
3	1	1*	1	1*	1	1	1	1	1*	1*	1*	1	1*	1*	1	15
4	1*	1*	1*	1	1	1*	1	1*	1	1*	1*	1*	1	1*	1	15
5	1	1	1	1	1	1*	1*	1	1	1*	1*	1*	1	1*	1*	15
6	1*	0	1*	1	1*	1	1*	1*	1*	1	1	1*	1*	0	1	13
7	1*	1	1	1	1*	1	1	1*	1*	1	1	1	1*	0	1*	14
8	1*	1	1	1*	1*	1	1	1	1*	1*	1	1*	1*	1	1*	15
9	1*	1	1*	1*	1	1*	1*	1	1	1	1	1*	1	1*	1*	15
10	0	1*	1*	1*	1*	1	1*	1*	1	1	1	1	1	1*	1*	14
11	0	1*	1*	1*	0	1	1	1	1*	1	1	1	1*	1*	1*	13
12	1*	1*	1	1*	1*	1*	1	1*	1*	1	1	1	1*	0	1*	14
13	1*	1	1	1	1*	1*	1*	1*	1	1	1*	1*	1	1	1*	15
14	1*	1*	1*	1	1	1*	1	1*	1	1*	1*	1*	1*	1	0	14
15	1	1*	1	1*	1*	1*	1*	1	1*	1*	1	1	0	1*	1	14
Dependence	13	14	15	15	14	15	15	15	15	15	15	15	14	12	14	

Table 4 (Reachability after Incorporating Transitive Relationships) is partitioned by iteratively applying the level partitioning method that employ elementary concepts of intersection from set theory. That generated Tables 5 & 6 below.

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Print ISSN: 3006-4651
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Table 5: Partitioning Iteration-1

Code	Reachability	Antecedence	Intersections	Level
1	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,12,13, 14,15	1,2,3,4,5,6,7,8,9,12,13, 14,15	
2	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,7,8,9,10,11,1 2,13,14,15	1,2,3,4,5,7,8,9,10,11,1 2,13,14,15	
3	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	*I*
4	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	*I*
5	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,12, 13,14,15	1,2,3,4,5,6,7,8,9,10,12, 13,14,15	*I*
6	1,3,4,5,6,7,8,9,10,11,1 2,13,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,3,4,5,6,7,8,9,10,11,1 2,13,15	*I*
7	1,2,3,4,5,6,7,8,9,10,11, 12,13,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,15	*I*
8	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	*I*
9	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	*I*
10	2,3,4,5,6,7,8,9,10,11,1 2,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	2,3,4,5,6,7,8,9,10,11,1 2,13,14,15	*I*
11	2,3,5,6,7,8,9,10,11,12, 13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	2,3,5,6,7,8,9,10,11,12, 13,14,15	*I*
12	1,2,3,4,5,6,7,8,9,10,11, 12,13,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,15	*I*
13	1,2,3,4,5,6,7,8,9,10,11,	1,2,3,4,5,6,7,8,9,10,11,	1,2,3,4,5,6,7,8,9,10,11,	

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	12,13,14,15	12,13,14	12,13,14
14	1,2,3,4,5,6,7,8,9,10,11, 12,13,14	1,2,3,4,7,8,9,10,12,13, 14,15	1,2,3,4,5,7,8,9,10,12,13,14,15
15	1,2,3,4,5,6,7,8,9,10,11, 12,14,15	1,2,3,4,5,6,7,8,9,10,11, 12,13,14	1,2,3,4,5,6,7,8,9,10,11, 12,13,14

Table 6: Partitioning Iteration-2

Code	Reachability	Antecedence	Intersections	Level
1	1,2 ,13,14,15	1,2,3,4,5,6,7,8,9,12,13,14,15	1,2,13.14.15	*II*
2	1,2, 13,14,15	1,2,3,4,5,7,8,9,10,11,12,13,14,15	1,2,13.14.15	*II*
13	1,2 ,13,14,15	1,2,3,4,5,6,7,8,9,10,11,12,13,14	1,2,13.14.15	*II*
14	1,2,13,14	1,2,3,4,7,8,9,10,12,13,14,15	1,2,13.14	*II*
15	1,2,14,15	1,2,3,4,5,6,7,8,9,10,11,12,13,14	1,2,14.15	*II*

On the basis of the determination of levels of factors through partitioning of the transitive reachability matrix Table 4 (Reachability after Incorporating Transitive Relationships) has been rearranged into a conical matrix and digraph. Since both these steps i.e. conical and digraph are considered optional for reporting, they are dispensed with for brevity (Sushil, 2017; Warfield, 1973; Warfield, 1974). From the digraph and ISM model (Figure 1) is generated.

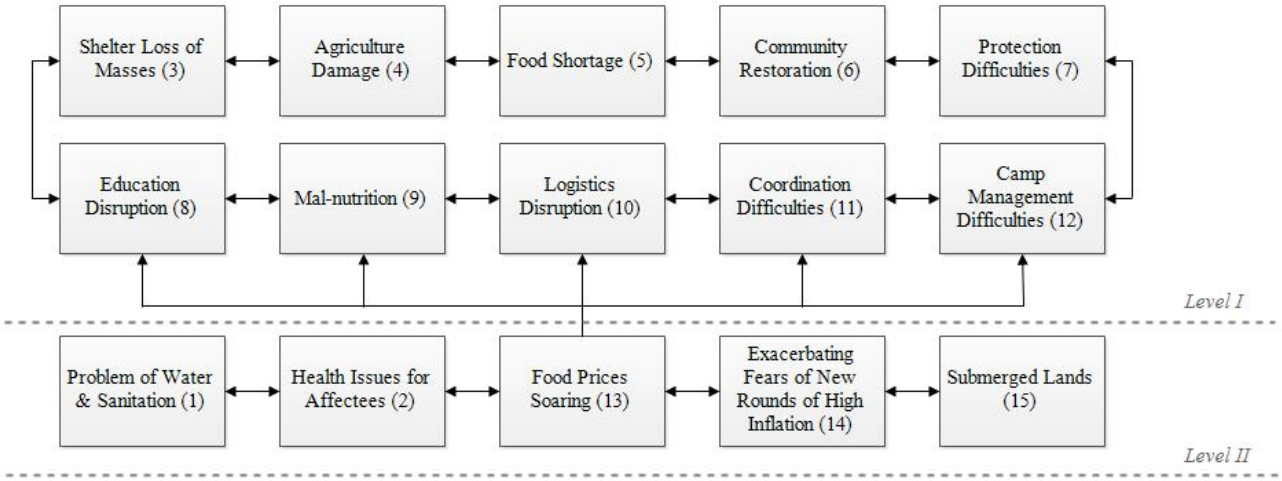

Figure 1: ISM Model

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From Figure 1 it can be learned that issues coded as (3), (4), (5), (6), (7), (8), (9), (10), (11) and (12) occupy *Level-I*. Issues coded as (1), (2), (13), (14), and (15) occupy *Level-II.*

Analysis

The MICMAC analysis of the data is performed according to the procedure devised vide in Godet (1986). The classification is made both on scale-centric and data-centric bases.

Scale-centric MCMAC Analysis

The following is the representation of scale-centric MICMAC analysis (Figure 2):

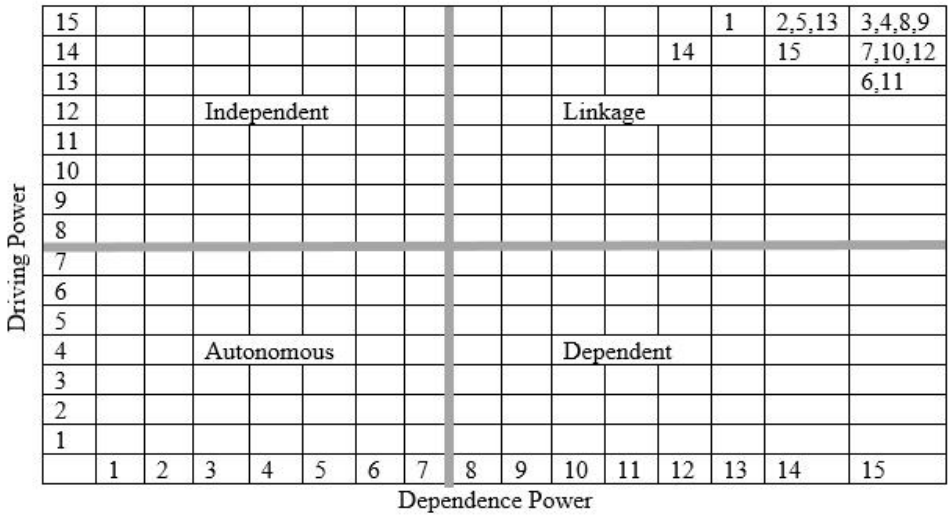

Figure 2: MICMAC (Scale Centric)

The scale-centric driving-dependence diagram shows that all the issues i.e. coded as (1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14) and (15) are categorized in the linkage quadrant (Kim, Krasilnikova, Choi, & Yeo, 2023), whereas, no issue falls in the independent, dependent and autonomous cluster.

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Data-Centric MICMAC Analysis

The following is the representation of data-centric MICMAC analysis (Figure 3):

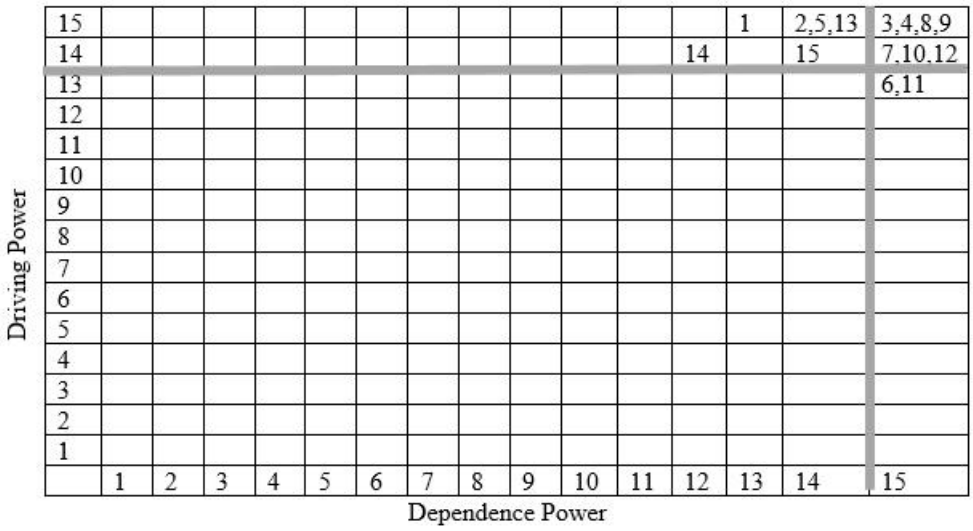

Figure 3: MICMAC (Data-Centric)

The data-centric driving-dependence diagram shows that issues coded as (3), (4), (7), (8), (9), (10), and (12) fall in the linkage quadrant, issues coded as (1), (2), (5), (13), (14) and (15) are categorized in the independent quadrant and issues coded as (6) and (11) falls in the dependent quadrant, whereas, no issue is categorized in the autonomous quadrant.

Results

The study aims to explore and explain the humanitarian issues arising out of floods and build an interpretive relationship-based structural model. A hierarchal model and driving-dependence diagram come to the fore resultantly. By gathering a series of articles, research reports, statistical bulletins, yearbooks, official documents, and authoritative websites the discourse of literature concluded that there are a total of fifteen humanitarian issues arising out of floods in Pakistan i.e. problem of water and sanitation (1), health issue for affectees (2), shelter loss of masses (3), agriculture damage (4), food shortage (5), community restoration (6), protection difficulties (7), education disruption (8), mal-nutrition (9), logistics disruption (10), coordination difficulties (11), camp management difficulties (12),

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food prices soaring (13), exacerbating fears of a new round of high inflation (14), submerged lands (15). Results of ISM modeling show that issues namely: shelter loss of masses (3), agriculture damage (4), food shortage (5), community restoration (6), protection difficulties (7), education disruption (8), mal-nutrition (9), logistics disruption (10), coordination difficulties (11) and camp management difficulties (12) occupy *Level-I.* Issues namely: the problem of water and sanitation (1), health issues for affectees (2), food prices soaring (13), exacerbating fears of a new round of high inflation (14), and submerged lands (15) occupy *Level-II.* It is worth mentioning that factors contained in *Level I* are the least important and those held at *level-II* are the most important. Results of data-centric MICMAC analysis show that problems of water and sanitation (1), health issue for affectees (2), food shortage (5), exacerbating fears of new round of high inflation (14) and submerged lands (15) fall in independent cluster, community restoration (6) and coordination difficulties (11) fall in dependent cluster and shelter loss of masses (3), agriculture damage (4), protection difficulties (7), education disruption (8), mal-nutrition (9), logistics disruption (10), camp management difficulties (12) fall in linkage cluster. Whereas, there is no factor in autonomous cluster both in scale-centric and data-centric analysis. The abridged results of the study are presented below in juxtaposed form (Table 7).

Table 7: Juxtaposed results of literature, MICMAC, and ISM

Results of Literature Review		Results of MICMAC Analysis					Results of ISM	Comment
Code	Determinants	Driving	Dependence	Effectiveness	Cluster		Level	
					Scale-Centr	Data-Centric		

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					ic			
1	The problem of water and sanitation	15	13	2	Linkage	Independent	Level-II	Key Factor
2	Health issues for affectees	15	14	1	Linkage	Independent	Level-II	Key Factor
3	Shelter loss of masses	15	15	0	Linkage	Linkage	Level-I	
4	Agriculture damage	15	15	0	Linkage	Linkage	Level-I	
5	Food shortage	15	14	1	Linkage	Independent	Level-I	Key Factor
6	Community restoration	13	15	-2	Linkage	Dependent	Level-I	
7	Protection difficulties	14	15	-1	Linkage	Linkage	Level-I	
8	Education disruptio	15	15	0	Linkage	Linkage	Level-I	

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	n							
9	Mal-nutrition	15	15	0	Linkage	Linkage	Level-I	
10	Logistics disruption	14	15	-1	Linkage	Linkage	Level-I	
11	Coordination difficulties	13	15	-2	Linkage	Dependent	Level-I	
12	Camp management difficulties	14	15	-1	Linkage	Linkage	Level-I	
13	Food prices soaring	15	14	1	Linkage	Independent	Level-II	Key Factor
14	Exacerbating fears of new round of high inflation	14	12	2	Linkage	Independent	Level-II	Key Factor
15	Submerged lands	14	14	0	Linkage	Independent	Level-II	Key Factor

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The summarized results are presented in Table 7. Issues coded as 1, 2, 5, 13, 14, and 15 i.e. problems of water and sanitation, health issues for affectees, food shortage, food prices soaring, exacerbating fears of new round of high inflation and submerged lands respectively are identified as key factors. These are independent and can potentially affect other factors.

Discussion

The study aims to investigate the inter-relationships among humanitarian issues arising from floods in Pakistan. The more specific objectives are given in the introduction section of the study, i) to ascertain an array of humanitarian issues arising out of floods in Pakistan, ii) to investigate the inter-relationships among these issues, iii) to build a theoretical structural model of the relationships of these issues, iv) to classify them into the order of dependence and v) to formulate the policy guidelines for affectees. The study uses literature discourse, structural modeling, and analysis based on primary data collected from a panel of experts. Having applied the methods of investigation and results in hand it is critical to discuss the same qua realities. The discussion is presented in the following sections.

Discussion on the Results of the Study

From the literature discourse study finds a total of 15 issues pertaining to the phenomena under study (Table 1). The key issues have been extracted from limited literature that may be biased and some issues might have been inadvertently been overlooked, and might merit rather further exploration by using other techniques. In the ISM model, the most influential issues lie at the bottom level, whereas the least influential issues occupy the top level. A two-level ISM model is obtained from the data. *Level-I* is occupied by shelter loss of masses (3), agriculture damage (4), food shortage (5), community restoration (6), protection difficulties (7), education disruption (8), mal-nutrition (9), logistics disruption (10), coordination difficulties (11) and camp management difficulties (12). The issues falling at *Level-I* are influenced ones as they possess high

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dependence power and are affected by those residing at *level-II*. They might indirectly influence the system. Issues namely: the problem of water and sanitation (1), health issue for affectees (2), food prices soaring (13), exacerbating fears of a new round of high inflation (14) and submerged lands (15) occupy *Level-II.* Immediate steps need to be taken to address these issues as they possess high driving power and are able to affect the system directly. The problem of water and sanitation can lead to further severe issues including water borne diseases and can strain the entire health care system. The increasing food prices can lead to food insecurity, especially the low-income families might encounter to afford basic necessities leading towards malnutrition, disruption of educational system, social unrest.

Additionally, relief efforts can be strained by the submerged lands creating hindrances in recovery. ISM also reveals that apart from hierarchies, all the issues have two-way at-level relations. The MICMAC analysis put forth a scale-centric and data-centric driving-dependence diagram demonstrating relationship and importance of issues relative to each other. Results of data-centric MICMAC analysis show that problems of water and sanitation (1), health issue for affectees (2), food shortage (5), exacerbating fears of new round of high inflation (14) and submerged lands (15) fall in independent cluster, community restoration (6) and coordination difficulties (11) fall in dependent cluster and shelter loss of masses (3), agriculture damage (4), protection difficulties (7), education disruption (8), mal-nutrition (9), logistics disruption (10), camp management difficulties (12) fall in linkage cluster. Whereas, there is no factor in autonomous cluster both in scale-centric and data-centric analysis. It is pertinent to highlight the properties of the quadrants of the MICMAC diagram. Matriced' Impacts Croise's Multiplication Appliquée a UN Classement (Cross Impact Matrix Multiplication Applied to Classification) popularly known as MIMAC in literature is a technique of structural analysis introduced by Godet (1986). It simply classifies the multitude of

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factors of the conundrum issue into four quadrants to oversimplify the problem. Like the Cartesian plane, it suggests four quadrants namely independent, autonomous, dependent, and linkage. This classification can follow data-centric or scale-centric approaches. The factors that have high driving power but low dependence power are classified in *independent* quadrant. The factors that have low driving power and also low dependence power are classified in the *autonomous* quadrant. The autonomous factors are separated from the model, have few but powerful links, and don't have much impact on the system. The non-existence of any factor autonomous quadrant by classification of MICMAC means all factors play an important role, therefore the practitioners should pay attention to all factors. The factors that have high dependence power but low driving power are classified in the *dependent* quadrant. The dependent factors are driven by other factors. The factors that have high driving power and also high dependence power are classified in the *linkage* quadrant. The factors that fall in the linkage quadrant are agile, unbalanced, unsettled, and indicative that the system is in its infancy, and is struggling to make some sense. Any action on them affects others and has a feedback effect on themselves as well. In the light of the contextual discussion represented above about MICMAC analysis, the results of MICMAC can be better understood.

Discussion on Contrasting the Study with Contemporary Literature

This research study can be compared to contemporary literature. The current study is contrasted with some studies from existing literature (Table 8). This study is different as it is conducted with twenty-two variables (supply chain issues). A different data collection and data analysis method is brought into use. Additionally, it has contributed differently in practical and theoretical domains.

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Table 8: Contrasting Results of the Study with Some Studies from Existing Literature

Study	Focus	Country	Variables	Methodology	Results
In hand	Humanitarian issues arising out of floods	Pakistan	15	ISM	Problems of water and sanitation, health issues for those affected, food shortage, food prices soaring, exacerbating fears of a new round of high inflation, and submerged lands respectively are identified as key factors
Shah et al. (2022)	School children's vulnerability during floods	Pakistan	17	Univariate, bivariate, and multivariate methods	Damage to homes, emotional distress, poor diet, parental loss, Children displacement, delayed

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					enrolment, multiple relocations, and family instability are the main factors
Philip and Vithya (2023)	Impact of flooding on adolescents in Kerala, India	India	5	Convergent mixed method design	Flood-affected adolescents score higher in metrics like the impact of events, depression, anxiety, and stress
Liu et al. (2023)	Linkage of natural flood disasters with infectious diseases	Worldwide study	5	quasi-Poisson GLM	New cases of acute hepatitis A, acute hepatitis E, dengue, malaria, measles, meningitis, typhoid and paratyphoid, tuberculosis, and upper respiratory infections significantly correlated with the longer

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					duration of floods
Gambo et al. (2024)	Discovering multi-dimensional poverty determinants	Nigeria	6	MCDM (AHP)	Areas at most risk from flooding in Jigawa, are also most partially affected by multidimensional poverty.

The current study is unique based on the context and variables under investigation. Different data collection and analysis methods are utilized, therefore the results of the study are unique and different from rivals. Shah et al. (2022) surveyed the school children's vulnerability in flood-affected rural areas of Pakistan and it concluded that as compared to other districts the school children in Nowshera are more susceptible to disasters than other districts. It also reveals that damage to homes and emotional distress are important predictors of psychological vulnerability, whereas proximity to disaster-prone areas, parental loss, and poor diet contribute significantly to physical vulnerability. Philip and Vithya (2023) studied the impacts of flooding on adolescents in Kerala, India by utilizing a convergent mixed-method design. It found that flood-affected adolescents score higher in metrics like the impact of events, depression, anxiety, and stress. Liu et al. (2023) studied by using quasi-Poisson GLM linkage of natural flood disasters with infectious diseases worldwide. It reveals that new cases of acute hepatitis A, acute hepatitis E, dengue, malaria, measles, meningitis, typhoid and paratyphoid, tuberculosis, and upper respiratory infections significantly correlated with the longer duration of floods are erupted due to the floods. Gambo et al. (2024), while conducting a study in Nigeria, disclosed that, the areas at most

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risk from flooding in Jigawa, are also partially affected by multidimensional poverty.

Discussion on Theoretical and Practical Implications of the Study

The study has insightful theoretical implications for researchers, scientists, and practitioners because it has contributed to theoretical models and the body of knowledge by way of providing important information on the issues, relationships of the issues, order of precedence, and dependencies that will ultimately help to the researchers to design future studies more clearly. The study also has profound practical implications because it has devised a detailed structure in order of importance in which the issues have to be dealt with, prepared a model to help to improve and understand the processes clearly, provided the basis for improvement of processes from the social point of view, and provided a more realistic framework to stakeholders. The study admits wide range of the phenomenon that includes national governments (i.e. policy makers, planners, project executors, plethora of departments and ministries like: planning and development department, housing and town planning department, environmental protection agencies, revenue authorities, forest and wildlife departments, water and power development authorities, canals, rivers and lakes management departments etc.), regulators, local government and other employees, industry representatives, landowners, farmers (who have lost their crops), general public (including households, local communities, village committees community workers local labor, disabled people, minorities, senior citizens and women), scientific community and others contributors to system, institutions engaged in disaster management, international donor agencies, academia, politicians & political parties, flood-prone communities, NGOs, volunteers, regional institutions, media, suppliers of goods & material, civil organizations, private institutions and other affected, interested or vulnerable groups. These stakeholders can further be classified into social beneficiary group, non-social beneficiary group, social adversely affected group

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and non-social adversely affected group. Findings of the study are helpful for: i) politicians & political parties, ii) flood-prone communities, iii) NGOs, iv) institutions engaged in disaster management, v) volunteers, vi) regional institutions, vii) civil organizations and viii) private institutions for understanding issues on the ground. The study has also practical implications for: i) suppliers of goods & materials, ii) industry representatives, iii) landowners, iv) the general public (including households, local communities, village committees community workers local labor (Ahmad et al., 2024), disabled people, minorities, senior citizens and women) and v) Other affected, interested or vulnerable groups, to be insightful of the situations, preventive and careful. The study has profound theoretical and practical implications for academia because it provides an understanding for developing a research framework for future research. It is also insightful for the scientific community and others contributors to system as it builds deeper understanding for providing some solutions to issues current problem of floods.

It is insightful for international donor agencies to understand issues on the ground to help the affectees. It also gives a lead to farmers who have lost their crops) by way of understanding to be preventive, careful, cooperative, and prepared to take even advantage by exploring the positive side of the floods (i.e. like reinstatement of land fertility, etc.). It is helpful to the media for comprehending the issues arising out of floods. The findings are also equally valuable for: i) national governments (i.e. policymakers, planners, project executors, a plethora of departments and ministries like planning and development department, housing and town planning department, environmental protection agencies, revenue authorities, forest and wildlife departments, water and power development authorities, canals, rivers and lakes management departments, etc.) ii) regulators and iii) local government and other employees in

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form of developing an understanding to adjust/readjust, formulate and implementing policies.

Discussion on Limitations and Recommendations for Future Research to Overcome Limitations of the Study

There are six different points to be discussed in this section. Firstly, the research is conducted in the context of Pakistan since there are varying cultural, social, technological, and political systems therefore generalization of results is limited accordingly. The research may be replicated in different contexts i.e. in countries and or sectors to enhance the frontiers of theoretical contribution. Secondly, since limited data and a simplified analysis is made therefore it is recommended for future researches to use TISM, Fuzzy ISM/TISM, or Modified-TISM, etc. that has rather greater interpretability. Thirdly, ISM method only identifies but does not quantify the relationships therefore future research should use techniques that have the capability of quantifying the relationships e. g. SEM, PCA, AHP, ANP, TOPSIS, GRA, or some other weighing methods. Fourthly, the key issues have been extracted from limited literature and hence may be biased and some issues might have been inadvertently overlooked, therefore, the issues may be explored by using other techniques like PCA or a rather thorough literature review in future studies. Fifthly, the model is not statistically tested and validated, therefore, future research may statistically validate the model using other statistical techniques like SEM (co-variance-based or PLS based) that will enhance the utility of the model. Sixthly, the panel of experts comprises of few representatives of stakeholders, therefore, the insights inferred are accordingly limited. Extensive research may be conducted by taking inputs from other/more stakeholders.

Discussion on Contribution of the Study

This study contributes to existing theories in the form of a deep understanding of the phenomenon. A scientifically developed simplified ISM-based model, scale-centric and data-centric driving-dependence classification diagrams, and plenty of

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supplementary information on causal relationships among issues is a significant contribution to the literature. That divulges a deeper understanding to researchers by way of the hierarchical structure of the issues contributing to the phenomena under study. It also advances potential frameworks to guide academics and practitioners in the future.

Conclusion

Floods are high-impact natural phenomena that have, both positive and negative effects on lives, properties, businesses, livestock, crops, natural resources, infrastructure, wildlife, forests, and so on. Hardly any community, group, or thing is left unaffected by floods. Therefore, it has got a high degree of importance on the research agenda. The topic understudy 'humanitarian issues arising out of floods in Pakistan" is very important by its very nature. The study aims to investigate the inter-relationships among humanitarian issues arising from floods in Pakistan. The study employed a qualitative design. The overall design consists of a literature review, data collection, and analysis. The methods include literature discourse, ISM modeling and MICMAC analysis. Results of the literature discourse show that there are a total of fifteen humanitarian issues arising out of floods in Pakistan (Table 1). Results of ISM modeling show that *Level-I* is occupied by the issues coded as 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12. The issues falling at *Level-I* have influenced ones as they possess high dependence power and are affected by those residing at *Level-II*, whereas, *Level-II* is occupied by the issues coded as 1, 2, 13, 14, and 15. The issues occupying *Level-II* are critical, important, and key issues. MICMAC puts forth, both, data-centric and scale-centric analysis. The data-centric driving-dependence diagram corroborates the relationship as determined in the ISM model. Results of scale-centric MICMAC show that all issues fall in the linkage quadrant and none of the issues fall in the autonomous, dependent, and independent quadrant. Results of data-centric MCMAC analysis show that issues coded as 3, 4, 7, 8, 9, 10, and 12 fall in the linkage quadrant, issues coded as 1, 2, 5,

13, 14, and 15 are categorized in the independent quadrant and issues coded as 6 and 11 falls in the dependent quadrant, whereas, no issue is categorized in the autonomous quadrant. One can reach an interesting conclusion from forth going results of the study, that since there is no issue in the autonomous quadrant, therefore, all the issues can be important and relevant to the phenomena. At the same time, all issues (according to scale-centric analysis) and the majority of the issues (according to data-centric analysis) fall in the linkage quadrant, therefore, the situation is a conundrum, complex, and unsettled. It deserves a high degree of attention from all stakeholders in general and policymakers in particular. It also deserves a high place on the agenda of research.

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Annexure A: Profile of the Panel of Experts

Sr. No.	Designation	Organization	Education	Experience
1	Civil Engineer	G4S Digital Solutions	Post-Graduation	10 years
2	Admin Manager	United Christian Hospital	Post-Graduation	10 years
3	Quality Assurance Manager	Pakistan State Oil	Graduation	10 years
4	Student	A Leading private-sector university	PhD. Scholar	12 years
5	Lecturer	Private Sector Degree Awarding Institute of science and technology	PhD. Scholar	10 years
6	Agriculturist	Entrepreneur	Graduation	16 years
7	Agriculturist	Entrepreneur	Graduation	16 years
8	General Public	Household	Graduation	20 years
9	Deputy Director (Quality Enhancement)	A Public Sector University, Lahore	Graduation	15 years
10	Lecturer	University of Lahore	Post-Graduation	10 years
11	Manager	One of the renowned autonomous bodies in Lahore	Post-Graduation	16 years
12	Manager Supply Chain	One of the leading groups of industries in Pakistan	Post-Graduation	12 years

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13	Doctor	Registrar in Large Public Sector Hospital	Post-Graduation	11 years
14	Professor (researcher)	A large public-sector university in Pakistan	Ph. D.	18 year
14	Professor (researcher)	A large private-sector university in Pakistan	Ph. D.	20 year
15	Director Irrigation	Department of Irrigation Government of Punjab	Post-Graduation	18 years
16	Co-coordinator	A leading NGO	Post-Graduation	15 years
17	Principal	A public sector school	Post-Graduation	20 years
18	Flood Affectee	Farmer	Graduation	10 years
19	Volunteer for rescuing the affectees	Political worker	Post-Graduation	15 years

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Annexure B: Instrument of Measurement

Approximately 30 minutes required to fill

Questionnaire

Investigating the Inter-relationships among Humanitarian Issues Arising Out of Floods in Pakistan: Applying the Interpretive Structural Modelling Approach with MICMAC Analysis

- We are the faculty members of large renowned public sector universities, conducting a research study for *"Analyzing the Inter-relationships among Humanitarian Issues Arising out of Floods"*.
- You are selected as an expert therefore your input is needed in this behalf by way of this survey.
- Your input will be a great contribution in our research work and a service to mankind.
- Data collected through this questionnaire will be used for research purposes only in combined statistical statements.

Section 1: Personal Information (Optional)

Name: ----------

Designation: ----------

Organization: ----------

Address: ----------

Phone: ----------

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Demographics: (Please tick the relevant box or color the box)

Gender	Male ☐ Female ☐	Marital Status	Married ☐ Single ☐	
Age Group	21-30 ☐ 31-40 ☐ 41-50 ☐ Above 50 ☐	Qualification	Less than 14 years ☐ 14years ☐ Above 16 years ☐ 16years ☐	
Income (in thousands)	< 40 ☐ 40-80 ☐ 81-100 ☐ 101-200 ☐ 201-300 ☐ Above 300 ☐	Experience	Up to 5 years ☐ 5-10 years ☐ 10-15 years ☐ above 15 ☐	

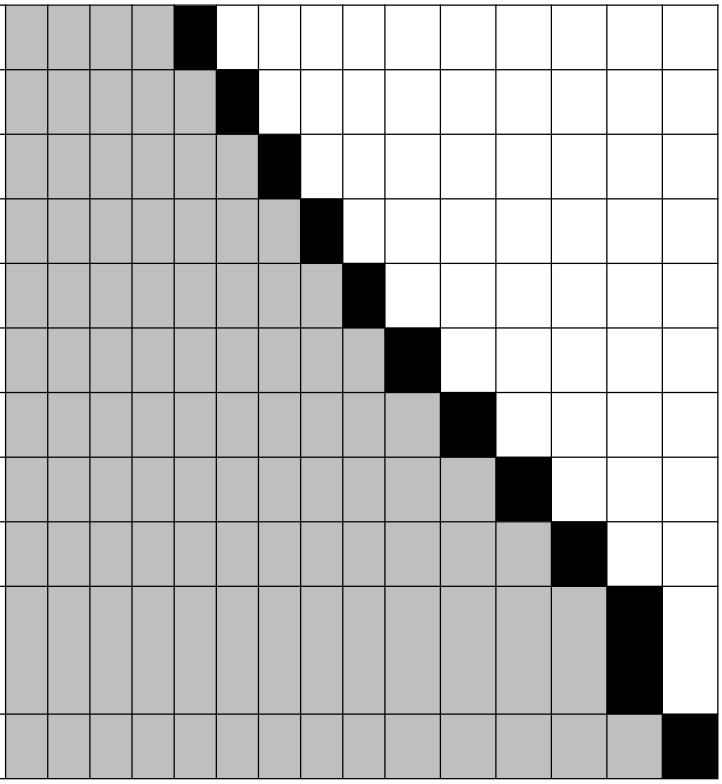
Section 2: Research Questionnaire

1. Fill only white cells.
2. Contextual relationship "severer than"
3. What to enter in the white cells?

- Enter V when (you think) the row is more severe than the column.
- Enter A when (you think) column is the severe than the row.
- Enter O when (you think) the row and the column are not comparable and have no relation.
- Enter X when (you think) row and column are equally severe.

Code	Issues Arising out of Floods	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Problem of water and sanitation															
2	Health issue for affectees															
3	Shelter loss of masses															
4	Agriculture damage															

Journal of Social Signs Review
Print ISSN: 3006-4651
Online ISSN: 3006-466X

5	Food shortage	
6	Community restoration	
7	Protection difficulties	
8	Education disruption	
9	Mal-nutrition	
10	Logistics disruption	
11	Coordination difficulties	
12	Camp management difficulties	
13	Food prices soaring	
14	Exacerbating fears of new round of high inflation	
15	Submerged lands	