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Thesis title: The role of Interorganizational Relationships in the level of effectiveness of Flood Risk Mitigation. *A case study of floods in Sindh, Pakistan*

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## Summary

Flood risk is considered as a complex and transboundary problem, one that is predicted to intensify due to climate change and hence necessitates it to be governed by a well-coordinated collaborative network of actors. Because it is an accelerating threat, municipal organizations have an imperative and challenging role in their policy practices and governance. In governance networks, micro-level interactions between actors constituting organizations and formulating networks embodies a lot of complexity and uncertainty. Although policy frameworks of Flood Risk Mitigation require for multi-sectoral and collaborative governing mechanisms, there is a recurring pattern of integration between actors implementing policies for planning, water and sewage and considerable disconnection between them and actors executing risk policies. This disconnection fragments the legal frameworks from the networks implementing it, which effects the level of efficiency of flood risk mitigation in municipal administrations.

The purpose of this qualitative research is to contribute to the current understanding of centralized and traditional hierarchical multi-actor governance structures by analysing what role Interorganizational relationships (IRS) in policy networks have in effectiveness of Flood Risk Mitigation (FRM), thus using Sindh, Pakistan as a case study, that is most vulnerable to floods. For the purpose of this research, data of a singular urban area was not collected, rather the province of Sindh as a whole was taken into account, as the phenomenon under study is relevant to many urban areas.

This qualitative research adopts a single case study strategy framed by primary and secondary data. For collecting primary data, fourteen semi-structured interviews were carried out in total, ten with high level government officers that formulate and implement policy processes in the field of FRM in Pakistan. Four experts were also interviewed who have exceptional knowledge of FRM and disaster management projects. The secondary data was gathered from official documents and official websites regarding the case study to triangulate findings. IRS are defined by environment of the actors that formulate the network, the resource dependencies and power structure, the processes followed to retain resource flow, decisions taken within relevant context for dependencies and exchange, the institutional provisions erected, perception patterns of actors that ensure clarity of values, and information sharing procedures in the network.

The analysis of the case study research by conducting an actor and network analysis on the FRM network has identified rich deep qualitative insights and strong linkage between IRS and effectiveness of FRM. The findings suggest a gateway to the lapses and gaps in flood risk mitigation and management and holds promising propositions for future policy makers in similar governance structures to consider network process of policy making and hence integrate knowledge and innovation on urban and human development levels.

## Keywords

Interorganizational relationships, Flood risk mitigation, inter-actor governance, process approach, policy networks

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## Abbreviations

CCI	Council of Common Interest
CDWPR	Civic Development Working Party
DDMA	District Disaster Management Authority
DDWP	Departmental Development Working Party
FFC	Federal Flood Commission
FFD	Flood Forecasting Division
FPSP	Flood Protection Sector Project
FRM	Institute for Housing and Urban Development Studies
FRM	Flood Risk Mitigation
FWC	Flood Warning Centre
GOP	Government of Pakistan
IRs	Interorganizational Relationships
IRSA	Indus River System Authority
MOCC	Ministry of Climate Change
MOD	Ministry of Defence
MOWR	Ministry of Water Resources
NDMA	National Disaster Management Authority
NESPAK	National Engineering Services Pakistan
NFPPP	National Flood Protection Plan Pakistan
NHA	National Highway Authority
PA	Pakistan Army
PC	Planning Commission
PCIW	Pakistan Commission for Inter Water
PCRWR	Pakistan Council of Research and Water Resources
PDMA	Provincial Disaster Management Authority
PID	Provincial Irrigation Department
PMD	Pakistan Meteorological Department
PSDP	Public sector development program
UPC	Umbrella Planning Commission
WAPDA	Water and Power Development Authority
WASA	Water and Sanitation Authority

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# Chapter 1: Introduction

## 1.1 Background information

Cities, in theory and practice, are now seen as systems with a disequilibrium in their development having chaotic, catastrophic, bifurcated dynamics (Batty, 2012). In past decades natural and built environments have become increasingly more vulnerable to climate change and to different types of crisis and disasters, with numerous resources of land, water and air being altered in terms of hydrological and ecosystems. (Allam, et al., 2020). These alterations and resultant anthropogenic climate change, are accelerating the global environmental challenges, pushing the realms of planetary boundaries of natural earth systems (Braat & Groot, 2012) (Baggethun & Barton, 2013) (Lamprecht, 2016). The constantly changing urban environments are therefore increasingly vulnerable to challenges related to these factors and their ability to adapt to shocks and uncertainties, such as climate change and natural disasters, is consequently threatened (Georgescu, et al., 2015).

This research is based on extreme climatic events of floods, which induce major challenges for water governance in the province of Sindh, Pakistan. These floods have caused irreplaceable loss to human lives, economy, and environment (UN-Habitat, 2012), and a cumulative financial loss of approximately 30 billion USD (FFC, 2015). Pakistan has been hit by 19 extreme floods since its independence in 1947, with the most recent super flood in 2010 claiming the lives of over 2000 people, affecting 20 million people. Floods in the Indus plain of the Sindh province are the cause of major destruction (FFC, 2015) Furthermore, Pakistan's projected temperature rise and increased uncertainty and variability in precipitation, glacial melt, and river flows will impact the wetlands, floodplains, ecosystems, and their services (ADB, 2017). The country's climate vulnerabilities are increasing exponentially and is globally ranked as the 8<sup>th</sup> most vulnerable country in the Long-term Climate Risk Index (Annex 1 Fig 29, Germanwatch, 2019). It is imperative to view the emergence of coastal, riverine, and flash floods in the context of the province of Sindh from a complexity perspective (Allam, et al., 2020), as this urban problem is directly linked with the declining levels of sustainability and resilience. There are several major drivers and contributors along with their complex interactions on planning and environmental factors that operate as interconnected and co-evolving entities and hence affect the actions taken for FRM (Zevenbergen, et al., 2008).

In the past years, numerous international organizations have provided not just aid to the flood-affected victims of Pakistan but also helped the country develop strategies for FRM. Moreover, multiple organizations at the local and national level are tackling with climate change to decrease risk towards floods. On a national level, the Government of Pakistan (GOP) along with the Ministry of Water Resources (MOWR), as a designated authority, formulated FRM projects as the National Flood Protection Plans (NFPPs). So far 3 NFPP's have been implemented with the most recent one, NFPP-IV, currently in the stage of implementation for the period of 2015-2025. Further information on FRM frameworks and details of the case study are included in Chapter 4.

## 1.2 Problem Statement

For the purpose of flood risk mitigation, the GOP has created numerous policies, involved state and non-state actors, erected disaster mitigation frameworks and liaised with international bodies (Akhtar & Dhanani, 2012) (FFC, 2015) (GCF, 2019), because of which networks have become fairly prominent. However, most of the control still lies with the federal government because of which the governing structures and hierarchies limit the patterns of interactions and effectiveness of FRM. The integrated networks resist governmental steering and mould their environments (Kickert, et al., 1997). Keeping in view the technical shortcomings from past catastrophic flood events, the previous lessons learnt in the years have identified numerous hinderances where accountability deficit and inadequate coordination between actors is seen as an imperative *gap* in the application of NFPP and relevant policies of Pakistan and many experts have highlighted the need to research and address this gap (UN-Habitat, 2012) (FFC, 2015) (GCF, 2019).

*Flood Risk Mitigation* (FRM) is a part of Flood Risk Management where the former is understood as the decisions, actions and strategies framed to analyse, assess, and reduce flood risks (Schanze, et al., 2004). FRM is a proactive approach that aims to reduce the likelihood or consequences of a hazard risk prior to the occurrence of a disaster (Coppola, 2011). The complex and transboundary nature of floods require to be governed by a collaborative network of multiple actors within organizations (Folke, et al., 2005). When it comes to public policies and response to flood disasters the demand for actions taken by actors in disaster management has become substantially complex due to the numerous relationships involved. Bachmann & van Witteloostuijn (2006) view *Interorganizational relationships* (IRs) as relationships that exist between and among organizations that take the shape of formal arrangements, bringing together resources of two or more organizations with the aim of producing joint value-added

resources (Bachmann & Witteloostuijn, 2006). A prominent type of IRs which is the *network approach* considers networks consisting of various actors (individuals, coalitions, bureau, organizations) as the main arteries where public policy making, and governance takes place.

This research also takes into account the perspective of IRs in inter-actor governance and flood risk management, as a two-fold angle of ‘unknown unknowns’, one were dealing with risk means combatting with uncertainty, though there is literature and arguments about the intricacies of turning immeasurable uncertainties into manageable risks (Kominis, et al., 2021), and then the complexity of interactions in IRs that are involved in governance from numerous aspects that affect it. As FRM demands for more integrated approaches of governance, and the construct of development of networks within inter-actor governance infrastructures emerge organically, these ‘unknown unknowns’ in IRs demand to be more present within the discussion of scientific communities to understand their implications. However, there is limited literature available hence a *gap* in the knowledge of these ‘unknown unknowns’ in IRs, which this research will address as well.

A lot of theoretical and empirical researches have pointed towards the need for a constructive paradigm shift to understand the problem of cooperation and coordination, and that of implementation in interorganizational networks in disaster management projects (Otley, 1994) (Grandori, 1997) (Osborn & Hagedoorn, 1997) (Dekker, 2004) (Kalkman & Waard, 2017). There is a dire need to understand the lack of coordination and coherence of interorganizational relationships, their performance, difference in goals, and hence different ways of measuring effectiveness. The province of Sindh is chosen as a case study for this thesis, as it is one of the priority areas for the Government of Pakistan, with numerous flood-vulnerable urban settlements. For this research, data of a singular urban area was not collected, rather the province of Sindh was considered, as the phenomenon under study is relevant to many urban areas This thesis research will therefore focus on covering the gap of implementation and coordination of FRM policy of Pakistan in terms of governance in policy networks and IRs in these networks.

### **1.3 Relevance of the research topic**

The UNFCCC calls for governance and inclusive participation of all state and non-state actors and organizations based on socio-economic responsibilities and respective capabilities as critical actors to combat climate change and its effects (UNFCCC, 1992). This research output will provide a significant body of knowledge which is critical to inform policymaking through

understanding IRs in networks and how to navigate governance to increase effectiveness of FRM in said context of climate change.

This research can also be of considerable social and practical relevance. Governance of IRs in complex networks inhibit a huge potential for societal changes like cultivating climate change management knowledge, enhancing readiness to adapt, enforcing accountability, enriching collaborative capacity, streamlining planning, facilitating social learning and building organizational and stakeholder consensus (Becker, 2018) (Cumiskey, et al., 2019) (Becker, 2021) (Bodin & Nohrstedt, 2016) (Aylett, 2015) (Kochskämper, et al., 2016). Hence there is a potential increase of commitment from governmental bodies, non-governmental and private sectors, and local communities by taking collaborative actions to enact national policies. Furthermore, as an added scientific relevance, the analysis and results of this research will also contribute to the gap of ‘unknown unknowns’ in IRs on inter-actor flood risk management and possibly benefit in adding to literature in this sphere. Therefore, in achieving the objective of this research, the extent to which IRs contribute to the effectiveness of FRM will also be identified which will help fill the gap on the conditions required to contribute to organizational compatibility and mitigate risks in complex networks and IRs by overcoming fragmentation to better integrate policy coherence.

#### **1.4 Research objectives**

The main objective of this research is to study the policy practice gap in IRs that in turn affect the actions of interorganizational actors in the governance of policy networks in FRM, and to provide recommendations on improving FRM governance in centralized and traditional hierarchical policy arenas, thus using Pakistan as a case study. To achieve this objective, this research will focus on four sub-objectives; *i*) interorganizational network mapping to identify the relevant actors and organizations involved and the resources they bring in FRM frameworks in Sindh, Pakistan. *ii*) To analyse the IR patterns in detail, this research will utilize actor and network analysis to map relationship patterns within and between organizations; *iii*) to qualitatively analyse the strength of interorganizational relationships in FRM, and *iv*) to analyse the mechanisms through which IRs influence the level of effectiveness of FRM.

#### **1.5 Main research question and research sub-questions**

Based on the objectives the main research question and sub-questions are.

*What is the role of Interorganizational relationships on the level of effectiveness of Flood Risk Mitigation? (Context: Sindh, Pakistan).*

Sub-questions:

1. Which actors are involved in the implementation of FRM?
2. What are the IR patterns of actors in networks?
3. What is the level of effectiveness of FRM and what are the approaches to measure it in literature and practice?
4. Through which mechanisms do IRs influence the level of effectiveness of FRM?

## **Chapter 2: Theory Review**

This section of the research presents the state-of-the-art literature and the existing scientific study in the field. The two main variables in this research are ‘Effectiveness of Flood Risk Mitigation’, as the dependent variable and ‘Interorganizational Relationships’ as the independent variable.

### **2.1 Flood Risk Mitigation**

#### **2.1.1 Defining Flood Risk Mitigation**

Flood Risk has been a historically exceeding global concern (Grobicki, et al., 2015.) not just for vulnerable communities (Dilley, et al., 2005) but also increasingly threatening to developed urban areas and their sustainable development goals (Priest, et al., 2016) notably because flood risk is predicted to accelerate with climate change (IPCC, 2014). Mitigation, also addressed as prevention or risk reduction, is widely considered as the cornerstone of disaster management. Mitigation measures are a proactive approach and aim to reduce the likelihood or consequences of a hazard risk prior to the occurrence of a disaster. (Coppola, 2011). The component of FRM is planned and implemented in accordance with the flood risk factors that an urban area would be potentially exposed to. A widely accepted approach to FRM is having measures that are structural and non-structural, where the former corresponds to measure taken for intervention of flood defence and the latter corresponds to all the rest of interventions (Schanze, et al., 2004) (Grobicki, et al., 2015.).

#### **2.1.2 Effectiveness of Flood Risk Mitigation and Relevant Approaches**

Effectiveness refers to the extent to which aims of FRM are accomplished. Ideally, effectiveness of these aims is measured in terms of the total avoided risk of flood; expected annual damage, number of deaths, number of people affected, flooded area etc. However, in practice of FRM the effectiveness is measured through variables like decrease in flood probability, decrease in water level, decrease in vulnerable points etc. While these variables in practice are said to be easier to establish the account of effectiveness, from a flood risk management perspective they are said to be principally less relevant. (Klijn, et al., 2009) (Wallis, et al., 2009). As an example, Fig. 1 shows a flood inundation map with estimation of sea level rise in flood hazard areas.

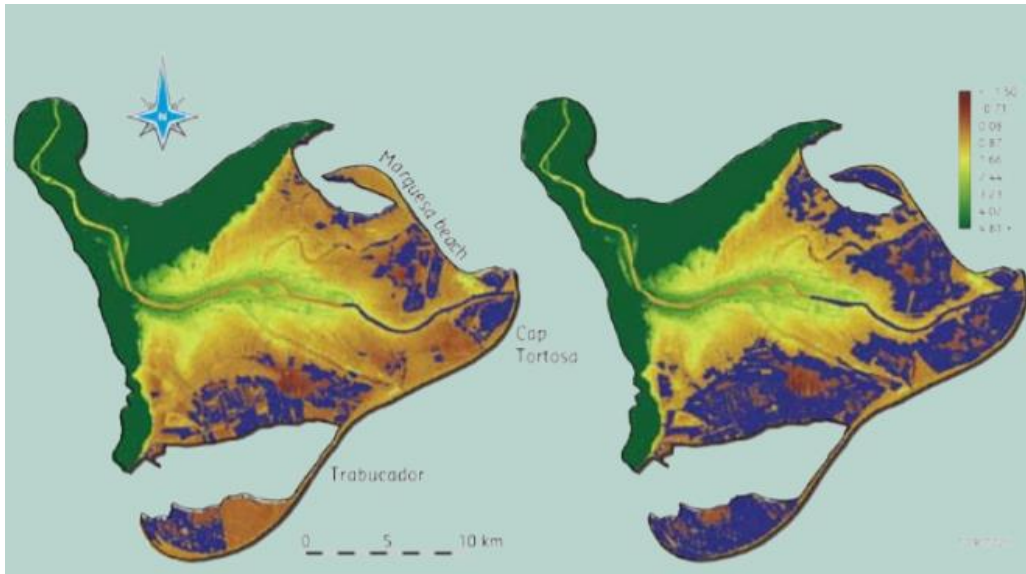


Figure 1 Estimation of sea level rise in Flood hazard areas, Source: (Wallis, et al., 2009)

A part of literature views effectiveness as a comparison between actual effect of FRM vs the intended effect. To establish effectiveness in this manner, the situation needs to be measured without the implementation of FRM strategies and compare with the situation after intervention. For example, if an area endures an annual damage of 100,000 USD, and the aim of risk reduction is to avoid all damages, the objective then would be to reduce annual damage by 100,000 USD. Then the actual effect after intervention is compared with the objective and the percentage difference reveals the effectiveness of FRM (Tapsell, et al., 2008).

Another approach to measure the total avoided risk is done by calculating the consequences of a flood of known probability. For example, if a flood has resulted in X number of economic damages in USD, and that flood had the probability of occurrence of 4% or 1:25 per year, then the risk contribution of that flood in terms of expected annual damage is calculated as: Expected Annual Damage:  $X \text{ USD} \times 1/25 \text{ p/y}$ : B USD/year (Tapsell, et al., 2008). Although this is a very sophisticated process of calculating the effectiveness of FRM, yet very specific and large amount of data is required, and it does not involve a lot of other factors which might be explained as the reason behind unexpected and fluctuating weather probabilities. In terms of *unprotected areas*, the probability of flooding is equal to the probability of water level exceeding the bank or land level, since in these areas it would be unavoidable and natural for channels to exceed their discharge capacity and for floods to occupy natural flood plains if any. In comparison, for *protected areas*, the flood probability will be calculated as the probability of failure of defence structures, where the combined acceleration of water levels and wave

height probabilities need to be considered (Wallis, et al., 2009). Fig. 2 and Fig. 3 show an example of the defence structures and measures that can be taken for FRM.

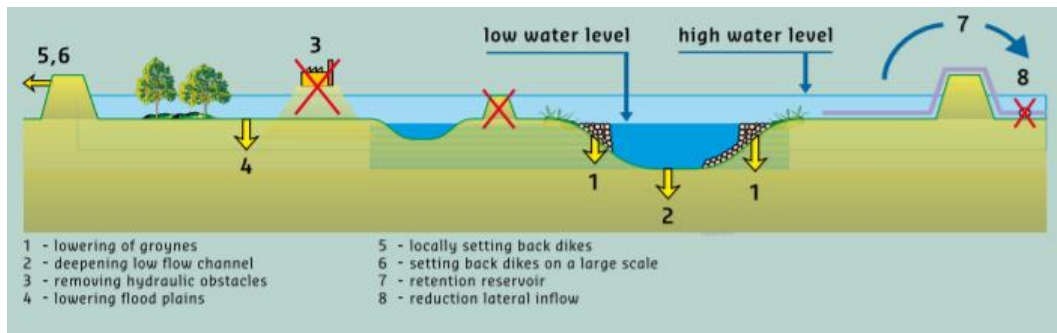


Figure 2 Example of defence measures for FRM, Source: (Wallis, et al., 2009)

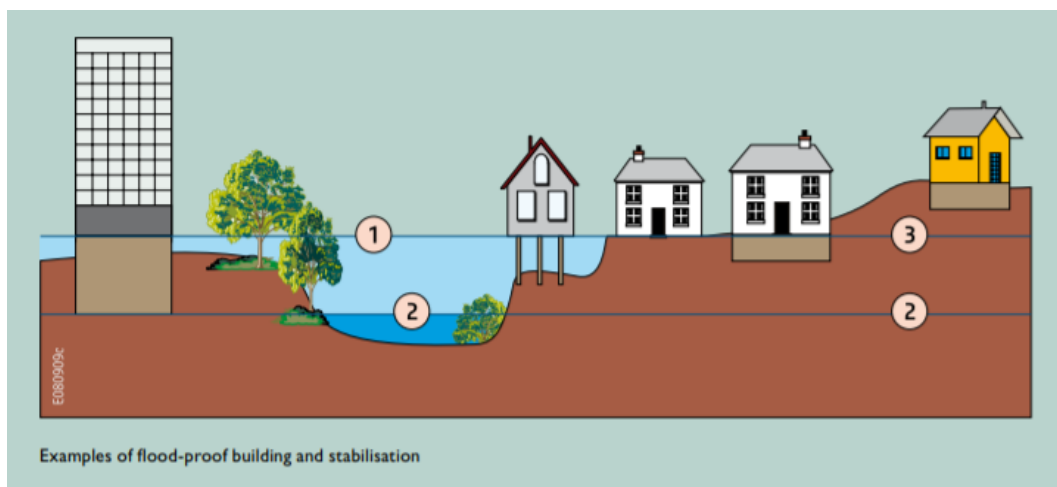


Figure 3 Examples of flood-proofing buildings, Source: (Wallis, et al., 2009)

A downside to this method for researchers is that these are not easy to determine because to calculate the probability of failure of defence structures certain other figures such as reliability and strength of these defences for various failure modes need to be determined. This makes it extremely challenging if not impossible to accurately establish the probability of floods, specifically because for many of the flood plain areas the probability of flooding is uncertain and flood probabilities can change drastically uncertain weather conditions and characteristics of catchment areas (Wallis, et al., 2009). As an example, Fig.4, Fig. 5, Fig. 6, and Fig.7 show the River Indus flow data in 2019 for the months of July, August, September, and October. It can be clearly seen how the river flow variates substantially within these months.



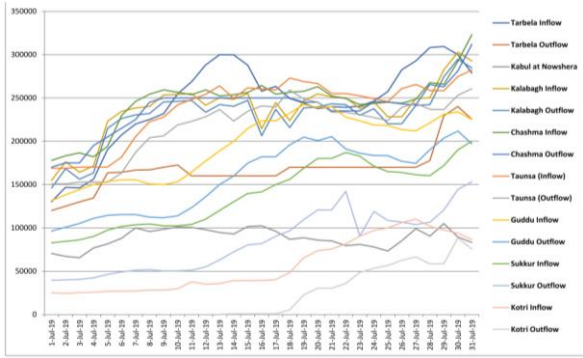


Figure 4\* River Indus Flow data July 2019

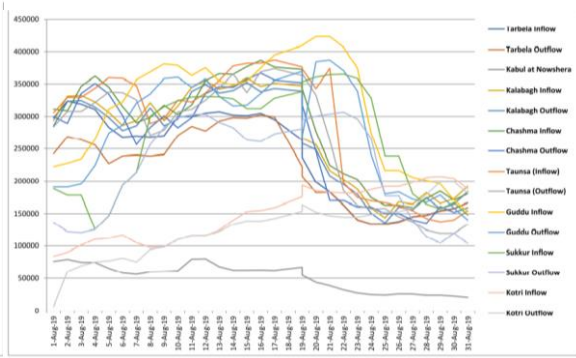


Figure 5\* River Indus Flow data August 2019

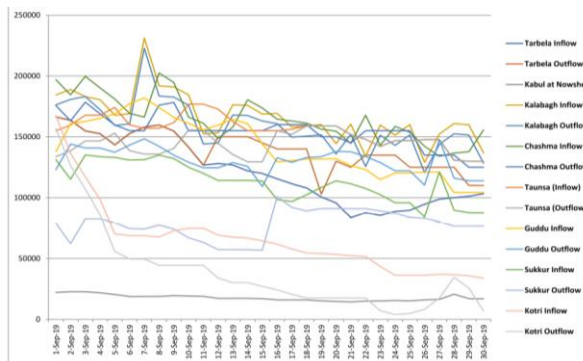


Figure 6\* River Indus Flow data September 2019

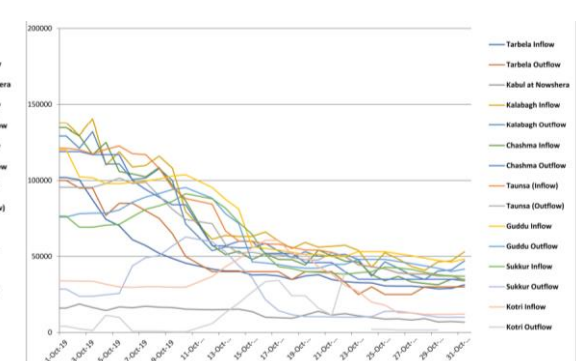


Figure 7\* River Indus Flow data October 2019

\*Source of all images: FFC, MOWR, Annual Flood Report 2020

Although, on one hand complex physical modelling is used to determine probabilities of future floods, in many urban and rural areas alike, land use changes due to urbanization are not always formal and many times if formal, they are politically driven to provide habitation to people in flood plains. Therefore, to assess exposure, calculate risk and probabilities, a lot of uncertainty and complexities can be involved (Collier, 2007). Fig. 8 shows an example of how flood peaks can variate for the same river over the years.

Dam/ Barrage Site	Designed Capacity	Highest Recorded		1988	1992	2010	2011-	2012-	2013-	2014-	2015-
		Year	Flow (Cusecs)	Peak Date	Peak Date	Peak <sup>^</sup> Date	Peak <sup>^</sup> Date	Peak <sup>^</sup> Date	Peak <sup>^</sup> Date	Peak <sup>^</sup> Date	
<b>Indus River</b>											
Tarbela Reservoir	1,500,000	1929	8,75,000	556,900 22.7.88	500,000 10.9.92	833,000 30.7.10	272,200 28.6.11	295,000 4.8.12	392,000 14.8.13	299,000 28-7-14	486,900 26-7-15
Jinnah Barrage	950,000	1942	950,000	598,000 2.8.88	849,245 10.9.92	937,453 30.7.10	293,900 26.7.11	285,300 18.7.12	479,603 13.8.13	258,000 25-7-14	532,998 2-8-15
Chashma Barrage	950,000	2010	1,036,700	580,000 3.8.88	668,000 11.8.92	1,036,700 1.8.10	356,500 28.7.11	298,300 8.7.12	637,482 14.8.13	282,000 17-8-14	636,512 3-8-15
Taunsa Barrage	1,000,000	2010	960,000	560,000 21.7.88	655,000 14.9.92	960,000 2.8.10	249,200 31.8.11	243,400 10.9.12	516,017 17.8.13	261,000 30-7-14	604,714 5-8-15
Guddu Barrage	1,100,000	1976	1,199,672	1,163,000 30.7.88	1,087,000 18.9.92	1,148,738* 8.8.10	272,300 3.9.11	236,100 12.9.12	567,418 20.8.13	367,000 18-9-14	769,872 3-8-15
Sukkur Barrage	900,000	1976	1,161,000	1,116,000 30.7.88	1,068,000 20.9.92	1,130,995** 10.8.10	260,800 6.9.11	214,800 14.9.12	510,875 24.8.13	321,000 20.9.14	709,316 5-8-15
Kotri Barrage	875,000	1956	980,000	649,600 17.8.88	689,300 30.9.92	964,900 27.8.10	261,400 14.9.11	166,000 21.9.12	381,696 30.8.13	145,000 25-9-14	634,919 15-8-15

Figure 8 An example of variation in Flood peaks of River Indus, Source: FFC, MOWR, Annual Flood Report 2020

Furthermore, there is a plethora of evidence where policy makers and scientific literature contradict with this approach on the grounds that the figures achieved as a result of these methods are only indicative to receptors of tangibles and do not include intangibles such as reduction of risk of casualties (Vander, et al., 2007) (Collier, 2007) (Poussin, et al., 2015). Fig 9 shows the various tangible and intangible effects associated with direct and indirect forms of consequences of floods.

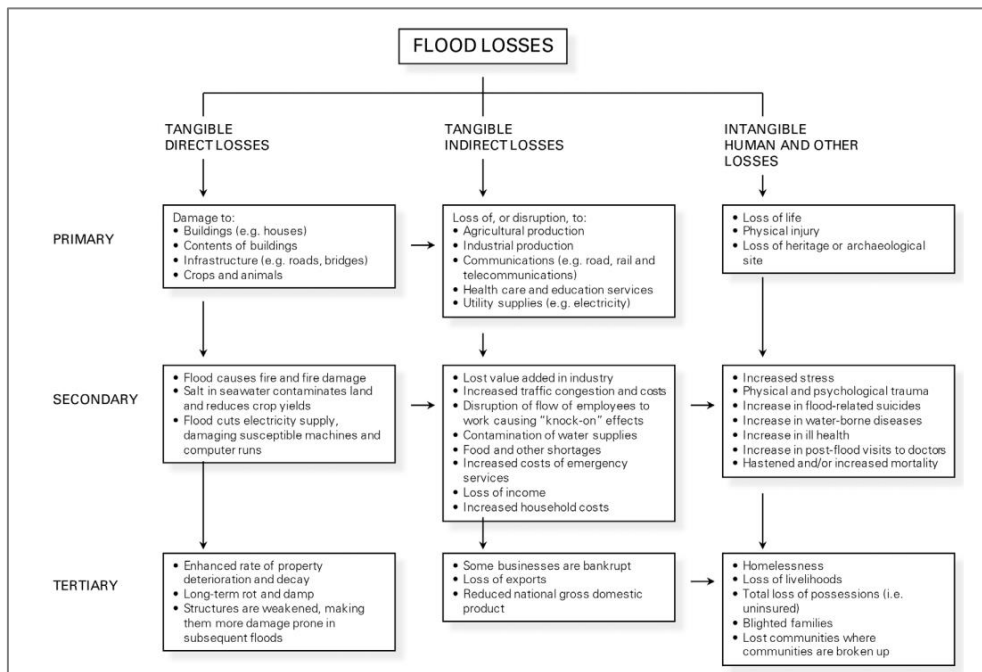


Figure 9 Types of Flood Consequences with examples, Source: (WMO, 2005)

When considering measures taken for risk reduction of flash, riverine and coastal floods, certain other measures need to be considered. For example, in urbanized and inhabited rural areas, flash floods only allow for a response time of a few days or in most cases a few hours, even though if physical and regulatory instruments are in place, the abruptness of these floods require a complementary response to the high residual risk. In these cases, timely flood forecasting, and warning systems play a crucial role, and this is where many mechanisms are greatly challenged posing for other measures like effective *monitoring and evaluation, repair, and communication mechanisms* to be in place. In addition to being endangered by water, these areas are also prone to destructive high velocity which in return chokes the drainage channels that respond very rapidly and excessively to intense rainfall, leaving little to no time for warning and evacuation and posing further challenges through destruction of modes of transportation and communication mechanisms (Wallis, et al., 2009). Fig.10 shows examples of urban drainage channels.



**Figure 10** An example of drainage channels in urban areas, Source: FFC, MOWR, Annual Flood Report 2020

Therefore, the perception of effectiveness of FRM varies greatly in literature, science and policy practice as does the perception of flood risk according to the urban and rural areas in their geographical context. For this research to collect data for effectiveness of Flood Risk Mitigation, variables related to tangibles and intangibles (*Direct losses, Flooded area, Lives lost*), *perception of effectiveness of FRM*, with sensitizing topics of *monitoring and evaluation, repair and communication mechanisms* will be used.

## **2.2 Interorganizational Relationships**

### **2.2.1 Defining Interorganizational Relationships**

A key challenge for complex problems in environmental and disaster management is the number and diversity of actors and organizations involved with their specific perceptions, goals, and resources. (Robinson, et al., 2011). To address this challenge, numerous collaborative approaches towards governance have been formulated that are a shift from state-entered top-town hierarchy that allow for a less-formalized governance by networks of interdependent organizational actors beyond the government sector. This is primarily due to reasons that include limited resources of the government like information, finances, and power to efficiently implement environmental management and hence makes it dependent upon other actors. There is a growing body of literature investigating governance of climate change and flood risk mitigation from a perspective of IRs in networks. Many of these scholars recognize the vital role that organizations and actors that formulate these organizations play in the implementation of climate related policies, and share wide consensus in terms of how perceptions, roles and responsibilities of actors are interrelated to make and influence the effectiveness of their decisions for governance of risk mitigation.

Bachmann & van Witteloostuijn (2006), in a systematic review of relevant literature, have theorized IRs to be relationships that exists between and among organizations. These are formal

arrangements formed between two or more officially dependant organizations with the goal of accumulation and mobilization of tangible and/or intangible assets to be viewed as joint value-added resources.

There are various types of IRs such as networks, alliances, trade associations, joint ventures, and interlocking directorates (Barringer & Harrison, 2000)). Amongst the various types of IRs this research focuses on IRs of *networks* which are considered structures of interdependence involving multiple agencies or divisions of those agencies for enactment of policies through service delivery (Barringer & Harrison, 2000). Interorganizational linkages are a prominent feature of service delivery, where ‘networks’ constitute of numerous interdependent actors made up of organizations which continually exchange resources like knowledge, finances, expertise and authority to achieve their objectives, expand and influence quality of outcomes, and circumvent complete dependence on each other.

With the advent of modernization of cities and societies, networks have fundamentally emerged as their characteristic part. The conventional views on governance in terms of planning and social systems do not fully consider the dependencies of government upon different actors like groups, organizations, and individuals in its policy environment. The *network perspective* on governance however differs greatly from these conventional views (classical perspective) (Mandell, 1990). The policy network approach backs interorganizational theory and views policy processes in terms of complex interactions of multiple actors participating and their goals and strategies could be ambiguous consequently having uncertainty in information and outcomes. Policy networks formulate around policy problems and resources required to handle policy problems. Furthermore, the term ‘policy networks’ identifies patterns of relationships between interdependent actors, focusing that actor on networks are interdependent because of their reliance on resources of other actors to achieve their goals. Hence *interdependency* is viewed as the dissemination of resources between numerous actors, goals they work towards and their perception of resource dependencies. Processes of institutionalization perpetuates interactions where information, goals and resources are shared and shared perceptions, structural and cultural features of current and future policy networks are developed and influenced (Kickert, et al., 1997)

The *network approach* hence considers networks consisting of various actors as the main arteries where public policy making, and governance take place. Keeping in mind that none of these components of networks possess the power to determine the strategies of the other actors

and the government is no more at an upper hierarchy than the other parties, but on equal footing with them. Furthermore, in essence, public policy making within networks considers both cooperation or non-cooperation between interdependent actors, with diverse and often contradictory rationalities, interests, and strategies. Thus, the network approach to understand and manage complex problems allows for policy processes to be viewed as an interactive process that emerges as a result of actor interactions, information, preference, and means sharing, resource dependency and trade-offs, and disregards seeing policy processes as implementation of ex-ante formulated goals (Kickert, et al., 1997).

Kickert et al., (1997) describe policy networks as '*patterns of social relations between interdependent actors*' that amalgamate around policy problems and programmes. This essentially means that policy networks formulate within the context in which policy processes are exercised, thus establishing a relationship between the context and process in which policy making is done. Within policy networks, interorganizational theory and IRs are integral, which is where the process approach to policy networks emerges with a focus on complexity of these processes. As discussed earlier, the complexity in policy making and policy practices originates from a number of interdependent factors which can be attributed to the variety of diverse actors that influence the process, changing preferences of these actors, and the complex interactions of strategic actions and perceptions of problems and solutions that continually shift (March & Olsen, 1976). Thompson (1967) stated that since policy processes navigate within the plurality of numerous actors with their separate goals, strategies, and interests, hence their analysis should also include interorganizational networks to not only research specific interactions but also structural relations between and within these organizations.

In terms of implementation of policies, as opposed to the top down approach formulated by ex-ante goals of central actors (Pressman & Wildavsky, 1973), interorganizational theory focusses on interaction of actors for implementation of strategies at the local operational level (Wamsley, 1985). Such a bottom-up approach within implementation studies is considered exceptionally effective in recognizing how local actors implement policies and frameworks from upper levels of government in accordance with their specific interests, goals, and perceptions, to emphasize the unpredicted effects of implementing policy decisions (Sabatier & Hahf, 1985).

### **2.2.2 Approaches to Interorganizational Relationships in Policy Networks**

The interorganizational approach emerged in the 1960's and 1970's, where interorganizational theory focuses on the relationships, interdependencies and strategies that exist between and

within organizations (Kickert, et al., 1997). This portion briefly introduces the emergence of interorganizational theory, which was built upon several former theories of organizational science. Theorists believe that historically our understanding of organizations were synonymous of them acting as ‘machines’ where organizations were understood as units of a hierarchical command and communication chain, with each part organized in a specific order, by a clear purpose, authority structure and defined work processes. Although this classical perspective stems from bureaucracy and divisionalized organizations, it must not be inferred that this practice is dormant, and therefore it still exists in many modern organizations (Morgan, 1986). This approach, called the ‘*rational organization approach*’, considers organizations as separate entities within their *environment*. However, a systems approach emerged, which considers organizations to be the part of an open system having interdependent connections with each other and their environment. While the rational organization determines organizations as units without having relations with the environment, organization theory focusses on how the environment influences the internal organization processes. The open systems concept paved the way for ‘*contingency theory*’, where organizations change their internal organization to respond to their relevant environment stipulating that a singular way doesn’t exist as a perfect way to organize, rather a contingency relationship emerges due to the interaction of the organizations with the characteristics of the environment, with the environment being a factor. With this advancement from rational organizational theory to contingency theory, numerous researchers and theorists constructed the classification of environmental types and interconnected organizational forms. Of these the highly regarded classifications (Emery & Trist, 1965) entailed the organization not to be a unit but composed of coordinated subsystems. Where the organization reacts purposefully to its environment, accordingly, varying its internal coordination to adapt to the environment (Mintzberg, 1989)

Interorganizational theory conceptualizes the *environment* to be a set of organizations that formulate a relationship with a focal organization, and interorganizational analysis takes into account the relations between organizations in terms of developing coordination that is formed as a result of resource exchange between them (Levine & White, 1961) (Negandhi, 1975) . Consequently, these interdependent relations formulate from certain relation patterns between organizations. With the interorganizational approach, IRs can be analysed from five different categories of *actors, processes, decisions, power, and information/values*. Within the interorganizational approach to analyse the IRs in networks, the dimension of ‘actors’ signifies the organizations involved as a part of network of organizations, the dimension of ‘*processes*’

relates to the interorganizational interactions through which resource exchange occurs which are guided by inter-organizational links, the dimension of '*decisions*' is considered as the choices or trade-offs made in order to sustain essential resource flow and is a consequence of negotiations between organizations within the network. Finally, the dimension of '*power*' is concerned with the authority structure owing to the need for resources and '*information/values*' relate to whether information is seen as a power resource owned by different actors and their coordinated and/or conflicting values (Kickert, et al., 1997) (Levine & White, 1961).

The approaches to execute actor and network analysis are built upon the dimensions discussed above. If the policy is already constructed and implemented in networks, to research networks Klijn, (2008) established a framework for conducting *actor analysis* and *network analysis*. A necessary analytic step to make the baseline of the problem situation is to reconstruct the perceptions on topics like current situation, desired solution, obstacles, goals, and objectives, since network theories on policy making and implementation assume their perceptions to influence the actions of actors (Klijn, 2008). As actors are the basic units of analysis and the source points for action, *actor analysis* consists of finding out the characteristics of the networks in terms of acting units involved, their interest and importance in realizing objectives, along with their roles and responsibilities. Further in actor analysis comes the construction of resource dependency in which the resources of each actor and their dependency relations are constructed and analysed. For the dimension of *network analysis*, several analytical tools can be used to understand the characters of the network; the *processes* that occur within the interaction patterns of actors marked by their frequency of meeting, contact pattern and position within the network. Establishing patterns of actors' *perception patterns* regarding problems, solutions and their environment is another important aspect which helps to determine the position of actors within the networks. Furthermore, to understand and illustrate the complexity of interaction, processes are analysed to determine the *relevant policy arenas* where various decisions take place within the policy game. The measures used within relevant arenas are decisions made, actors' interaction within their context and the coherency and linkages of these actor groups. Furthermore, *Institutional provisions* that connects actors in networks are measured using formal rules, informal rules, and organizational arrangements in the network relevant to policy implementation. The construction of the formal rules and organizational arrangements can be done through analysis of official documents; however, reconstruction of informal rules require in-depth interviews. All of these in turn help determine rules that actors

follow and establish within the policy practice in networks for exchange of information and resources (Ostrom, 1986) (Burns & Flam, 1987) (Klijn, 2001, 2008)

### **2.2.3 Interorganizational Relationship Patterns in Networks**

Analysing how individual actors within organizational networks interact to form relationship patterns within their environment while implementing policies requires understanding how the dynamics of their relationships occur and in what capacity they interact. Levine and White (1961), theorists who have contributed most to the foundational ideas of interorganizational theory emphasized that exchange processes between organizations are attributed to the factor of '*Resource Dependency*', whereby organizations procure resources from each other. Other researchers built on their concepts and formulated a resource dependency model as the core of interorganisational theory (Thompson, 1967) (Scharpf, et al., 1978) (Aldrich, 1979), wherein the set of organizations develop the environment of an organization. Organizations interact with each other to obtain their goals (Aldrich, 1979), by creating and regulating a pool of necessary resources such as capital, knowledge, human resources that cannot be produced by a single organization. Respective goals of each organization define their need for the resources, making interdependencies and establishing networks of organizations to interact. These IRs are categorized as direct or indirect ties depending upon whether they obtain the resources explicitly or via mediaries (Scharpf, et al., 1978) (Pfeffer & Novak, 1976). It is observed that the possession of resources is directly linked to having *power*, which is a crucial concept in resource dependency, and within this approach, organizations may take certain steps control the resource flow (Aldrich, 1979) (Aldrich & Whetten, 1981). Another concept is the *values* and *norms* that form because of these resource flow patterns, however irrespective of what influences these social relationships, dependence is still established (Becker, 2018).

When it comes to implementation and *coordination* in Interorganizational Networks, a lot of empirical and theoretical research have been framed. Questions like how the relations of an organization effect its performance and how this performance can be improved are important to carry out if the performance and survival of an organization depends upon the way it relates to other organizations. The research projects conducted to understand organizational cooperation yield that complex organizations employ professional from diverse fields and experience, participate in joint ventures and opportunity to enter into these links between these organizations are an important factor for new initiatives (Turk, 1970), however in such organizational networks, many domains of conflicts exist that hinder effective interorganizational coordination (Warren, et al., 1975). Although these research projects do not



signify whether interorganizational coordination had an improving effect on the quality of services, yet the continuity of services was improved (Rogers & Mulford, 1982). This observation could be linked to the fact that the criterion for measurement is difficult in complex interorganizational networks owing to multi-actor environments with varying goals, hence different ways of measuring effectiveness and efficiency.

However, interorganizational theory does stress on formal structures within organizational arrangements to secure cooperation. Signifying on the concept of contingency approach, more research stresses to focus on nature of dependency and nature of coordination. Thompson, (1967) assumed that for pooled interdependency, coordination based on standardization is the most appropriate approach where each organizational actor contributes to the network. If the inputs of actors are dependant upon the outputs of other actors as a form of sequential interdependence, then a coordination by plan and mutual adjustments is most effective. These types of coordination are backed by other researchers as well (Rogers & Whetten, 1982), who made a distinction according to degree of autonomy of the separate organizations between three forms of coordination namely, mutual adjustment, alliance and corporate. Parties retain their autonomy within mutual adjustment where coordination is done by voluntary informal rules and spontaneous interactions. Within the second type of coordination that is alliance, no authority exists, and coordination is achieved by negotiation of rules. Corporate coordination strategies are those when organizations formulate a joint authority structure to which some authority is given. Such analysis of IRs serves as a way of comparing coordination structure and their effect on analysis of interorganizational relations is debateable. However, the focus of analysis of IRs is to clarify the means with which organizations reach other goals or adjust their strategies through organizational arrangements (Kickert, et al., 1997).

#### **2.2.4 Other Factors that influence FRM**

In addition to IR's there are several other factors that may influence the dependant variable of FRM. These include non-climatic factors such as i) unplanned and rapid urbanization, ii) poor land governance and spatial planning, iii) increase in anthropogenic activities, iv) temporary adaptive strategies taken by people like self-organization for e.g., connecting tertiary sewers with drainage systems choking the channel capacity, and climatic drivers v) rapidly changing meteorological factors (Akhtar & Dhanani, 2012) (Anwar, 2012) (Aslam, 2018). All these factors overlap and force major challenges on the effectiveness of already implemented flood risk mitigation strategies producing impacts such as vi) change in urban area characteristics (high water run-off, low soil storage capacity), vii) low adaptive capacity to climate change

and climate vulnerability. As the complexity of this wicked problem is very wide and interlinked, the scope and purpose of this thesis research will focus on the independent variable of IRs in terms of the interaction, decision making process and resource dependency of multiple critical actors involved in the governance of Flood risk mitigation.

### **2.3 Interorganizational Relationships and Flood Risk Mitigation**

When it comes to public policies and response in the form of disasters and crisis, the demand for actions taken by organizations in disaster management has become substantially complex due to the numerous relationships involved. Complex problems cannot be addressed independently by organizational stakeholders as complexity highlights the element of mutual dependency between organizations themselves and with non-organizational stakeholders (Ansell & Gash, 2008) (Alford & Head, 2017). With the acceleration in natural disasters, and complex problems, there is demand for the involvement of multi-organizations that co-work and form good relationships with stakeholders to aid in recovery and response to risks and disasters (Bodin & Nohrstedt, 2016). As a result, forms of interorganizational cooperation and networks have developed as a pertinent component of disaster risk management, where disaster brings together these organizations and forces them to work collaboratively to resolve situations that affects them all (Ndlela, 2019).

It is also imperative here to highlight that IRs in inter-actor governance are considered ‘unknown unknowns’, where the complexity of interactions in IR’s currently reveal that their numerous other aspects involved in governance that affect it. The complexity in interrelated decision-making in the face of uncertainty characterizes situations where no probabilities could be ruled out, therefore making the outcomes of decisions hard to assess (Kominis, et al., 2021). As Flood risk management demands for more integrated approaches of governance, and the construct of development of networks within inter-actor governance infrastructures emerge organically, these ‘unknown unknowns’ in IR’s demand to be more present within the discussion of scientific communities to understand their implications .

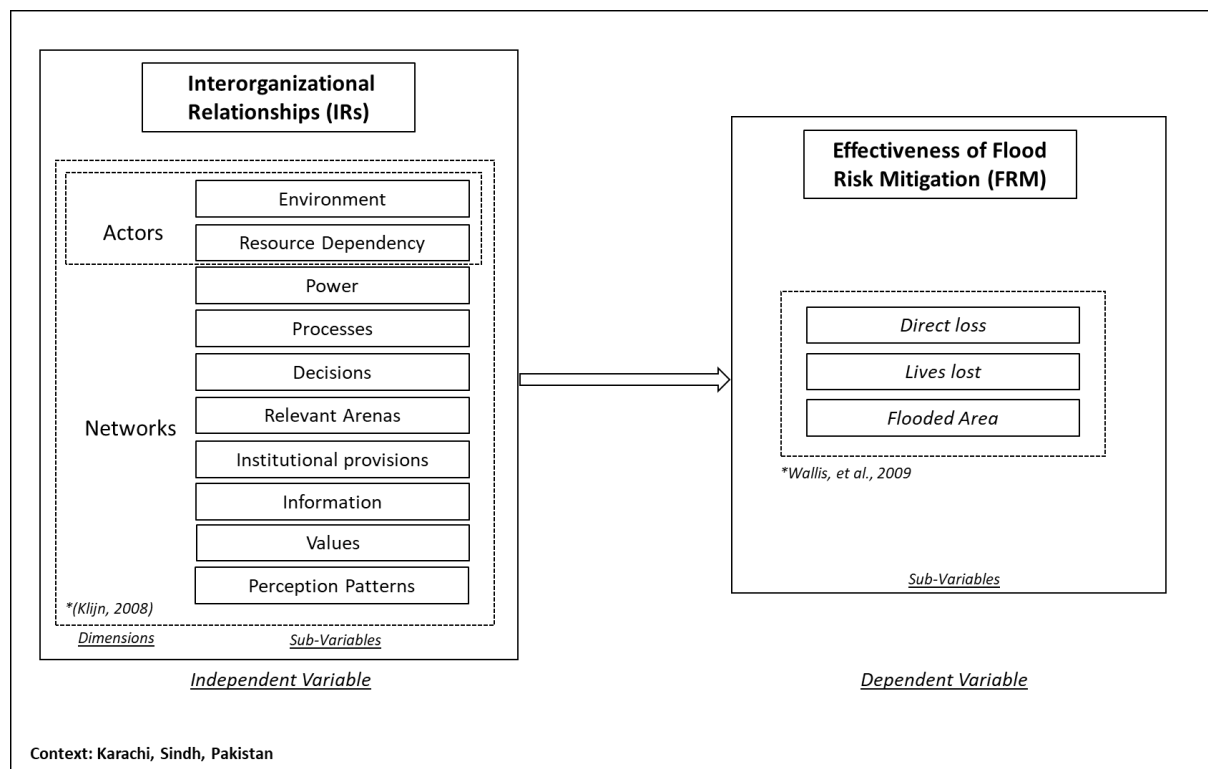
### **2.4 Conceptual framework**

The conceptual framework given below, Fig. 11 is an outcome from the scope of literature discussed in the above sections, which examines the relationship between the IV of IRs and DV of effectiveness of FRM. This research aims to study the role of IRs in policy implementation networks on the level of effectiveness of FRM in a centralized and traditional hierarchically distributed governance network of, Sindh, Pakistan.

The independent variable of IRs is conceptualized as an agent for the effectiveness of FRM and represents the two dimensions of actors and networks. Firstly, how actors interact to form their environment and the characteristics of resource dependency they have which forms their networks. Then how these formulated networks interact during the processes of policy implementation of FRM frameworks, and which Institutional provisions are in place that actors in the network follow to take decisions within their relevant arenas. Power in networks is concerned with the authority structure owing to the need for resources whereas information and values relate to whether information is seen as a power resource owned by different actors along with their coordinated and/or conflicting values. Perception patterns of actors relate to the images they hold about problems and solutions, the obstacles that arise due to difference in perceptions and are closely linked to values.

Effectiveness refers to the extent to which aims of FRM are accomplished. The dependent variable of effectiveness of FRM because of the IRs in place is represented by variables taken from literature where the effectiveness of FRM is understood as the avoidance of or trends of change in loss of lives, direct loss, and flooded areas.

Figure 11 Conceptual Framework, Source: Author, 2021



## **Chapter 3: Research Design and Methods**

This chapter presents the research design methods and operationalization of the research. The first section (3.1) begins with the description of the research design strategy and scope of the research. Definitions of measures and operationalization of the variables are presented in Section 3.2, followed by data collection and analysis methods in Section 3.3. This chapter ends with the section of ethics, reliability, and validity (3.4) and challenges and limitations of the research (3.5).

### **3.1 Description of the research design strategy and scope of the research**

The objective of this study is to gain more in-depth knowledge of the role that interorganizational relationships (IRs) of actors play in the level of effectiveness of Flood Risk Mitigation (FRM) when implementing policies. For this research, a single case study design is selected, as the research method of case study permits to examine a concrete issue and analyse it within a certain context in detail (Van-Thiel, 2014) (Bryman, 2012). Detailed, qualitative and empirical data is essential, therefore a case study strategy is most appropriate for this research. A qualitative research strategy is further chosen for this study because the aim is not to have a generalizable outcome but to have a contextual understanding on a micro level of the case, to explain and understand the point of view of relevant actors within the main context and concepts of the study. (Teegavarapu & Summers, 2008)

As explained in the problem statement, the province of Sindh is under constant risk of floods and previous FRM plans have highlighted a huge barrier in terms of implementation and coordination of organizations. It is also one of the most vulnerable areas to floods according to its geographical, economic and governance levels. For the purpose of this research, data of a singular urban area was not collected, rather the province of Sindh was considered, as the phenomenon under study is relevant to many urban areas. Further elaboration of the case study is in Chapter 4. Moreover, the selection of catchment area of Indus River was done by the logic of extreme case, Flyvbjerg (2006) was of the view that bigger challenges more often reveal most information about complex problems since they activate additional actors and mechanisms. However, for a catchment area to be considered extreme has less to do with extreme magnitudes of flood risk and more with the complexity of the flood problem.

### 3.2 Operationalization: variables and indicators

The following tables (Table 1 & 2) show the transition from theory to empirical research, in terms of making the concepts measurable through main concepts, their working definitions, variables, sub-variables and indicators. The operationalization of variables is a crucial step to design the research and measure the identified variables. The operationalization of this research is deductive, using the theories of Interorganizational Relationships and Effectiveness of Flood Risk Mitigation discussed in detail in Chapter 2.

**Table 1 Variables, Indicators and their definitions, Source: Author, 2021**

Variables	Dimensions	Sub-Variables	Definitions
<b>1. IV: Interorganizational relationships IORs</b>			Relationships that exist between and among organizations. These are formal arrangements formed between two or more officially dependant organizations with the goal of accumulation and mobilization of tangible and/or intangible assets to be viewed as joint value-added resources. (Bachmann & Witteloostuijn, 2006)
	<b>Actors</b>	1.1: Diversity of Actors/Environment.	The Environment of the network is determined by the diversity of acting units, which actors in the network are important in realizing objectives and policy goals, which actors have an interest in finding a solution to the problem. The importance and interest can be seen as high/medium/low (Kickert, et al., 1997)
		1.2: Resource dependencies	To understand the positions that actors take regarding the problem situation and how much do actors depend upon each other. These can be found by means/resources that actors have at their disposal, the importance of those means and possibility to acquire from elsewhere, the unilateral or mutual dependency, and the direct/indirect procurement of resources (Kickert, et al., 1997) (Levine & White, 1961)
	<b>Networks</b>	1.3: Power	Power in a network is seen within an authority structure distributed within the networks. The authority structure can be clear and centralized, ambiguous, have no central authority, or power can depend upon the need for resources (Kickert, et al., 1997).
		1.4: Processes	Interorganizational interaction in which resources are exchanged, guided by organizational arrangements (links) between organizations. These are the interaction patterns of actors which determine the nature of dependency and is used for mapping of relation patterns. Through mapping the frequency, diversity, and varying/unvarying contact patterns of interactions of actors, networks and the actors who belong to them can be determined (Kickert, et al., 1997) (Klijn, 2008).
		1.5: Decisions	Decisions that signify the nature of coordination and negotiations between organizations aimed at sustaining necessary resource flow for survival. The nature of coordination can be categorized into mutual adjustment, alliance and corporate (Kickert, et al., 1997).
		1.6: Relevant Arenas	Acknowledging coherent groups of actors and interaction situations around demarcated policy issues and/or initiatives that are meaningful to the initial initiative or policy game. These include where important decisions are made, actors' interaction within context (sector, policy, ad hoc etc), coherency of actors and relations/linkages of actors. (Klijn, 2008)

		1.7: Institutional provisions	Institutional provisions connect actors in networks through relevant formal rules and judicial procedures, informal rules, and other organizational arrangements such as meeting and consultation procedures in the network relevant to the policy game (Klijn, 2008).
		1.8: Information	The way of gathering information determines characteristics of a network. These include a Scientific way of gathering information, Strategic information gathering or whether in the network information is seen as a power resource possessed by different actors (Kickert, et al., 1997).
		1.9: Values	These relate with the clarity of values and provide the directions in which actors would like to move; they describe the internal motivations of actors. Related concepts such as ‘norms’, ‘interests’ and ‘purposes’ function on a more abstract level, whereas ‘objectives’, ‘goals’ and ‘targets’ express values in more specific terms. ‘Preferences’ and ‘positions’ translate values into a (relative) preference ordering over specific solutions or policy outcomes. Variables on this dimension are closely linked to actors’ perceptions (see also Sabatier, 1988, 131–133).
		1.10: Perception Patterns	By determining the relation in perceptions among actors, one can discover which networks actor belong to. These are determined by actors’ perceptions regarding problems, solutions, and their environment, differences in perception from other actors and obstacles caused because of these differences (Klijn, 2008).
<b>2. DV: Effectiveness of Flood Risk Mitigation</b>			Flood risk Mitigation measures are a proactive approach and aims to reduce the likelihood or consequences of a hazard risk prior to the occurrence of a disaster. (Coppola, 2011) Effectiveness refers to the extent to which aims of Flood Risk Mitigation are accomplished. Ideally, effectiveness of these aims is measured in terms of the total avoided risk of flood. (Wallis, et al., 2009)
		2.1: Direct Loss	Tangible loss, Total annual financial loss (environment, economic, infrastructure...etc) due to flooding (Wallis, et al., 2009).
		2.2: Lives Lost	Intangible loss, Total human deaths (Wallis, et al., 2009).
		2.3: Flooded Area	Tangible loss, Total flooded area due to floods (Wallis, et al., 2009).
		2.4: Perception of Effectiveness of FRM	Tangible loss, Total annual financial loss (environment, economic, infrastructure...etc) due to flooding (Wallis, et al., 2009).

**Table 2 Operationalization of variables according to Literature, Source: Author, 2021**

Variables	Dimensions	Sub-Variables	Indicators	Data Type	Measurement	Data Collection Method	Data source	References
<b>1. IV: Interorganizational relationships IORs</b>	Actors	1.1: Diversity of Actors/ Environment.	1.1.1: Acting units 1.1.2: Actors important to realizing objectives/policy goals 1.1.3: Actors' interest in finding solutions	1.1.1: Name of actors 1.1.2: High/Medium/Low 1.1.3: Name of actors	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews <b>Secondary:</b> Official documents, Official websites	Interview Respondents /Official documents/ Official websites	(Kickert, et al., 1997, Levine & White, 1961, Klijn, 2008, Koppenjan & Klijn, 2004, Ostrom, 1986, Burns & Flam, 1987)
		1.2: Actor positions and dependencies	1.2.1: Means at disposal 1.2.2: Importance of means (possibility to acquire elsewhere) 1.2.3: unilateral or mutual dependency 1.2.4: Procurement of resources: Direct/Indirect 1.2.5: Actor's position (critical, dedicated and/or comparable)	1. 2.1: list of means 1. 2.2: text/speech 1. 2.3: unilateral or mutual dependency 1. 2.4: Direct/ Indirect 1. 2.5: text/speech	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews <b>Secondary:</b> Official documents, Official websites	Interview Respondents /Official documents/ Official websites	(Ansell & Gash, 2008, Alford & Head, 2017, Bodin & Nohrstedt, 2016, Ndlela, 2019)
	Networks	1.3: Power	1.3.1: Authority structure	1.3.1: text/speech	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews	Interview Respondents	(Koppenjan & Klijn, 2004, Klijn, 2008)

	1.4: Processes	1.4.1: Frequency of meeting 1.4.2: contact pattern (varying/unvarying) 1.4.3: Position of actors in the network in accordance to contact pattern/ centrality of exchanges	1.4.1: number 1.4.2: varying/unvarying 1.4.3: text/speech	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews <b>Secondary:</b> Official documents, Official websites	Interview Respondents /Official documents/ Official websites	(Aldrich & Whetten, 1981, Aldrich, 1979., Mitchell, 1969, Pfeffer & Novak, 1976, Scharpf et al., 1978, Thompson, 1967, Becker, 2018, Oliver, 1991, Kickert, et al., 1997)
	1.5: Decisions	1.5.1: Mutual adjustment 1.5.2: Alliance 1.5.3: Corporate	1.5.1: text/speech 1.5.2: text/speech 1.5.3: text/speech	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews	Interview Respondents	(Rogers & Whetten, 1982, Thompson, 1967, Kickert et al., 1997)
	1.6: Relevant Arenas	1.6.1: decisions made that are important to the initiative/policy game that is analysed 1.6.2: Actor's interaction and within context 1.6.3: Coherency of actors	1.6.1: text/speech 1.6.2: text/speech 1.6.3: text/speech	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews <b>Secondary:</b> Official documents, Official websites	Interview Respondents /Official documents/ Official websites	(Folke et al. 2007, Koppenjan & Klijn, 2004, Klijn, 2008)
	1.7: Institutional provisions	1.7.1: Formal rules 1.7.2: distinguished informal rules 1.7.3: organizational constructions	1.7.1: text/speech 1.7.2: text/speech 1.7.3: text/speech	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews <b>Secondary:</b> Official documents, Official websites	Interview Respondents /Official documents/ Official websites	(Ostrom, 1986, Burns & Flam, 1987, Klijn, 2001, 2008, Koppenjan & Klijn, 2004)
	1.8: Information	1.8.1: way of information gathering	1.8.1: text/speech	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews <b>Secondary:</b> Official documents, Official websites	Interview Respondents /Official documents/ Official websites	(Ostrom, 1986, Burns & Flam, 1987, Klijn, 2001, Koppenjan & Klijn, 2004, Klijn, 2008)
	1.9: Values	1.90.1: Clarity of Values	1.90.1: text/speech	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews <b>Secondary:</b> Official documents, Official websites	Interview Respondents /Official documents/ websites	(Ostrom, 1986, Burns & Flam, 1987, Klijn, 2001, Koppenjan & Klijn, 2004, Klijn, 2008)
	1.10: Perception Patterns	1.10.1: Perceptions of actors 1.10.2: Difference of perceptions 1.10.3: Obstacles due to Differences	1.10.1: text/speech 1.10.2: text/speech 1.10.2: text/speech	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews	Interview Respondents	Bodin & Nohrstedt, 2016, Cumiskey et al., 2019, Folke et al. 2007, Klijn, 2001, 2008, Koppenjan & Klijn, 2004)
<b>2. DV: effectiveness of Flood Risk Mitigation</b>	2.1: Direct Loss	2.4.1: Total annual financial loss in U.S. Dollars	2.4.1: amount in any currency	Objective	<i>Quantitative</i> <b>Primary:</b> Semi-structured interviews <b>Secondary:</b> Official documents, Official websites	Interview Respondents /Official documents/ Official websites	
	2.2: Lives Lost	2.5.1: Total number of human deaths due to floods	2.5.1: number(s)	Objective			
	2.3: Flooded Area	2.6.1: Total flooded area	2.6.1: number(s)	Objective			(Tapsell et al., 2008, Wallis et al., 2009)
	2.4: Perception of effectiveness of Flood Risk Mitigation	2.4.1: Expert opinions on how EFRM is measured	2.4.1: text/speech	Subjective	<i>Qualitative</i> <b>Primary:</b> Semi-structured interviews	(Wallis, et al., 2009)	

### **3.3 Data Collection and Analysis**

#### **3.3.1 Instruments and Analysis**

Primary qualitative data is collected through the instrument of semi-structured interviews from organizational actors and experts involved in NFPP-IV. Secondary qualitative data is retrieved from published official project documents, which not only provides contextual project specifics but also helps in assessing and validating information collected from primary data. The combination of both methods also helped check certain facts and conduct triangulation of data to increase validity (Van-Thiel, 2014).

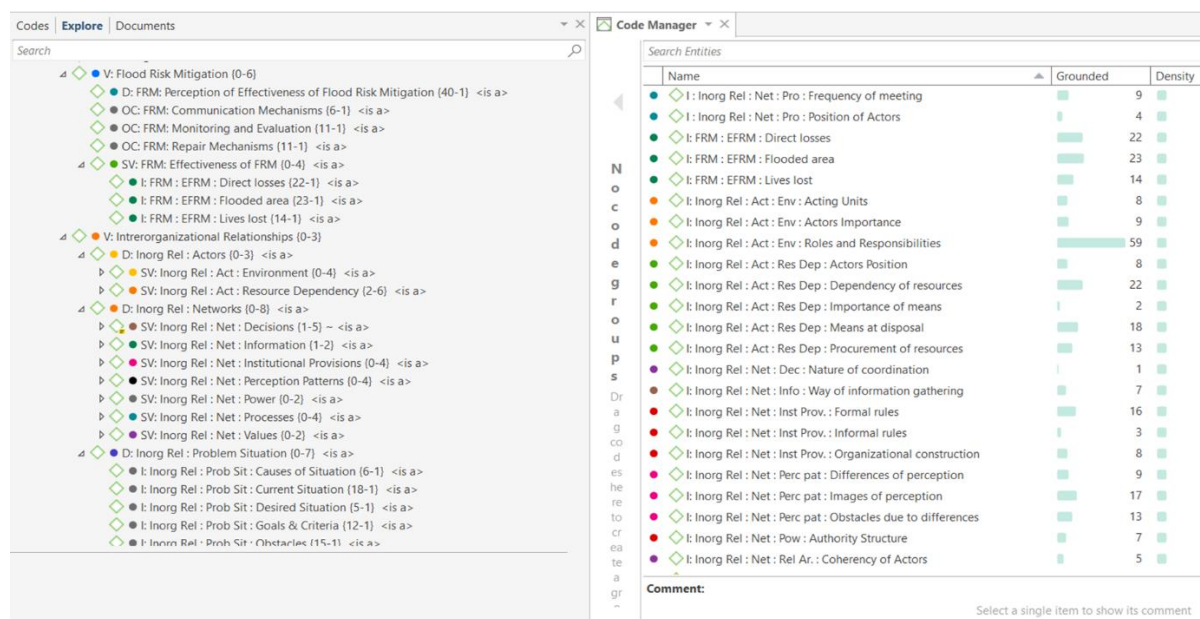
Interviews as an instrument are used in this research to collect non-factual information and data, since this instrument visualizes perceptions and beliefs about the topic of research (Van-Thiel, 2014). Factual information was cross-referenced by secondary data. Semi-structured interviews for data collection support the case study strategy, as the format of semi-structure interviews allows not only flexibility in collecting data but also provides the element of going into detail and finding unexpected information that was not previously included. Furthermore, since this study required an in-depth understanding of how both the variables of IRs and EFRM relate to each other, the data collection method chosen should take this into account. Interview guides provide crucial guidance for detailed conversations. Therefore, to conduct interviews, an interview guide was developed (see interview guide, Annex 2) to maintain a loose order in the conversation, but more specifically to ensure that all the questions cover the topics in operationalization of variables of the research. Suggestive or leading questions should not be asked in the interview to focus on the respondent's true experience and insights (Van-Thiel, 2014), hence specific attention was paid to use clear, unambiguous, and nonsuggestive language. Moreover, the interview guide was structured and adapted using components of frequently used interview instruments related to analysing IRs constructed in literature by Klijn (2008). Several parts and not the entire structure was adapted because Klijn, (2008) states that it is not always necessary to perform all the analytical steps and the researcher can restrict themselves and choose elements that are relevant to the scope of the research,

Primary qualitative data is collected by conducting semi-structured interviews. Since the researcher could not travel to Pakistan due a global pandemic, and the resources devoted are limited, the efficiency of data collection is a key element in this research. To allow the researcher to analyse the qualitative data with concentration, ensure accuracy of content, account for translation due to a different language, and to sort the information gathered, the



interviews were recorded and transcribed using a recording and transcribing application software (Otter). The primary and secondary qualitative data was analysed using Atlas Ti software, a tool that is acclaimed for qualitative analysis. The software has enabled the researcher to assign codes in accordance with operationalization of variables. After the coding, the analysis is done through using analysis query tools, co-occurrence tables, generating reports, network maps and other outputs to formulate conclusions based on the findings. The analysed data proved to be the core for interpreting the findings to address the research objectives, answer the research questions and formulate conclusions and recommendations. An example of coding using Atlas ti is provided below in Fig.12.

**Figure 12 Screenshot of coding sample from Atlas ti. Author, 2021**



Once the data was collected and uploaded to the qualitative software programme Atlas ti., the variables and indicators used in the conceptualization framework and operationalization table were used to code the data. Furthermore, Atlas ti. provides the researcher with the tool to search and code using words, combination of words and compounds, and inflected forms of a word. In addition to this, it also provides the option to perform Sentiment Analysis to scan the data for positive, neutral, and negative sentiments expressed in the data. Synonyms of the sensitizing topics and words were taken both from literature and from local language used within the geographical and cultural context to find linguistic connections to distil meaning and perform coding of the data. (See coding samples in Annex 1, Fig 30, 31, 32).

### 3.3.2 Sample size and selection

The choice of sampling takes into account scope and objectives of the study, research design, theoretical framework, access to population and circumstances such as financial resources and time constraints (Van-Thiel, 2014). To conduct a research study, it is not possible and feasible to collect data from all the units, hence a sample or a selection is made from the total population to collect data from, and then the findings could be generalized on a bigger population in reference to the context of the study (Bryman, 2012). Purposive sampling technique is used to select participants with the criteria that helps answer the research question, as it is also feasible for qualitative data collection (Van-Thiel, 2014). Snowball sampling is also used as a second method of sampling in this research to keep the possibility open for collecting further useful information through primary respondents that suggest or lead to other respondents. Since generalizing findings is not the primary goal of a case study design strategy, snowball sampling is considered as a suitable option to reach out to other knowledgeable respondents and get rich insights. To collect data, recommendations from literature were used as a guidance. The construction of the formal rules and organizational arrangements can be done through analysis of official documents, however, reconstruction of informal rules require in-depth interviews. All of these in turn help determine rules that actors follow and establish within the policy practice in networks for exchange of information and resources (Ostrom, 1986) (Burns & Flam, 1987). The unit of analysis for this study are the actors/organizations involved in FRM in Sindh, Pakistan.

To select the optimal size of a non-probability sample, the sample size cut off depends upon when saturation is achieved, and no distinctive or new information is recorded any further. This is appropriate for qualitative data collection, and also aligns with a research strategy that does not seek to generalize findings (Van-Thiel, 2014). Therefore for collecting primary data, fourteen semi-structured interviews were carried out in total, ten with high level government officials and ministers that formulate and implement policy processes in the field of FRM in Pakistan. Official documents related to NFPP-IV were used to establish a preliminary list of actors and later snowballing was used to collect data from relevant organizational actors and experts. Four experts including one journalist were also interviewed who have exceptional knowledge of the FRM and disaster management projects. A detailed list of all the respondents is given in Annex 2.

### **3.4 Ethics, Reliability, and Validity**

To gain access to respondents and gather data that is ethically sound, this research addresses the issues of ethics in several ways. The data collection phase ensured complete confidentiality to respondents to confirm that they are not identifiable by using pseudonyms and safeguarding anonymity so that no harm occurs. Furthermore, compliance with the data protection act and encrypted data storage platforms are used. Study information sheet and informed consent forms were circulated in written before conducting interviews. (Van-Thiel, 2014) (Bryman, 2012)

Reliability is a twofold dimension, often assessed in terms of accuracy and consistency of case study findings. The open design of case study can potentially reduce the reliability of findings. However, it was increased by developing a case-study-protocol; having transparency in the design, collecting, and analysing of data in a systematic manner through clear documentation of all the steps, and developing a data base to be used for review. (Van-Thiel, 2014) (Yin, 2008)

Case Study design research has low external validity as the findings are based on the context and hence not generalizable. Moreover, internal validity might also be low as the findings are usually based on the interpretation of the researcher (researcher bias) and there could be other variables as well not included in the research that might explain the phenomenon, or the participants could be pushed to give socially desirable answers (respondent's bias). Low internal validity and reliability of case study design is countered by performing triangulation, which is a verified way of increasing reliability and validity and mostly used in qualitative research. (Van-Thiel, 2014) The study employed triangulation in the operationalization phase by using various measures per indicator and to data sources where data is collected through combination of different methods and sources (interviews, textual analysis etc), to be consistent across the case.

### **3.5 Challenges and Limitations**

The main challenge faced during this research was during data collection. To gain access to respondents from another time-zone and continent during a global pandemic, with most people working from home, the travel restrictions in place did not allow to conduct in-person

interviews. This challenge was addressed by conducting interviews online using the application of Zoom and through direct phone calls.

As the interview was designed to collect qualitative and subjective data, there was a challenge to avoid a respondent's bias due to the political sensitivity of the governance structure and most of the respondents being government officials at high level positions. This challenge was addressed by conveying the data privacy methods and ethics followed by the researcher at the start of each interview, to ensure their anonymity. Furthermore, due to the qualitative nature of the interview, to ensure coherency between the questions asked and responses given, clear, straightforward, and unambiguous language was used. A limitation confronted by the researcher was when respondents would shift from speaking in English to the official language of the country, Urdu. Although the researcher is fluent in the native language of the country, yet reliance on translating and interpreting the subjective content of interview discussions limits data analysis.

## Chapter 4: Research Findings

This chapter focuses on the description of the case study and a presentation, analysis and discussion on the data collected both through primary and secondary sources analysed.

### 4.1 Case Study

#### 4.1.1 Background of FRM in Pakistan

Pakistan's FRM system constitutes of flood policies, flood strategies, flood laws, flood intuitions, flood planning and flood management measures. The flood risk management policy in Pakistan is currently in a draft form, yet to be approved and implemented as National Water policy. The flood strategies consist of flood planning, flood preparedness and post-flood operations. The flood management laws are lacking where legal issues related to floods are addressed by existing water laws (G1).

Flood institutions in Pakistan are grouped under two main categories; the first consists of FRM organizations that implement structural and non-structural measures and the second is flood crisis management organizations that deal with rescue, relief, and rehabilitation. There are five critical *actors* of FRM ; on federal level i) Federal Flood Commission (FFC), that develops and directs implementation of National Flood Protection Plans (NFPP's), ii) Pakistan Meteorological Department (PMD), which deals with flood and rainfall forecasting and warning, iii) Water and Power Development Authority (WAPDA), which performs planning, development and operation of flood control infrastructure including collecting and providing hydro-meteorological data, iv) Pakistan Commission for Indus Waters (PCIW) which is in interacts with India for gathering information about trans-boundary streams, and on a provincial level, v) Provincial Irrigation Departments (PIDs), of all four provinces that are responsible for construction, operation, maintenance and management of flood control infrastructures in their respective territories. There are six critical actors for Flood crisis management; on a federal level, i) Federal Relief Commission (FRC) to manage relief operations, ii) National Disaster Management Authority (NDMA) that supervises and directs rescue and relief activities, iii) Pakistan Army (PA) which helps institutions for rescue and relief activities, and on provincial level iv) Provincial Disaster Management Authority (PDMA) for coordination with other provincial organizations and perform flood preparedness, rescue and relief, v) Provincial Relief Commission (PRC) to perform relief activities, and on a

district level vi) District Disaster Management Authority (NDMA) to conduct post flood rescue and relief.

### **4.1.3 Background of the Case Study**

Historically Pakistan faced mega-floods and super-floods in 1973 and 1976 which accelerated the concerns of the Government of Pakistan and policymakers, where they sat together and discussed the need for flood planning to avert these disasters, as these disasters cannot be completely avoided but with modern techniques and wisdom risks can be mitigated for mega events and disasters to occur. As a result, the National Flood Protection Plan NFPP was conceptualized (D1, D2, D3, D4). The Federal Flood Commission (FFC) formulated three National Flood protection plans from 1978 to 1998, as a solution to the problems. In 2010, there was a super-flood in Indus River causing a total loss of US\$10 billion, which is about one-third of the total loss until 2010 since the independence of Pakistan in 1947. FFC undertook NFPP-IV formulation in the aftermath of devastating floods of 2010 with a focus on both structural and non-structural measures for restoration and maintenance of existing flood protection works. For the preparation of NFPP-IV, NESPAK consultants were engaged along with the World Bank Funded Water Sector Capacity Building and Advisory Services Project (WCAP). The draft version of the resultant plan for the next 10 years was submitted in May 2015, as a joint effort in consultation and series of more than 100 meetings (G1, G2, E1, E4, D10) with all actors involved in Federal and Provincial government levels.

### **4.1.4 The Case of NFPP-IV**

#### **4.1.4.1 Ideal Situation: Goals and Objectives**

The NFPP-IV is conceptualized according to the following objectives (D1, D2, D3).

- i. Task A: To develop the NFPP-IV and PC1<sup>1</sup>.
- ii. Task B: To develop an inventory of the existing flood protection infrastructures and carry out benefit monitoring and evaluation of flood protection works.
- iii. Task C: To carry out Floodplain Mapping & Zoning.
- iv. Task D: To automate Flood Situation Monitoring and Reporting system.

Fig 36, 37 and 38 in Annex 1 are a pictorial representation of the structural and non-structural measures proposed under NFPP-IV.

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<sup>1</sup> PC-1 is known as a planning tool for the development and execution of any projects in the Government Departments of Pakistan

#### 4.1.4.2 Current Situation: Causes, obstacles, and revised goals

The NFPP-IV should be tackling current flood disasters in Pakistan. However, even after the massive 2010 floods in Pakistan, the plan approval was dependent on and delayed because of securing the huge budget of 332 billion rupees, all of which were stated in the PC-1<sup>2</sup> document. Respondent G1 at the FFC stated that there was changing levels of interest in approving the NFPP-IV between 2015 - 2017 because of the false flood-security signs of draughts and financial constraints, as a result -PC1 was not approved. Consequently, FFC further consulted with all the actors, revising the NFPP-IV and prepared a plan called the Federal Protection Sector Project-III (FPSP-III) reflecting priority projects initially stated in the NFPP-IV. In parallel some provinces based on their own individual requirements found donors and themselves implemented their schemes (G1, G3, G5, G6). After a delay of 5 years, the PC-1 of FPSP-III, now having a reduced budget of 95.98 billion rupees received initial approval in May 2017, as the funds available on national level by the NDMA were redistributed due to Covid-19. Although the implementation of the plan way delayed, the actors in FRM network were still implementing pervious schemes (G1, G2, G4, D3, D4).

*“In NFPP-IV a huge investment plan is involved, which delayed the project. And for every subproject funding is required not just through GOP but external resources as well. So, we did have fund at NDMA but unfortunately because of covid it got even more delayed” – (G3)*

Since funding is a major fuel of the project during its implementation, in previous NFPPs, the capital costs were arranged and provided by the Federal government, however for NFPP-IV according to CCI, the finance is on “50-50 sharing formula” (E1, E4). The approval of NFPP-IV and now FPSP-III encompasses identification and safeguarding the different provinces' vulnerabilities including Sindh, that was “not properly planned” and catastrophically damaged from the floods in the floods of 2010.

There are 5 main water resources in Pakistan running through the country's plains, originating from higher altitudes, and flowing due to snow melting and monsoon rains. The river Indus, Jhelum and Chenab are western rivers and rivers Ravi and Sutlej are eastern rivers, all of which supply water to the entire Indus Basin Irrigation System. The Indus catchment area owes its uniqueness to 7 of the world's highest peaks and largest glaciers. Additionally, the surrounding

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<sup>2</sup> PC-1 is known as a planning tool for the development and execution of any projects in the Government Departments of Pakistan.

areas of the ridge in Sindh Province where the Indus River flows are lower than the riverbed and outside of flood embankments, consequently restricting overflowed water to reenter it, causing exponential and persistently longer damages to many areas even after flood peaks lower. Since Sindh province is located at the tail end that drains out all the rivers, it is highly dependent upon properly planned measures in the upper areas of the province (Fig 11 & 12). There are 47 crucial vulnerable points identified across the Indus River for flood protection measures. (E1, E4, G3)

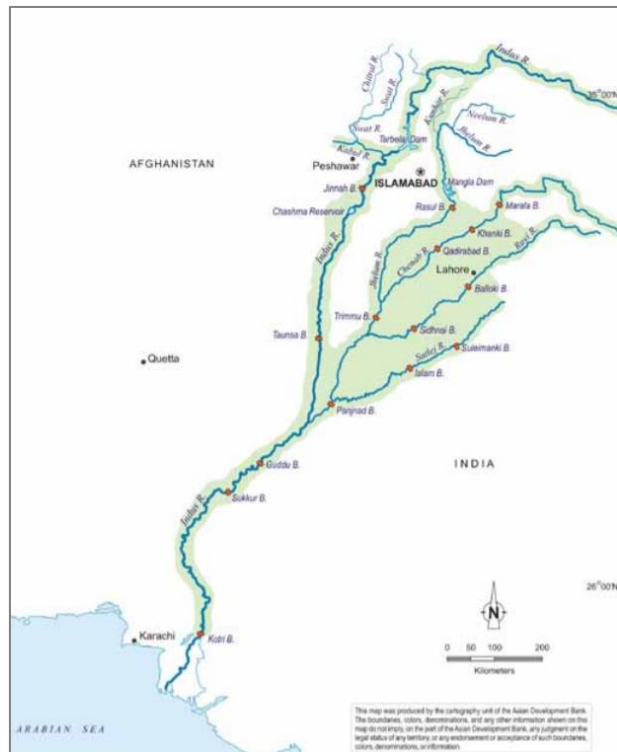
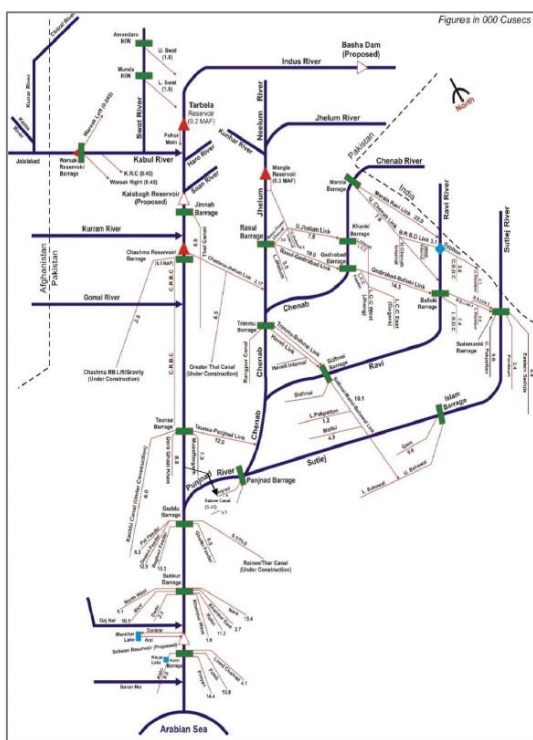


Figure 11 Schematic diagram of Indus Basin Irrigation System Figure 12 River Indus draining out at the tail end of Karachi, Sindh  
Source: (Akhtar, 2013) Source: (Akhtar, 2013)

For the purpose of this research, data of a singular urban area was not collected, rather the province of Sindh was considered, as the phenomenon under study is relevant to many urban areas.

## 4.2 Data Presentation and Analysis

In this section the research findings and analysis are outlined per variable according to the conceptual framework and operationalization table. In this research primary data was collected through semi-structured in-depth interviews and secondary data was collected through review of official documents, official websites, and relevant studies to support the analysis and to assist



in triangulating information about the case study. The data was coded deductively (Table 3) however while analysing the data a few inductive codes as open codes were also introduced.

**Table 3 Table of coding and quotations in Atlas ti. Source: Author 2021**

Variables	Sub-variables	Codes	No. of quotations
<b>Interorganizational Relationships IRs (Independent variable)</b>	Environment	Acting Units, Actors Importance, Roles & Responsibilities	76
	Resource Dependency	Means at disposal, procurement, dependency, importance, actor positions	69
	Power	Authority Structure	38
	Processes	Frequency of meeting, contact pattern, position of actors	18
	Decisions	Nature of coordination	01
	Relevant Arenas	Decisions made, interaction, coherency	44
	Institutional Provisions	Formal & informal rules, org. construction	31
	Information	Way of info gathering	07
	Values	Clarity of values	09
	Perceptions	Images, differences, obstacles	40
<b>Effectiveness of Flood Risk Mitigation EFRM (Dependant Variable)</b>	Direct Loss	Direct Loss	22
	Lives Lost	Lives Lost	14
	Flooded Area	Flooded Area	23
		Perception of Effectiveness of FRM	40
<b>Open Codes</b>	Monitoring & Evaluation	Monitoring & Evaluation	11
	Communication Mechanisms	Communication Mechanisms	06
	Repair Mechanisms	Repair Mechanisms	11
<b>Total</b>			<b>460</b>

While conducting the research and analysing the data a very crucial finding surfaced that due to the complex interconnectivity between various variables and sub-variables, they cannot be understood in isolation. Because of this the discussion of the findings is structured both alongside answering the research questions and interpreting the linkages of the variables with each other. However, the research findings of each variable and sub-variable respectively are presented and discussed per variable according to the conceptual framework (in Chapter 2) in a systematic way, where first the findings of primary data are presented with the findings from analysis of secondary data that supports the former. A summary the variables is given at the end of this chapter.

The tools of analysis utilized are query tools, co-occurrence tables and network diagrams which illustrate interesting and important relationships between codes. The co-occurrence table (Table 4) below is a useful visual which shows some of the important codes and their relations around the sub-variables and specific indicators of interorganizational relationships and flood risk mitigation. The topmost co-occurring codes are highlighted and used as a main starting point in the data presentation and analysis given in the next section.

**Table 4 Co-occurrence Table extracted from Atlas ti. Source: Author, 2021**

		Effectiveness of FRM						Environment	Resource Dependency		Institutional Provisions		Perception Patterns	Decisions		Power
		Perception of EFRM	Direct losses	Flooded area	Lives lost	Monitoring and Evaluation	Repair Mechanisms	Roles and Responsibilities	Dependency of resources	Means at disposal	Formal rules	Org. const.	Images of perception	Decisions made	Interaction of actors	Authority Structure
Effectiveness of FRM	Perception of EFRM	0	7	10	3	9	7	23	18	3	8	6	8	17	10	16
	Direct losses	7	0	19	14	2	2	7	3	1	2	1	2	8	2	3
	Flooded area	10	19	0	13	2	3	9	3	0	3	1	3	6	2	3
	Lives lost	3	14	13	0	0	0	3	1	0	2	1	1	2	1	1
	Monitoring and Evaluation	9	2	2	0	0	2	9	1	1	0	0	1	3	2	4
	Repair Mechanisms	7	2	3	0	2	0	6	5	0	2	1	3	3	1	2
Environment	Roles and Responsibilities	23	7	9	3	9	6	0	23	7	11	9	6	11	4	20
Resource Dependency	Dependency of resources	7	3	3	1	1	5	23	0	6	15	7	4	3	1	23
	Means at disposal	3	1	0	0	1	0	7	6	0	1	1	2	3	1	12
Institutional Provisions	Formal rules	8	2	3	2	0	2	11	15	1	0	3	1	9	10	9
	Organizational construction	6	1	1	1	0	1	9	7	1	3	0	2	5	9	6
Perception Patterns	Images of perception	8	2	3	1	1	3	6	4	2	1	2	0	6	1	6
Decisions	Decisions made	17	8	6	2	3	3	11	3	3	9	5	6	0	18	22
	Interaction of actors	10	3	6	4	2	1	5	1	1	10	9	1	18	0	11
Power		16	3	2	1	4	2	20	23	12	9	6	6	22	11	0

## 4.2.1 Interorganizational Relationships

The starting point of collecting data for this variable was from the dimensions of actors that form these networks, conducting an actor analysis and network analysis respectively. Both these dimensions were measured qualitatively and subjectively.

### Dimension 1: Actor Analysis

The sub-variables covered under the first dimension are *diversity of actors* and *resource dependencies*.

#### 4.2.1.1 Sub-variable 1: Diversity of Actors/Environment

This sub-variable aims to formulate the Environment of the network to understand which actors need to be considered. Interorganizational theory conceptualizes the environment to be a set of organizations that formulate relationships. The data is measured through the three indicators of *acting units involved*, their *importance in realising policy goals* and their *roles and responsibilities*.

The description given by the interview respondents helped generate a network actors inventory. This data was supported by analysis of official documents to create a list of all the actors involved for the implementation of FRM plans in the province of Sindh, Pakistan. Furthermore, the indicators of *importance in realising policy goals* and *roles and responsibilities* were used

to collect data about the network actors which have an importance and interest in finding a solution to the problem situation which was evident from the roles and responsibilities that they carry. From using query analysis tool in Atlas ti., reports were generated. This data was collected through the following no. of quotations as depicted in Table 5.

**Table 5 Code and Quotations of DOA/E extracted from Atlas ti. Source: Author, 2021**

<b>Diversity of Actors/ Environment</b>	Acting Units	08
	Importance in realizing policy goals	09
	Roles and responsibilities	59

Table 6 presents the inventory list and helps identify the responsibilities of these actors and their importance within the network.

**Table 6 Actors Inventory list extracted from data collected Source: Author, 2021**

Importance/ Interest	Acting Units	Roles and Responsibilities	Level
<b>High</b>	<b>MOWR</b> Ministry of Water Resources	consists of 5 Wings (Admin, Water, Hydro Power, Project, and Finance), 4 Departments (IRSA, WAPDA, CEA/FFC and PCIW). Approving sub-projects scrutinized by the SC at FFC and allocating budget.	National
	<b>FFC</b> Federal Flood Commission	Operating under MOWR, Preparation and coordinate NFPPs including technical scrutiny and approval to PID schemes, Monitoring and Evaluation, oversee flood forecasting, warning, management, and research	National
	<b>PID</b> Provincial Irrigation Departments	Development, construction, implementation, and maintenance of flood protection infrastructure.	Provincial
	<b>PMD</b> Pakistan Meteorological Department	A technical and service department in the fields of meteorology, hydrology, and seismology.	National
	<b>FFD</b> Federal Flood Division	Data processing, modelling, monitoring, forecasting and warnings. Collection of data from World Meteorological Organization, India, WAPDA and PID.	National
	<b>FWC</b> Flood Warning Centre	Compilation of forecasts from FFD and transmission of flood warnings.	National
	<b>WAPDA</b> Water and Power Development Authority	Planning, development, and operation of infrastructure to control flooding. Collecting hydro-meteorological data including river and rainfall from telemetric system installed	National
	<b>IRSA</b> Indus River System Authority	Coordinates with India regarding the flooding which takes place in the trans-boundary streams.	National
	<b>PCIW</b> Pakistan Commission for Indus Waters		National
	<b>External Donors</b>	Main function of external doners are technical assistance and funding resources.	National/ International
<b>Medium</b>	<b>NDMA</b> National Disaster Management Authority	Rescue & Relief operations. Preparation, implementation and assistance to provinces and districts of national disaster management	National
	<b>PDMA</b> Provincial Disaster Management Authority	Disaster preparedness, emergency response, post-disaster activities including	Provincial

		rehabilitation and reconstruction and give directions to District Disaster Management Authorities (DDMAs).	
	<b>DDMA</b> District Disaster Management Authority	Rescue and Relief functions at the District and Tehsil/Union Council level	District
	<b>PA</b> Pakistan Army	Participation in pre-flood inspections of infrastructure. Assistance to civil authorities in rescue and relief operations	National
	<b>NESPAK</b> National Engineering Services Pakistan	Consultant for Engineering Solutions of Flood Protection Infrastructures.	National
	<b>WASA</b> Water and Sanitation Agencies	Carries out site survey and prepare plans for dredging/desilting of drainage channels.	Municipal
<b>Low</b>	<b>NHA</b> National Highway Authority	Clearance and cleaning of highways, preparing contingency plans for monsoon season	National
	<b>PR</b> Pakistan Railways	Clearance and cleaning of railway tracks, preparing contingency plans for monsoon season	National
	<b>CCI</b> Council of Common Interest	The CCI ensures the equitable distribution of water among the provinces. It formulates and regulates policies and reports to the Parliament. The role of the CCI in flood management, however, is limited.	National
	<b>MoCC</b> Ministry of Climate Change	Prepare national climate change policy, Prepare, and mobilize Pakistan Nationally determined contributions NDCs and coordinate with UNFCCC.	National
	<b>IRI</b> Irrigation Research Institute	Physical Modelling of floods and floods structural measures	National
	<b>DDWP</b> Developmental Department Working Party	Clear and approve schemes under a certain allocated budget.	National
	<b>CDWPR</b> Civic Development Working Party	Clear and approve schemes that are over the budget of DDWP	National

The data collected revealed that the FRM system is governed by Federal, Provincial and Municipal organizations that have a very specific set of roles and responsibilities assigned to them (Table 7). It is observed that organizations at the federal level are more important in overseeing policy goals of FRM frameworks. On the level of importance and interest in finding solutions to policy implementation, FFC (operating under MOWR), PIDs, FFD (operating under PMD),, FWC, WAPDA, IRSA, PCIW, and External donors are highly critical actors, NDMA, PDMA, DDMA, PA, NESPAK and WASA are of medium importance whereas CCI, MoCC, NHA, PR, IRI, DDWP, and CDWPR have little involvement in the implementation of FRM frameworks. In this network of actors or organizations the FFC is the central body operating under MOWR. (G1, G2, G3, G5, G6, D8, D10)

*“Flood Management Wing/ FFC is a multistakeholder platform. It brings together all relevant organizations from federal and provincial levels to one forum. It provides a coordination mechanism that would otherwise be absent in water sector policy making and project implementation.” (G8)*

Based upon the implementation of NFPP-IV, there are three main functions of the FFC. First is to prepare the National Flood Protection Plan every 10 years. (G1, G3, G8, D1, D2, D3, E2),

then to provide technical clearance of the sub-projects and lastly to monitor and evaluate the progress of the implemented schemes and provide recommendations accordingly. The second most important actors are the Provincial Irrigation Departments or the PIDS, which prepare the PC1 documents including cost estimation according to the sub-projects of NFPP (G1, G3, G5, D1, D2, D3).

From the data collected, it is recorded that PID’s are responsible for implementation and maintenance of the approved schemes.

*“Once the structure is completed, then the responsibilities rest with the provincial governments, meaning the running and maintenance is the responsibility of the respective provincial government.”*

(G3)

Parallel with the PIDs, Pakistan Meteorological Department PMD and WAPDA are important actors that work as the main technical and service department and provide services mainly in the fields of meteorology, hydrology, and seismology (G2, G6, D1, D2, D4). According to the data extracted from interviews and secondary sources, we find the sub-variable of roles and responsibilities in IRs co-occurring with the sub-variables of EFRM (Table 7). It is also interesting to see how sub-variables of IRs relate with each other (Table 8).

**Table 7 Co-occurrence table of Roles and responsibilities with DV, extracted from Atlas ti. Source: Author, 2021**

	Perception of EFRM	Direct losses	Flooded area	Monitoring and Evaluation	Repair Mechanisms
Roles and Responsibilities	23	07	09	09	06

**Table 8 Co-occurrence table of Roles and responsibilities with other sub-variables, extracted from Atlas ti. Source: Author, 2021**

	Dependency of resources	Formal Rules	Decisions made	Actors Position
Roles and Responsibilities	13	11	11	07

An important finding through the co-occurrence tables on this sub-variable is the way ‘conflict resolution’ draws on the *roles and responsibilities* of the critical actors, linking it with *clarity of values* through power dynamics in the *authority structure* of the network, within their institutional provision of *organizational construction*, hence effecting FRM.



the process of dependencies and exchange within the FRM network, that are discussed in the next section.

#### 4.2.1.2 Sub-variable 2: Resource Dependency

#### 4.2.1.3 Sub-variable 3: Power

The sub-variable of resource dependency aims to identify actor positions and dependencies. It is measured through 5 indicators; means at disposal, importance of means, procurement of resources, dependency of resources and actor positions for these means. The possession of resources are directly associated to having power, which is a crucial concept in interorganizational theory. Therefore, the data related to these two sub-variables and analysis are reported together. The sub-variable of power was used to collect data on how power to utilize resources is distributed within the network from the indicator of *authority structure* in the network.

The table 9 shows the no. of quotations recorded in the data for each indicator.

**Table 9 Code and Quotations of Resource Dependency and Power extracted from Atlas ti. Source: Author, 2021**

<b>Resource Dependency</b>	means at disposal	18
	importance of means	02
	procurement of resources	21
	dependency of resources	30
	actor positions	08
<b>Power</b>	Authority Structure	07

The respondents interviewed were questioned about the means they have at their disposal, how important are the means and whether they could be acquired elsewhere, whether there is a unilateral or mutual resource dependency, whether the procurement of resources is direct and/or indirect, the position of actors regarding the resources as critical/dedicated and /or comparable and the authority structure of power within the network to disseminate resources. It was observed in the data that all the actors come together to develop a pool of resources that are shared according to *power* distribution within the network and *institutional provisions* in place like *formal rules*, *informal rules*, and *organizational construction*. This pool of resources includes rules and policy, funding, technical information, technical scrutiny, advice and technical support, equipment and materials, human resources, monitoring and evaluation

mechanism, report of activities, recommendation reports, technical manuals, technical information including flood forecasting and other data.

A very significant finding from the data is the interdependencies that interorganizational actors experience while procuring the resources of funding. There is a clear authority structure when it comes to power and dissemination of resource (G3, E1), where both the federal level (FFC, under MOWR) and provincial level have a certain allocated budget to approve schemes. (G1, G2, E4, D1, D10). Additionally PSDP is a dedicated authority for developmental work and it is important to reflect all the funds in PSDP, irrespective of the source of funding, as funding cannot be given out without it (G3, D8). So, the Provincial governments and PIDs are dependent upon these federal funds procured indirectly through MOWR to initiate implementation of their schemes, this is a critical resource and cannot be acquired from anywhere else.

The respondents from FFC further elaborated if the financial needs of the PIDs' schemes are above their allocation limits, then their needs for additional resources are communicated to the Ministry where they either make re-appropriation of funds or try to explore some other financial window (G1, G3). It is interesting to note here that data from secondary sources as analysed through official documents specify that one of the major issues in implementing NFPP's are the Financial Gaps within the FRM system (D10). The resources of technical scrutiny, advice, and technical support to the PIDs are provided by the FFC, which also monitors the entire flood forecasting on a national level, makes reports and recommendations and communicates the changes shared by all PIDs to the MOWR. (D4, D1, D8, D10, G3, G8)

*"We visit schemes and based on those visits, we have the subsequent visits to check if our earlier recommendations have been implemented or not. Further we must see all the aspects starting from honesty, competency, and corruption related issues. We must judge and document all these things.*

*And then, based on this, we can say how effectively a plan was implemented." (G3)*

FFC has also played a pivotal role in improving the National Flood Forecasting & Warning System, and River Telemetry where resources were procured for PMD (FFD) under the umbrella of NFPPs of FFC (D8). Additionally, coordination between FFD and WAPDA is considerably important as WAPDA has a lead role in providing hydrometric flood data of the whole river network in Pakistan (D5, D9). PIDs, in their own jurisdiction are responsible for dissemination of funds, executing the project, monitoring, and controlling, providing report of activities, and arranging material and equipment from pre-defined sources (G4). For the procurement of materials, equipment, and extra technical staff, the PIDs have the power to



source these themselves through provincial departments or other dedicated bodies, according to a source manual called the “Bund (Dijk) Manual (G3, G4, E3, D7, D8).

Interview with the respondents from PID Sindh based in Karachi revealed that when an unprecedented flood occurs the information is received by them only 8-10 days before the expected event, having a reliability for only 2-3 days. The IRs during these events are attributed to immediate procurement of resources. Respondent G4 from PID Sindh further elaborated that in urgent situations like these when extra human resources are needed, PIDs rely on the police, rangers and army during flood season, the possible need is communicated in pre-flood meetings by all actors. In this matter, the lead role is from PIDs, because of being a technical implementing authority. Community involvement is also done where local people are hired based upon their knowledge of the area. If extra resources are needed for example for drainage, then they have technical staff, chief engineers, and executioners at hand to appoint and shift to the sites according to changing needs (G2, G3, G7, E1, E2, D7). The PIDs are also dependent on the PCIW, that receives cross border information of river flows originating from India, based upon their IRSA card. The PCIW is also a critical actor for receiving and accessing all information regarding flood flows from India. However sometimes the information is not received on time and they must procure it from other sources which causes delays and increases risks.

The data from secondary sources also pointed out the technical Gaps faced by the networks in the implementation of flood protection works. These technical gaps are; limited real-time data availability, lack of information on monsoon forecasts, less reaction time to flashy streams, low standards for embankments and barrages and poor maintenance, monitoring and repair (D8). The analysis on data collected for the sub-variable of resource dependency indicated high co-occurrences (Table 10) with perception of effectiveness of flood risk mitigation (6), power and several indicators of actors/environment, Institutional provisions, decisions, and images of perception.

**Table 10 Co-occurrence table of Resource Dependency extracted from Atlas ti. Source: Author, 2021**

	Perception of EFRM	Power	Roles and Responsibilities	Formal Rules	Decisions made	Images of perception
Resource Dependency	18	28	23	18	16	8
Procurement of Resources	13	12	14	6	8	3
Means at disposal	12	10	7	4	4	4
Power	16	0	5	9	22	6



based upon which the PIDs make their flood protection schemes that are processed for approval by the competent forums (G1, G4, G7, E1). Based upon this decision, Punjab province has more means at disposal and because of these differences that exist time and again, where every province wants to be prioritized. Actors like WAPDA and all others function under a joint umbrella that coordinate with all the PID's to facilitate.

*“Since we have a lot of geographical variety that differs across all the provinces, Province of Punjab has its own point of view, and they are the ones who are the key stakeholders as well, but Province of Sindh is low-lying and more vulnerable to both floods and droughts.” (G7)*

The respondents at PID Sindh unanimously were of the view that the dynamics of resource dependency and power puts them at a comparative disadvantage than other provinces.

*“I feel like problems do occur in project conceiving and project implementation, because not all requirements of respective provinces are being met.” (E1)*

When trying to explore the reason behind this, the data also uncovered another important aspect. Based upon organizational construction, the function of provincial governments has been increased because of which their rights to procure resources starting from finances at federal level has lowered. Interestingly enough, enhancing the functions of provincial governments to operate at their hierarchical level has significantly reduced their power to influence at the national level (G4). When such differences arise, actors like FFC, WAPDA and all others function under a joint umbrella that coordinate with all the PID's to facilitate (G2, G4, G7, D1, D2, D7)) However, reflecting to literature in chapter 2, it is interesting to note here that public policy making within networks considers both cooperation or non-cooperation between interdependent actors, with diverse and often contradictory rationalities, interests, and strategies. Thus, the network approach to understand and manage complex problems allows for policy processes to be viewed as an interactive process that emerges because of actor interactions, information, preference, and means sharing, resource dependency and trade-offs, and disregards seeing policy processes as implementation of ex-ante formulated goals.

## **Dimension 2: Network Analysis**

The dimension of *networks* is operationalized through network analysis constituting the sub-variables of *power, processes, decisions, relevant arenas,, institutional provisions, perception*

*patterns, information, and values.* The sub-variable of power has already been reported in the previous sub-section.

#### 4.2.1.3 Sub-variable 3: Processes

This sub-variable maps the frequency and diversity of interaction of actors and hence enables the researcher to determine which actors belong where in the network through indicators of frequency of meeting, contact pattern and position of actors in the network in accordance with the contact pattern. Table 11 shows the no. of quotations recorded in the data for each indicator.

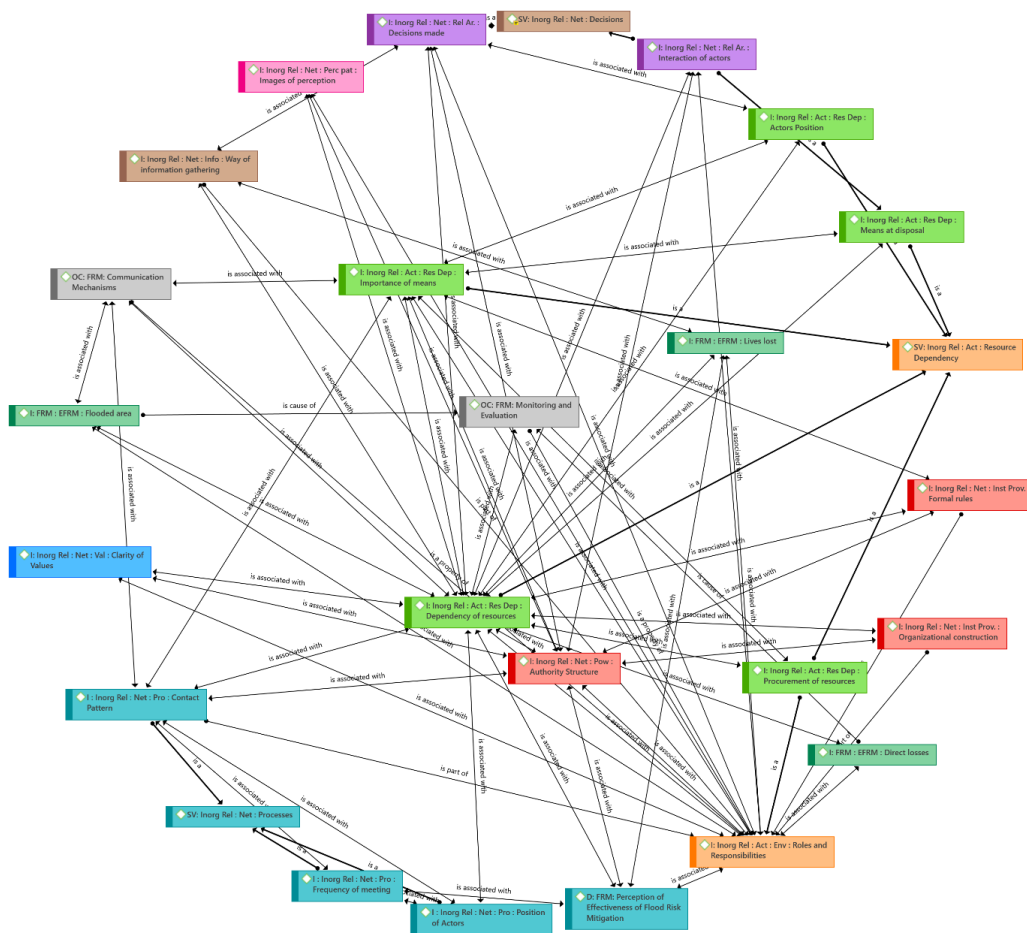
**Table 11 Code and Quotations of Processes extracted from Atlas ti. Source: Author, 2021**

Processes	<i>Frequency of meeting</i>	9
	<i>Contact Pattern</i>	5
	<i>Position of actors</i>	4

The interview respondents revealed that all organizations have separate internal meetings with the frequency of once a month regarding mega projects formulation, progress review with unvarying contact pattern (G1, G3, G8, E4, D1). In addition to these, the major centrality of exchanges for technical, financial, administrative approvals within the network occurs in the mandatory 4 annual meetings, 2 pre-monsoon season, one in monsoon season and the last in post-monsoon season attended by all the actors within the network (G4).

Respondent G4 at the FFC said that in addition to these, the FFC conducts 3 of their own meetings, 1st preparatory meeting, 2nd preparatory meeting, 3rd, and final annual meeting prior to start of monsoon season. In addition to these, regular progress review meetings are held by the FFC at a monthly and/or quarterly rate. D1 Regular meetings are also held at the office of General Manager (Planning & Design) during flood season where necessary instructions are issued to Dam Management Committees. D12

Figure 15 shows the network diagram of processes that visually places the codes of power and *resource dependencies* at the very centre of the network, showing how the centrality of exchanges within the network and contact patterns as coordination mechanisms are associated with resource dependency and power within the network, influencing the level of effectiveness of FRM.



**Figure 15 Network diagram of Processes showing relationships with other sub-variables extracted from Atlas ti.**  
**Source: Author, 2021**

A significant finding is how the IRs place the actors of FFC and PID at the very centre of the network where they work in close coordination with MOWR, FWC, PMD, FFD, PCIW, IRSA, WAPDA and donors for the implementation of FRM.

*“Then our coordination mechanism has improved a lot, because we believe that by proper coordination, we can avoid any damage or loss to public and private properties. Because no money is required for coordination, in fact timely decision-making is ensured through it, so it is very important.” G3*

Reflecting on literature, interorganizational analysis considers the relations between organizations in terms of developing coordination that is formed because of resource exchange between them (Levine & White, 1961) (Negandhi, 1975). Processes are an important element of IRS where policy processes navigate within the plurality of numerous actors with their separate goals, strategies, and interests to implement policy outcomes.

#### 4.2.1.4 Sub-variable 4: Decisions

#### 4.2.1.5 Sub-variable 5: Relevant Arenas

While analysing data it was observed that the sub-variable of relevant arenas and decisions were closely linked to each other where the former measured the coherency of actors during decision making in policy implementation issues and the latter measured the nature of coordination during decision-making, hence they can be better analysed when grouped together. Table 12 shows the no. of quotations recorded in the data for each indicator.

**Table 12 Code and Quotations of Decisions/RAs extracted from Atlas ti. Source: Author, 2021**

Relevant Arenas/Decisions	<i>Decisions made</i>	22
	<i>Interaction of actors</i>	09
	<i>Coherency of actors</i>	05
	<i>Nature of coordination</i>	1

Decisions determine the nature of coordination between actors within the network, The data from the respondents indicated that decisions within policy practice processes are made on various levels, depending upon the nature of the decisions to be made and their effect on the actors within the network. Policy processes where the outcome of decisions effect the entire network are made in a corporate manner where a joint authority structure is formulated which has a designated authority. FFC provides a multi stakeholder platform, where the provinces come with their schemes, issues, and additional demands, all of which are discussed, and the decisions are taken which seem to be viable mutually. (G1, G2, G3, G4). In this platform all the critical actors involved within the planning, irrigation, water and sanitation and flood works departments interact, since they have technical linkages with each other and there is a need to retain necessary resource flow before the monsoon season to keep the network updated (G10). The network of FRM operates under a clear authority structure to ensure coherency of actors, defined by their roles and responsibilities (G3, G9, D1). Respondent G4 from PID Sindh further elaborated that on provincial level the central authority to take decisions is the PID and on federal level it is the FFC.

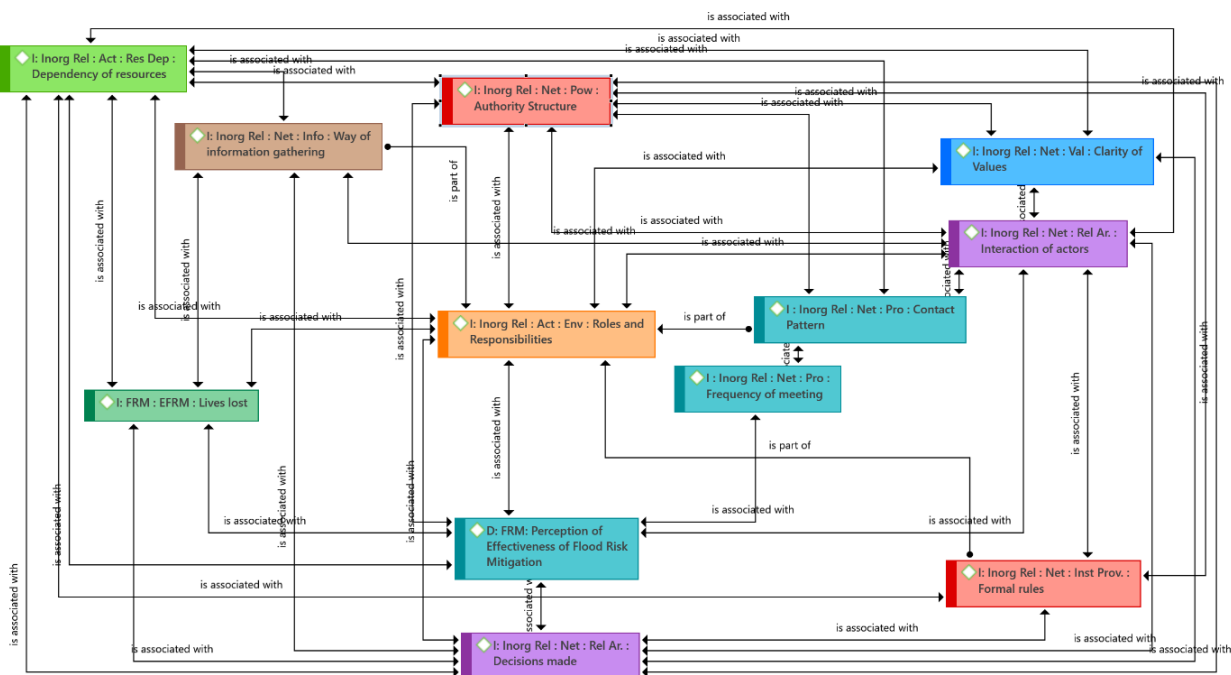
*“As a province, at PID, we always take the responsibilities within jurisdiction of our province and accordingly take measures. For doing this a very close coordination is practiced within the network between PID’s and FFC, specially during flood season”. G4*

While analysing the data from interview with the respondents and official documents, it was found that decisions within the network are only taken according to the corporate nature of

coordination with a central authority at both federal and provincial levels, the actors don't have other forms of coordination like mutual adjustment where organizations retain their autonomy and coordinate through voluntary informal rules or spontaneous interactions, or alliance where no authority exists and actors negotiate rules to coordinate. Table 13 and Fig 16 present the co-occurrence table and network diagram from the data analysis.

**Table 13 Co-occurrence table of Decisions extracted from Atlas ti. Source: Author, 2021**

	Perception of EFRM	Direct losses	Flooded area	Roles and Responsibilities	Dependency of resources	Formal rules	Power	Interaction of actors	Clarity of Values
Decisions made	17	8	7	12	14	9	22	18	7
Interaction of actors	10	3	6	5	10	5	11	0	6



**Figure 16 Network diagram of Decisions showing relationships with other sub-variables extracted from Atlas ti. Source: Author, 2021**

The most relevant finding from analyzing the data for decisions in the network, as shown in the co-occurrence table (Table 14) and Network diagram (Figure 19) is that the decisions made in the network of IRs are directly associated with the perception of effectiveness of flood risk mitigation, where decisions to maintain resource flow owing to the dependency of resources are taken in accordance to the power and authority structure within the network, driven by roles and responsibilities of actors within the network and the institutional provisions that define the

network’s formal rules. It further confirms actor interdependencies between decision making, clarity of values of the actors, the processes followed and the way of information gathering within the policy practice network

*“Once the project is approved according to the prevailing procurement rules at federal and provincial government level, all organizations are working in line with them, as there are already prescribed rules for procurement of any civil infrastructure of flood forecasting warning projects. For everything else that needs to be done and decisions that need to be taken, there are already defined procedures every department and organization follows.” G2*

#### 4.2.1.7 Sub-variable 7: Institutional Provisions

The sub-variable of Institutional provisions was measured by indicators of formal rules, informal rules, and organizational constructions relevant to policy implementation that connects actors in the networks. Table 14 shows the no. of quotations recorded in the data for each indicator.

**Table 14 Code and Quotations of Institutional provisions extracted from Atlas ti. Source: Author, 2021**

Institutional Provisions	<i>Formal rules</i>	16
	<i>Informal rules</i>	03
	<i>Organizational Construction</i>	08

The data collected from the interview respondents and official documents revealed that all the actors within the network follow formal rules and judicial procedures throughout the various stages of implementation of FRM framework. The organizational construction in the network that structure the policy process implementation consists of contractual obligations between the actors, meeting and consultation procedures, memberships on board (FFC membership and IRSA card holders), and interchange of personnel between organizations. (G1, G3, G4, G5, D1, D2, D10)

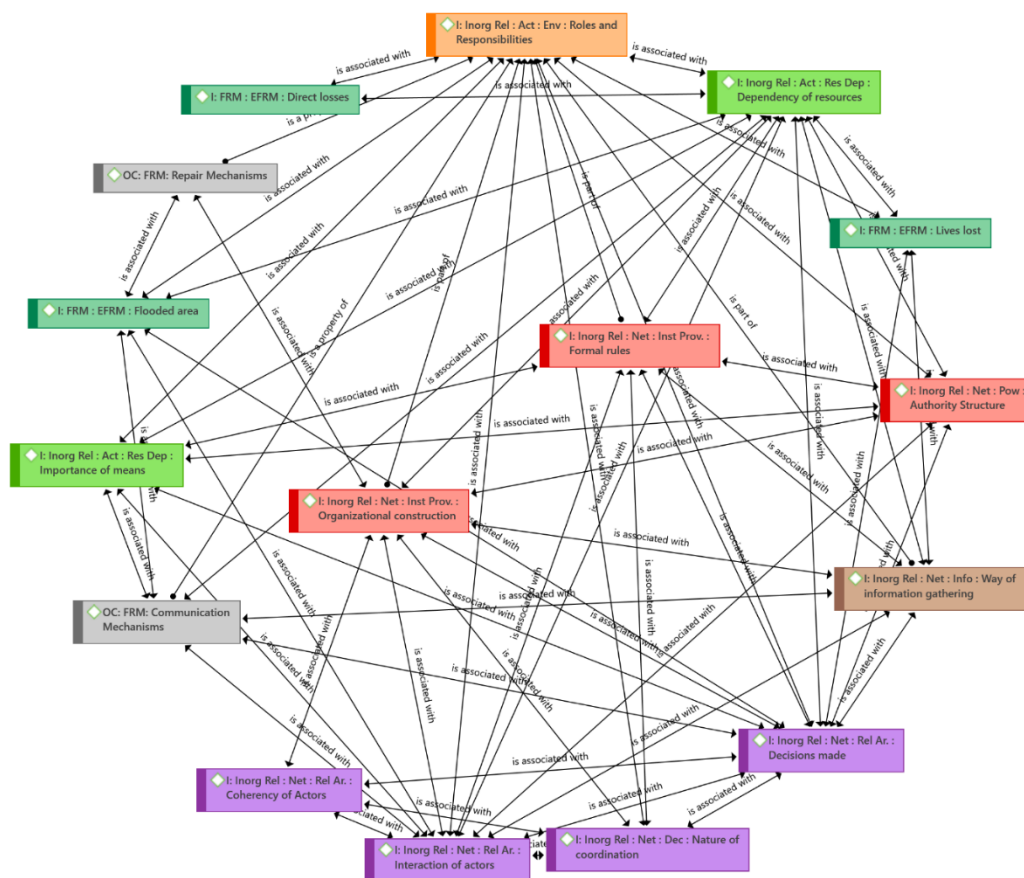
*“In these meetings the lead is done by the FFC, where the role of FFC is to call a meeting and the schemes are discussed. Because in the central pool we receive the funds and technical clearance, so all the provinces follow the same procedures where PIDs present their schemes and cleared by PDWP. We coordinate through meetings, reports, and other coordination throughout the season with the FFC.” G4*



The actors responsible for providing information of hydrometeorological data and for precuring all sorts of resources also must follow the formal rules of sharing information through the systems in place (E1, E3, D1). Some informal rules regarding information provision and communication within the actors were also identified where actors coordinate through WhatsApp and text messages. Table 15 and Fig 17 present the co-occurrence table and Network diagram respectively. The analyses revealed linages between the codes of institutional provisions with roles and responsibilities, dependency of resources, power and decision making.

**Table 15 Co-occurrence table of Institutional Provisions extracted from Atlas ti. Source: Author, 2021**

	Perception of EFRM	Roles and Responsibilities	Dependency of resources	Decisions	Power	Interaction of actors
Formal Rules	08	11	15	9	9	10
Organizational Construction	6	9	7	5	6	9



**Figure 17 Network diagram of Institutional Provisions showing relationships with other sub-variables extracted from Atlas ti. Source: Author, 2021**

Although the data collected shows following of strict formal rules for the preparation of flood protection works, however during the flood season there seem to be some major institutional gaps in terms of lack of coordination between federal and provincial departments during floods, lack of technical data sharing mechanisms among departments, lack of expertise and specialists in flood handling departments and. lack of definition of roles and responsibility in departments towards floodplain encroachments. This is because of the huge lapse of Floodplain Policies and Legislations where socially impoverished and vulnerable communities living along the rivers, engage in agricultural activities taking advantage of rich soil in riverbeds. This land mostly owned by the government by default comes under ownership of these communities due to land occupation, where they gradually build permanent settlements enforcing political pressure on the government to carry out development activities. As no firm policy prevents the encroachments of these floodplains, this land occupation restricts waterway to sustain flood waters causing breaches in flood protection structures (E1, F2, D1, D5, D10)

#### 4.2.1.8 Sub-variable 8: Information

The data for the sub-variable of Information was collected through understanding the system of gathering information as scientific, strategic, or power driven. Table 16 shows the no. of quotations recorded in the data for each indicator.

**Table 16 Code and Quotations of Information extracted from Atlas ti. Source: Author, 2021**

Information	<i>Way of information gathering</i>	07
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To collect data for this sub-variable, interview respondents from each organization were asked about the way of information gathering within their organization and within the FRM network. All the respondents unanimously acknowledge that there is a scientific and strategic way of gathering information within their organization and within the network. The provincial government and federal agencies are connected through various modes for communication of information. For scientific information sharing, the network for collecting hydro-meteorological data is installed and maintained by WAPDA, PID and PMD. There is a telemetry and telecommunication system through which relevant and urgent information regarding flood forecast and flood records is automatically shared with all actors within the network. (D3).

*“I feel like we have a very integrated and well-coordinated network that works on flood risk mitigation and most of the times we ensure that there is nothing lacking in our schemes.” G4*

For strategic information sharing regarding progress of schemes through monitoring and evaluation prepared by the PIDs and FFC is shared in monthly and annual meetings with all actors of the network. All information regarding the usage of financial resources used during the sub-projects for the implementation of FRM have transparency and are reflected in the PSDP funds (G1, G3, G5). In addition to this system, to ensure monsoon flood preparedness, information regarding flood data during the monsoon season is available from Daily Flood Situation reports weather advisory reports and significant flood reports that are published on official websites in addition to being shared with all the actors in the network. (G2, G5) For cross border data, the PCIW receives data from India once a day, that is processed by the FFD. (G1, G2, D1).

While analysing the data, the network diagram (Fig 18) displays associations of code of information gathering with various other codes. The linkages of information gathering with institutional provisions show that organizational construction and formal rules are followed within the network to share information. Because of these provisions and interaction of actors within the network, decisions are made to retain dependency of resources. These IR interdependencies play a role to ensure monitoring and evaluation and communication of information which are directly linked with lives lost and flooded area, sub-variables of effectiveness of FRM.

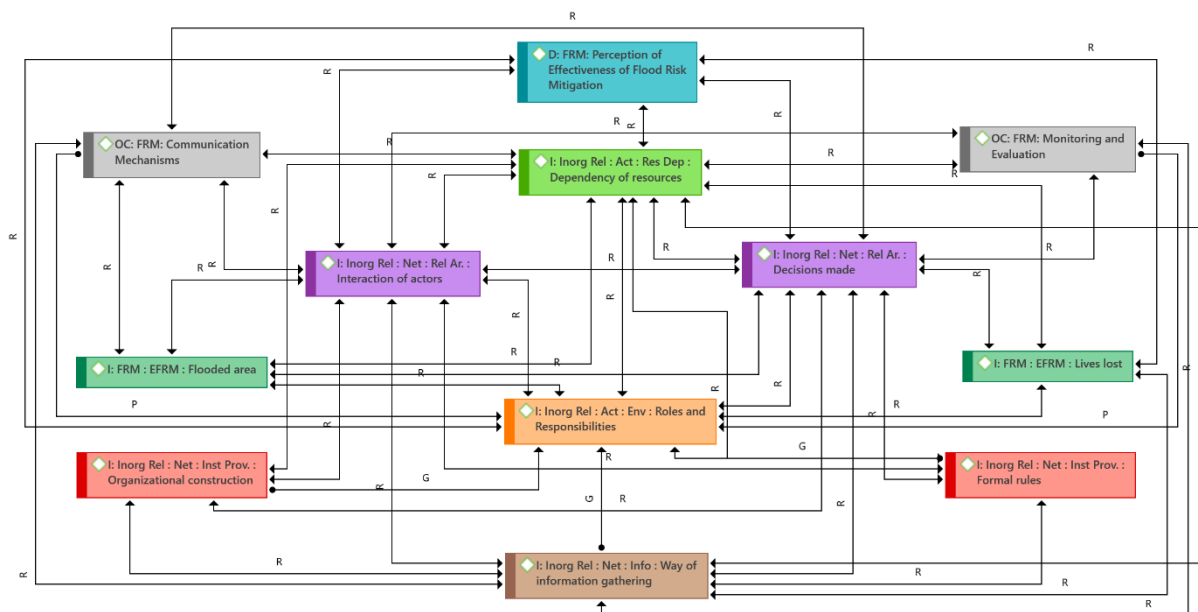


Figure 18 Network diagram of Information gathering showing relationships with other sub-variables extracted from Atlas ti. Source: Author, 2021

#### 4.2.1.9 Sub-variable 9: Values

#### 4.2.1.10 Sub-variable 10: Perception Patterns

The sub-variable of Values is measured through the indicator of clarity of values as either clear, ambiguous and/or conflicting. As indicated in literature (Chapter 2) it was observed throughout the analysis that this sub-variable is closely linked to perception patterns of actors. The indicators to measure perception patterns of the problems, causes and solutions are images of perception, differences of perception and obstacles due to perception. The table 17 shows the no. of quotations recorded in the data for each indicator.

**Table 17 Code and Quotations of Values & Perception patterns extracted from Atlas ti. Source: Author, 2021**

<i>Values</i>	<i>Clarity of Values</i>	<i>06</i>
<i>Perception Patterns</i>	<i>Images of perception</i>	<i>17</i>
	<i>Differences of perception</i>	<i>09</i>
	<i>Obstacles due to perception</i>	<i>13</i>

Clarity of values in IRs provide the direction towards which the actors move in terms of their objectives and goals while perception patterns translate values into a more relative preference over solution towards problems and policy outcomes. To align the strategies and goals of all the actors, the FFC has representation from all PIDs, rescue and relief organizations, and all other actors that have a stake in the implementation of NFPP. Under these forums the actors interact, and decisions are made that ensures clarity of values within the network. (D1). An interesting finding from the data was that on one hand conflict resolution, material, equipment, and manpower procurement (d4) and better coordination is practiced reducing risk to floods (D3) on the other, interview respondents also mentioned that “Planning is good, but implementation is difficult because there are so many bottlenecks.” D4.

*“In flood management there are very simple formulas for better management. No one can say otherwise. We are required to have resources for flood risk management, treatment of catchment areas and forecasting and warning systems. So why would any organization go against this objective or goal and say that this is not required or not to make flood protection facilities.” G5*

*“The repair and rehabilitation of flood protection works, especially during pro-longed dry cycle, suffers from a memory lapse that floods do occur. Meagre financial resources available and further miniscule allocation in the budget, makes it virtually impossible to keep the health of the protection works intact.” D1*

The data also revealed that flood fighting is more of a reaction than pre-emption within FRM implementation in Sindh, Pakistan. Flood management in various parts of the country is fairly a complex issue, due to the varying physiographic, climatic, demographic, and socio-economic conditions.

*“Despite a significant role and wide range of responsibilities, the local authorities are hampered by lack of preparedness due to shortage of funds and accurate forecasts and early warning because of which much of the flood words are carried out in the form of relief and that too by the Army.” (D1)*

## 4.2.2 Effectiveness of Flood Risk Mitigation (FRM)

In this research, Effectiveness of FRM is studied as a dependent variable to investigate and describe the extent to which aims of FRM are accomplished in Sindh, Pakistan. For the purpose of this research to collect data for effectiveness of Flood Risk Mitigation, variables related to tangibles and intangibles (Direct losses, Flooded area, Lives lost), are used, with sensitizing topics of monitoring and evaluation, repair, and communication mechanisms. Graphs, Co-occurrence tables, network diagrams and query tools in Atlas ti. were used to generate reports on the codes. This data was collected through the following no. of quotations as depicted in Table 18.

**Table 18 Table 6 Code and Quotations of EFRM extracted from Atlas ti. Source: Author, 2021**

Effectiveness of Flood Risk mitigation	Direct Losses	22
	Lives Lost	14
	<i>Flooded Area</i>	23
	<i>Perception of Effectiveness of Flood Risk Mitigation</i>	40
Open Codes, Meta data	<i>Communication Mechanisms</i>	03
	<i>Monitoring &amp; Evaluation</i>	11
	<i>Repair Mechanisms</i>	11

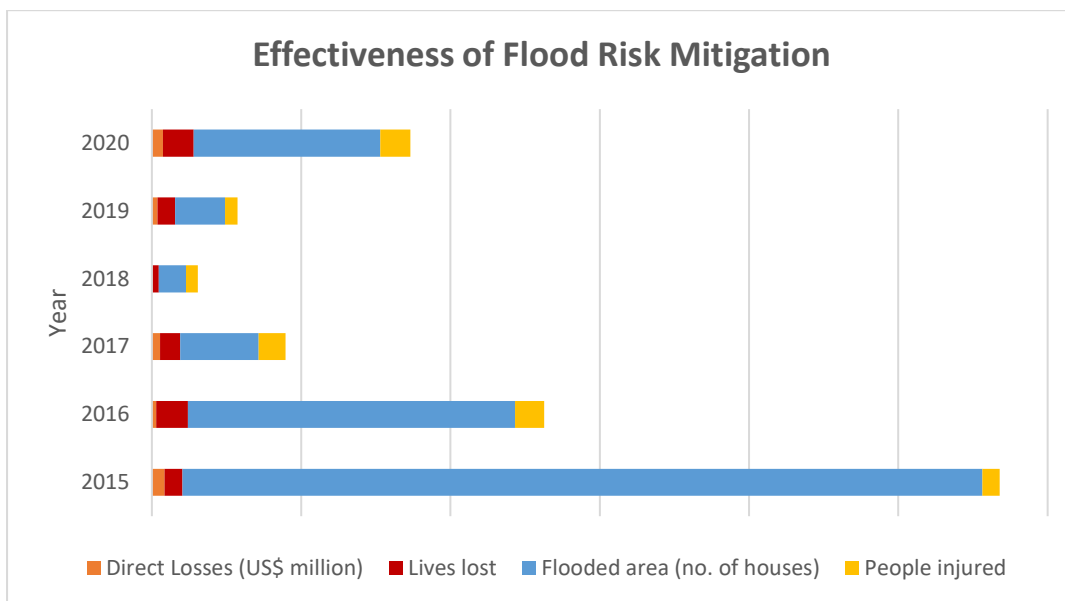
### 4.2.2.1 Sub-variable 1, 2, 3: Direct losses, Lives Lost, Flooded Area and Perception of effectiveness of Flood Risk Mitigation

The data collected for these sub-variables helped generate tables and graphs for the trend of change in direct losses, lives lost, flooded area and no. of people injured from 2015-2020 during

the implementation of FRM works. Although the implementation of the NFPP-IV was delayed until 2017, the relevant actors were still implementing FRM works and completing previously delayed schemes (G1, G3, G5, G7). Table 19 and Fig 19 show the data collected on the total losses, lives lost, flooded area and people injured from 2015-2020.

**Table 19 Data collected for total losses extracted from Atlas ti., Source: Author 2021**

Year	Direct Losses (US\$ million)	Lives lost	Flooded area (no. of houses)	People injured
2015	170	238	10716	232
2016	60	424	4381	392
2017	110	271	1050	359
2018	6	88	362	158
2019	75	235	670	166
2020	150	410	2500	402



**Figure 19 Bar graph showing total effect due to floods from 2015-2020, extracted from Atlas ti. Source: Author, 2021**

There can be seen a generally declining trend for direct losses and flooded area from 2015-2019 with a sharp rise in 2020 due to devastating floods, with the no. lives lost and people injured fluctuating every year. The data collected through interview respondents implementing FRM policy processes revealed that actors in the network rely on several mechanisms to ensure effectiveness of FRM. Regarding their perception of what hinders the effectiveness of FRM, the experts were of the view that in the face of climate change, localized events happen mostly due to encroachments, and consequent narrowing of the waterways that increases the water

run-off. These issues add vulnerability to the existing system and hence the implemented schemes require constant retrofitting. Under NFPP-IV for the schemes which were based on scientific modelling, consultants took the decision and recommended the PIDs to raise capacities of dikes to reduce the risk of future events. While added responsibilities were communicated to the PIDs and some of the provinces took up the relevant flood protection works, many of the schemes are not retrofitted because of the increase in budget as they must procure more resources. (G1, G3, G5, G7). Fig 20, 21, 22, 23 show line graphs of trend in the change of direct losses, lives lost, flooded area and no. of people injured.

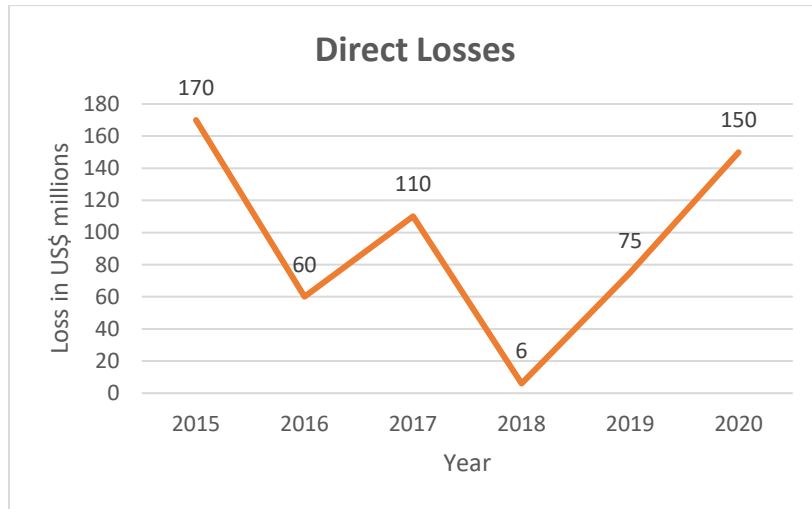


Figure 20 Line Chart of Direct losses in US\$ from 2015-2020, extracted from Atlas ti. Source: Author, 2021

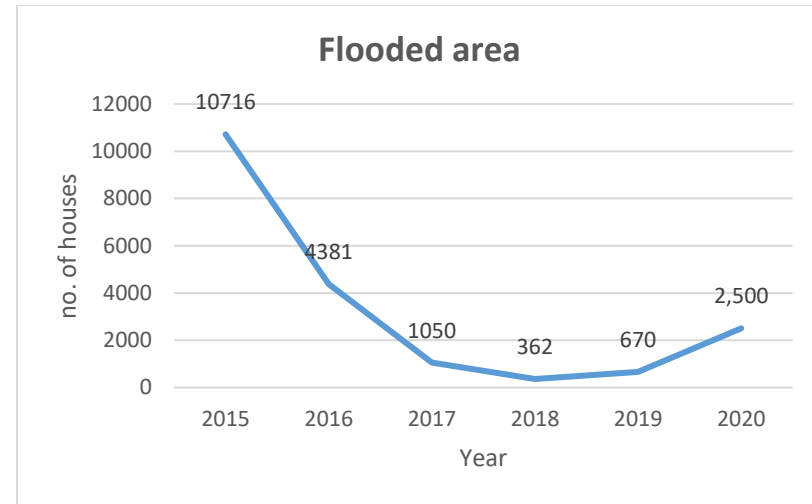


Figure 22 Line Chart of Flooded area (no. of houses) from 2015-2020, extracted from Atlas ti. Source: Author, 2021

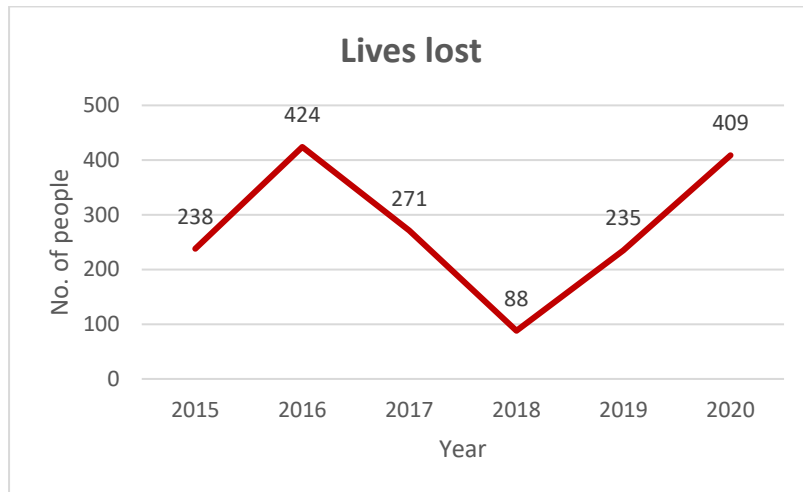


Figure 21 Line Chart of Lives lost from 2015-2020, extracted from Atlas ti. Source: Author, 2021

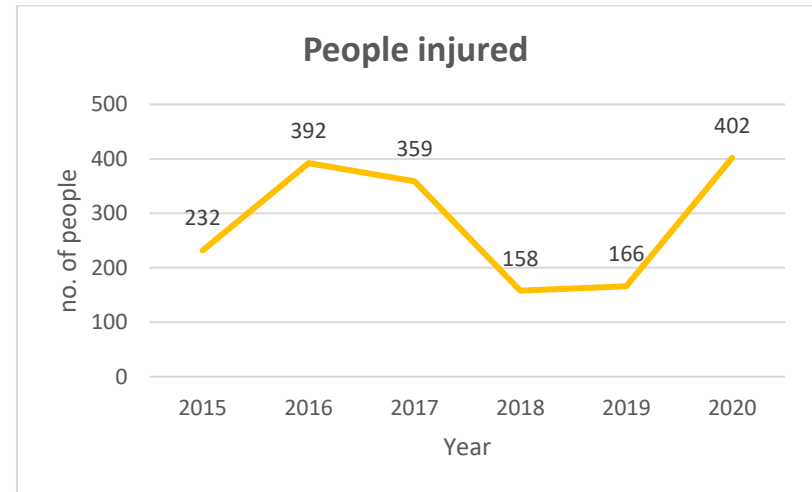


Figure 23 Line Chart of no. of people injured from 2015-2020, extracted from Atlas ti. Source: Author, 2021



While analysing the above tables, a very interesting finding was observed that although the direct losses in 2020 (150 million USD) were very close to the direct losses in 2015 (170 million USD), yet there is a huge difference in the figures of no. of houses effected due in flooded area, 2500 in 2020 almost 23.3% of 10716 in 2015. Interview with the respondents lead to the information that a lot of encroachments and illegal settlements were removed from flood plains, however many of the vulnerable communities to fend to themselves started using the area for crop cultivation and grazing cattle during the global pandemic of 2019, where they remained unchecked. Because of these, 143017 people had to be moved to relief camps. Table 20 shows that 1120761 acres of crop area was damaged, and 62115 cattle head perished in 2020 as opposed to a significantly lower number of same indicators in 2019.

**Table 20 Other effects due to floods in the years 2019 & 2020, extracted from Atlas ti., Source: Author 2021**

Year	People in relief camps	Crops area damaged (acres)	Cattle head perished
2020	143017	1120761	62115
2019	21	400	15

From analysing the data regarding perception of effectiveness of flood risk mitigation, the co-occurrence table and network diagram (Fig 24) of the codes of FRM showed many linkages with the codes of IRs. The linkages of lives lost, direct losses flooded area and perception of EFRM with institutional provisions, resource dependencies, environment, processes, and decisions show the interdependencies of IRs on the effectiveness of FRM.





#### 4.2.2.4 Summary of data analysis

The linkages between the actors in the network and effectiveness of FRM are drawn through IRs patterns recorded and analysed in the data collected. Through the network diagrams and co-occurrence tables, it was observed that the FRM network is composed of formal arrangements of multiple interdependent actors which are the main arteries where *public* policy making, governance and enactment of policy processes take place. The actors continually exchange resources to mobilize their efforts to achieve their objectives and influence the quality of outcomes. Analysing the variable of IRs through a Network approach, the role that actors play to understand and manage complex problems in policy processes are quite evident. Where every actor has their own roles and responsibilities, power to take decisions, varying perceptions and approaches and consequent conflicts, an interactive process emerges because of actor interactions, information, preference, resource dependency and trade-offs. Furthermore, it was observed that there is a very clear and defined authority structure and defined rules and responsibilities of actors within the network similar to the classical perspective of rational organization approach discussed in Chapter 2. The classical perspective stems from bureaucracy and divisionalized organizations with an understanding of organizations as ‘machines’ and units of a hierarchical command and communication chain, with each part organized in a specific order, by a clear purpose, authority structure and defined work processes. This analysis from data reiterates Morgan’s (1986) conception that this practice is still not dormant and exists in many modern organizations. However, within this classical perspective, when the network was analysed from an open systems concept and contingency theory, it was observed that actors continually change their internal organization to respond to the environment, where contingency relationship patterns emerge with the environment being a factor. As opposed to the rational approach which considers actors as units without having relations with the environment, the opposite phenomenon was observed within the FRM network where IRs constantly enable the actors to interact, form interdependencies and relations within the environment.

It is also important to mention here that the network should not be considered as a whole big network but rather a composition of sub-networks interacting at various levels. The policy implementation network in this case study seems to be at a transitional junction between a top-down and a bottom-up approach. In terms of implementation of policies, the interorganizational theory focusses on interaction of actors for implementation of strategies at the local operational level, as opposed to the top-down approach formulated by ex-ante goals of central actors

(Pressman & Wildavsky, 1973) (Wamsley, 1985). Such a bottom-up approach is considered exceptionally effective in recognizing how local actors implement policies and frameworks from upper levels of government in accordance with their specific interests, goals, and perceptions (Sabatier & Hahf, 1985). The data analysed in this research revealed that actors even in the centre of the network do not have many resources of their own but rather adhere to formal arrangements of interdependencies, exchange of resources and power with other actors to achieve their goals, interacting through institutional provisions, decisions, and processes. Processes of institutionalization perpetuates interactions where information, goals and resources are exchanged, and shared perceptions and values for current and future policy networks are developed and influenced.

## **Chapter 5: Conclusions and recommendations**

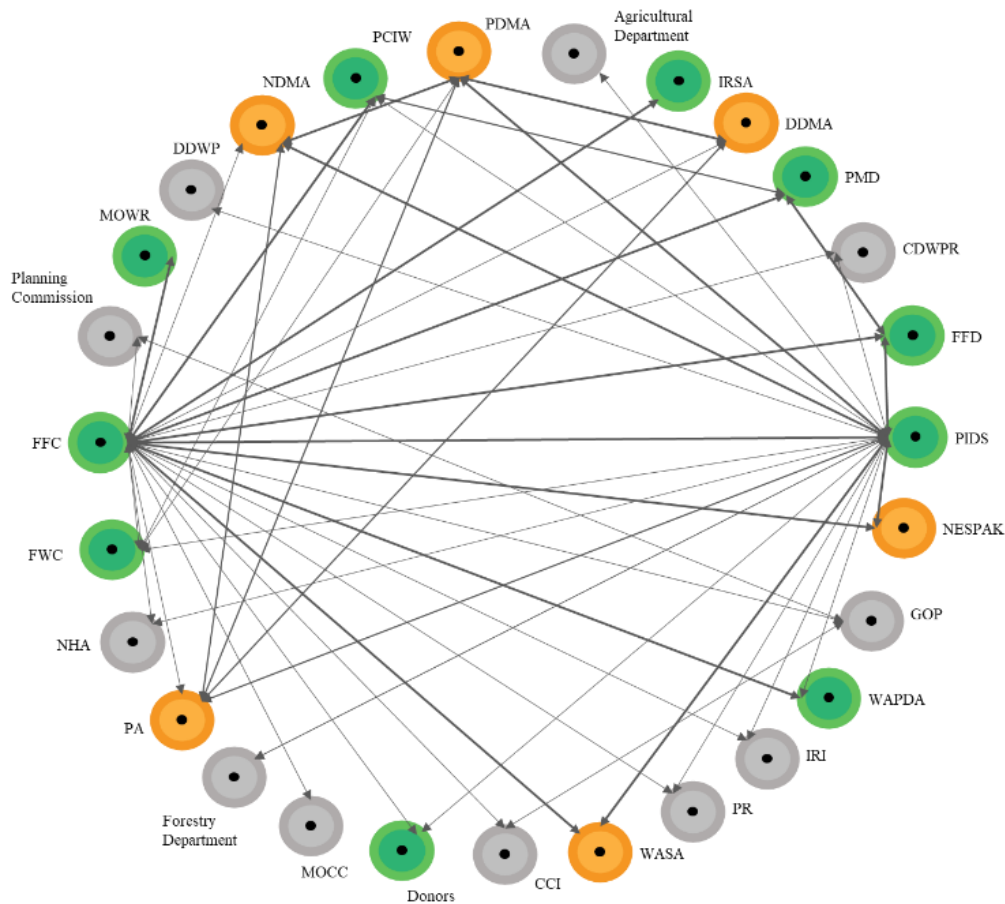
Owing to the complex and transboundary nature of flood risks, they require to be governed by a collaborative network of multiple actors within organizations (Folke, et al., 2005), where the combined capacity for the mitigation of these flood risks is highly dependent on the patterns of social relations between these actors (Becker, 2018, 2021). The purpose of this research is to study the policy practice gap in terms of interorganizational relationships that affect the actions of interorganizational actors in the governance of policy networks in flood risk mitigation, in centralized and traditional hierarchical policy arenas, thus using Pakistan as a case study. In doing so, this research assesses which patterns of Interorganizational relationships (IRs) exist in policy networks, whether and which IRs enabled the effectiveness of Flood Risk Mitigation (EFRM) in the case study of Sindh, Pakistan, and the mechanisms through which IRs effect FRM, to draw conclusions on whether a relationship exists between these two concepts. For the purpose of this research, data of a singular urban area was not collected, rather the province of Sindh was considered, as the phenomenon under study is relevant to many urban areas.

***What is the role of Interorganizational relationships on the level of effectiveness of Flood Risk Mitigation?*** (Context: Sindh, Pakistan)

The sections (5.1 - 5.4) answer the main research question through a detailed discussion and conclusions drawn for four sub-questions. The chapter ends with sections of a summary and recommendations for future policymaking and research.

### ***5.1 Research Question 1: Which actors are involved in the implementation of flood risk mitigation?***

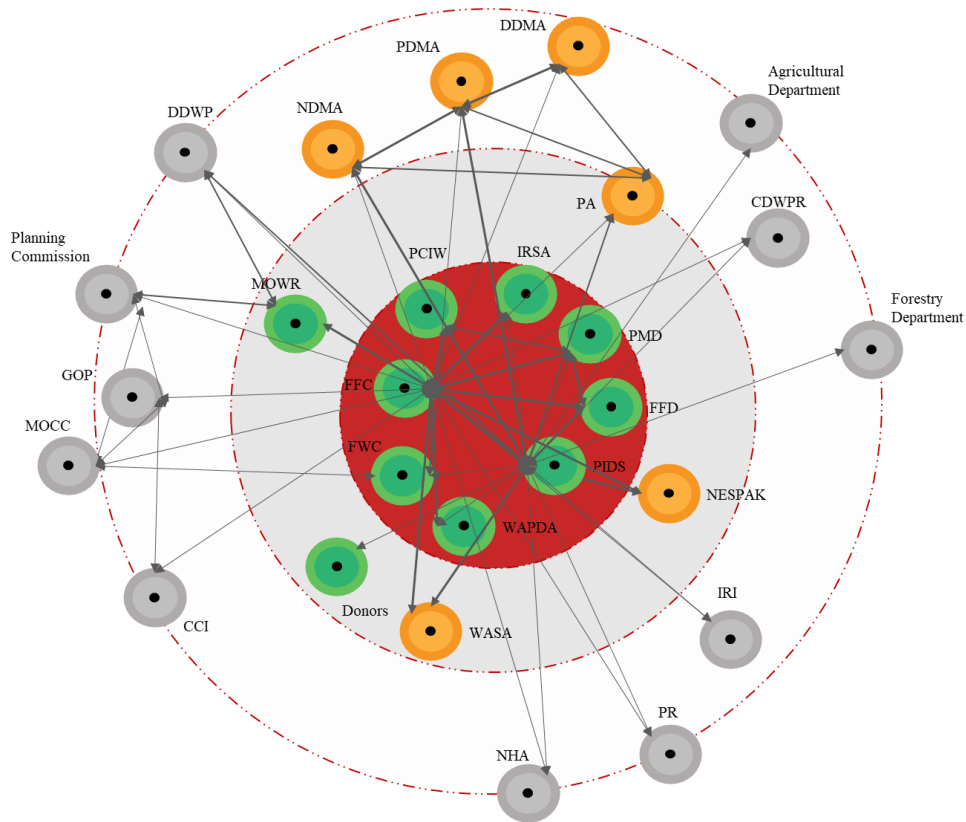
The main research outcome of this sub-question was to identify the actors that formulate the environment of the policy implementation network. This sub-question was addressed by performing an actor analysis. The network diagrams (Fig 26, 27 and 28) are an output of the actor analysis showing all the actors within the FRM network.



**Figure 26 Network Diagram for all actors within the FRM network. Source: Author, 2021**

The main research finding relevant to this question from actor analysis is how the critical actor of Federal Flood Commission (FFC) binds the entire network of actors together, where the FFC acts as a platform for coordination within the network. Data analysis shows that, in the hierarchical governance system of Sindh, Pakistan, FFC acts as a central authority at a national level and closely associated with it are the Provincial Irrigation Departments (PIDs), a critical actor being the authority at a provincial level. Fig. 27 and 28 present the network diagram showing the position of all the actors within the network defined by their IRs, placed in three tiers. The policy implementation network in this case study seems to be at a transitional junction between a top-down and a bottom-up approach, where the provincial organizations which are mainly responsible for implementation of FRM framework share responsibilities with the central actor. Drawing from literature, the interorganizational theory focusses on interaction of actors for implementation of strategies at the local operational level, as opposed to the top-down approach formulated by ex-ante goals of central actors (Pressman & Wildavsky, 1973) (Wamsley, 1985). Such a bottom-up approach is considered exceptionally effective in recognizing how local actors implement policies and frameworks from upper levels of

government in accordance with their specific interests, goals, and perceptions (Sabatier & Hahf, 1985).



**Figure 27 Network Diagram showing which tier of the FRM network actors belong to. Source: Author, 2021**

It can be seen from the network diagrams that the IRs place the actors of FFC and PID at the very centre of the network where they work in close coordination with Ministry of Water Resources (MOWR), Flood Warning Centre (FWC), Federal Flood Division (FFD) operating under Pakistan Meteorological Department (PMD), Pakistan Commission for Indus Waters (PCIW), Indus River System Authority (IRSA), Water and Power Development Authority (WAPDA) and donors for the implementation of FRM. The actors of Irrigation Research Institute (IRI), Pakistan Railway (PR), National Highway Authority (NHA), and other actors to the right of the network do not have strong ties with the central actors and coordination is need-based with them because they do not play a prominent role in the implementation of FRM, which places them at the outer periphery of the network. The Pakistan Army (PA), and Disaster Management Authorities (NDMA, PDMA and DDMA) are for rescue and relief operations and form their own sub-network, whereas the PA at times coordinates with the PIDs to communicate important information. Another important finding was that the Planning Commission and Ministry of Climate Change (MOCC) are also at the periphery, with the Water and Sewage authority WASA at the periphery of the second tier, because they are not much



engaged within the network of implementation of FRM and interaction with these actors is also need based.

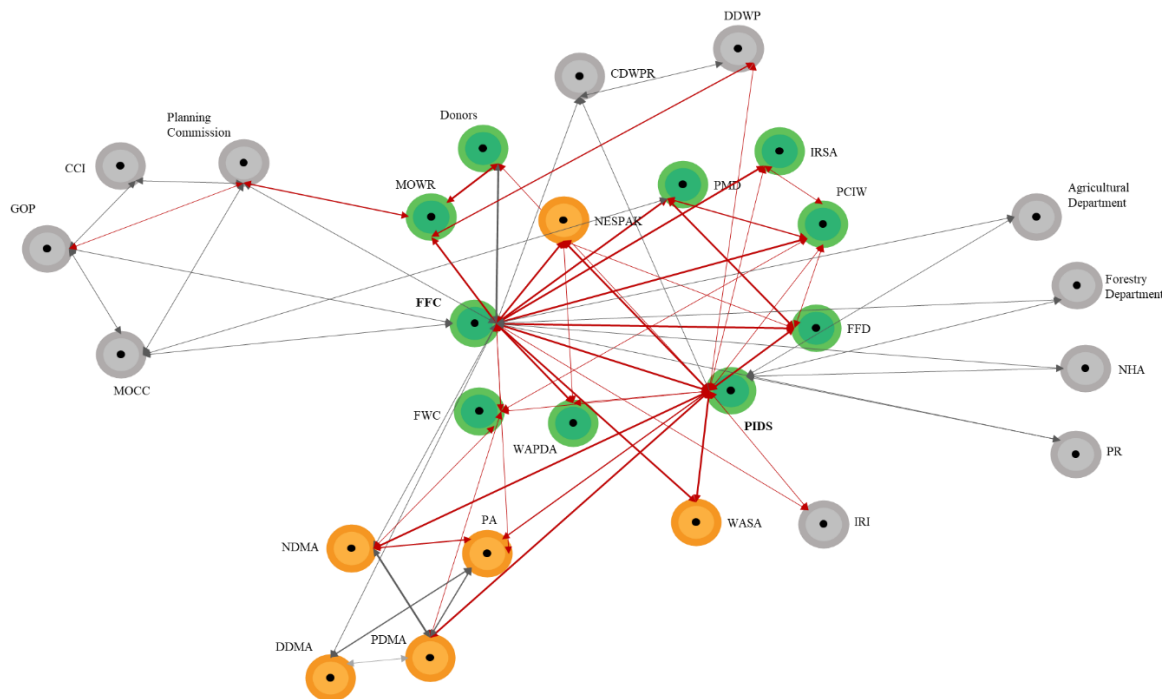


Figure 28 Network Diagram showing relationships of all actors within the FRM network. Source: Author, 2021

## 5.2 Research Question 2: *What are the interorganizational relationship patterns of actors in networks?*

This research question is answered from a thorough review of literature, explaining the core concepts of interorganizational theory, and helps answer sub-question 4, to place mechanisms of IRS within the context of FRM networks in Sindh, Pakistan. It was found that to analyse patterns of interaction of individual actors, a thorough understanding needs to be developed about dynamics of their relationships. Thus, interorganizational theory conceptualizes the environment to be a set of actors that formulate a relationship with a focal organization, and interorganizational analysis considers the relations and patterns between organizations in terms of developing coordination for resource exchanges (Levine & White, 1961) (Negandhi, 1975).

The most important finding was that relations between organizations are majorly influenced and determined by dependency and exchange, which are considered as focal concepts and hence analysis of interorganizational relationship patterns in networks involves these concepts (Aldrich & Whetten, 1981). These exchange processes between organizations are attributed to the factor of 'Resource Dependency', whereby organizations procure resources from each other

(Levine & White, 1961), thus making resource dependency the core of interorganizational theory (Thompson, 1967) (Scharpf, et al., 1978) (Aldrich, 1979). Organizations interact with each other to obtain their goals by creating and regulating a pool of necessary resources that cannot be produced by a single organization. Respective goals of each organization define their need for the resources, making interdependencies and establishing networks of organizations to interact in.

Furthermore, it was found that the possession of resources is directly linked to having power, which is a crucial concept in resource dependency, and within this approach, organizations may take certain steps to control the resource flow or influence the interdependency of actors by claiming authority of power or altering their goals (Aldrich, 1979). While understanding the process to analyse IR patterns, it was found that the actors within networks formulate relationship patterns in terms of *processes, decisions, power, institutional provisions, information, and values*. ‘Processes’ relate to the interorganizational interactions through which resource exchange occurs which are guided by inter-organizational links, ‘decisions’ are considered as the choices made to sustain essential resource flow and is a consequence of negotiations between organizations in the relevant arenas or context. ‘Power’ is concerned with the authority structure owing to the need for resources and ‘information and values’ relate to whether information is seen as a power resource owned by different actors and their coordinated and/or conflicting values. Establishing patterns of actors’ perception patterns regarding problems, solutions and their environment is another important aspect which helps to determine the position of actors within the networks. (Kickert, et al., 1997) (Levine & White, 1961). The findings from this research question which are the patterns of IRs described above were used to execute actor and network analysis for collecting and analysing data in this research.

### **5.3 Research Question 3: *What is the level of effectiveness of Flood Risk Mitigation and what are the approaches to measure it in literature and practice?***

To answer this research question, theoretical review in chapter 2 was used as a basis to define effectiveness and approaches to it in FRM where effectiveness is defined as the extent to which aims of FRM are accomplished. While many ideal, scientific, and mathematical approaches were discussed, some were deemed less relevant from a risk governance perspective as they do not consider social interorganizational factors, which is a main concept in this research, where

the result of the approaches make it almost impossible to isolate the effect of FRM due to the complexity of factors it involves which cannot be always attributed to physical intervention measures. Furthermore, policy makers and scientific literature contradicts with these approaches on the grounds that the figures achieved as a result of these approaches are only indicative to receptors of tangibles and do not include intangibles such as reduction of risk of casualties (Vander, et al., 2007) (Collier, 2007). Therefore, to consider social context of inter-actor governance, this research, used variables related to both tangibles and intangibles (Direct losses, Flooded area, Lives lost), to determine the trend of changes along the years of implementation of the FRM framework along with the perception of effectiveness of Flood Risk mitigation, with sensitizing topics of monitoring and evaluation, repair, and communication mechanisms.

The findings show a generally declining trend for direct losses and flooded area from 2015-2019 with a sharp rise in 2020 due to devastating floods, with the no. lives lost and people injured fluctuating every year. According to the data, actors in the network rely on several mechanisms to ensure effectiveness of FRM. The key instrument that appears in the centrality of findings are the IR patterns of dependency and exchange that occurs while implementing the FRM framework. As the organizations constantly interact with each other to retain resource flow and obtain their goals, problems that arise in the implementation are addressed through interorganizational interactions and institutional provisions like meetings, progress reports, monitoring and evaluation mechanisms. Through negotiations between actors of the FRM, network in a multi-actor platform provided by the FFC, decisions are taken to address and eradicate problems. The collaborative processes, decision making and institutional provisions in place enable the actors to incorporate the necessary changes to streamline FRM systems by reorganizing strategies and goals to utilize resources, however it also causes delays and puts further pressure on the actors to acquire additional resources.

Another interesting finding in the research was the linkage between effectiveness of FRM and institutional provisions. While strict formal rules are followed, the data pointed towards a lack of Flood-plain policies and legislations attributed towards lack of roles and responsibilities and coordination between federal and provincial actors. Lack of policies to prevent encroachments and floodplain occupation restricts waterways and causing breeches and hence directly effecting the outcome of FRM works.

#### **5.4 Research Question 4: *Through which mechanisms do Interorganizational Relationships influence the level of effectiveness of Flood Risk Mitigation***

The main research finding about the context within which inter-actor governance takes place in the case study of Sindh Pakistan, is the interdependencies that exist within the FRM network. Data analysis shows that these interdependencies are prominent through mechanisms of relation patterns between these organizations in terms of diversity of actors in their environment, resource dependencies, power, processes, decisions, institutional provisions, information, values, and perception patterns. Findings show that relationship patterns in these dimensions play a pivotal role in establishing coordination and integration within the governance framework, implementation and hence effectiveness of FRM.

According to literature, IRs between organizations are majorly influenced and determined by resource dependency and exchange, which are considered as focal concepts in IRs (Aldrich & Whetten, 1981). The findings of this research drawn from interviews and secondary data revealed rich insights into this relationship pattern and highlight the importance of these interdependencies. It was observed in the data that all the actors develop a pooled interdependency of resources that are shared according to power distribution within the network. Literature highlights that in policy networks interdependency is viewed as the dissemination of resources between numerous actors working towards both individual and common goals. Hence resource dependency in the FRM network of Sindh encouraged and enabled the actors to keep the pooled dependency afloat through coordination to implement their schemes according to their goals and objectives, which directly influence the effectiveness of FRM works.

Another important finding of the research was how the power to utilize and allocate resources is used in the FRM network of Sindh, where a clear authority structure exists and actors follow the mechanisms of institutional provisions like formal rules and organizational construction in place, to take the necessary steps to for retaining resource flow. This relationship pattern links to the theory about power within the network, where possession of resources is directly linked to having power, a crucial concept in resource dependency, and organizations may take certain steps control the resource flow by claiming authority of power or altering their goals (Aldrich, 1979). Hence, institutional provisions enable the retainment of resources as well as the authority structure of power within the network through formal rules in place, contractual obligations, progress, and monitoring reports.

The findings of the research also show that Resource Dependency links with another important relationship pattern of decisions, where decisions determine the nature of coordination between actors within the network. In the case of Sindh, Pakistan, policy processes where the outcome of decisions effect the entire network, decisions are made in a corporate manner where a joint authority structure has a designated authority. Linking decisions to resource dependency, where the data collected indicated numerous instances of direct and indirect procurement of resources, the fundamental impact of lack of financial means at disposal hindered the NFPP-IV implementation greatly, delaying it from 2015 to 2017. Since the previous NFPPs were funded by GOP, and the bulk of financial resources needed were insufficient this time around, it took two years and the involvement of a higher authority, the CCI, to decide for reframing of the NFPP-IV, restricting it to priority sub-projects only and the source of funding to be equally divided between the federal and provincial governments. However, since the PIDs were included in the decision-making process, the schemes and PCIs were approved for execution as soon as the decision was finalized. This underpins the basis of IRs, where resource dependency is extremely crucial and bottlenecks within policy implementation could be addressed by readjusting goals and resources.. According to data, exchange of information, and decisions regarding implementation are taken in the processes of interorganizational interactions through which resource exchange occurs which are guided by inter-organizational links. The study shows that the exchange of information through strategic and scientific ways created a relation pattern facilitated through various interactions between the national and provincial governments and hence enabled the cohesion of network to create transparency, where information is not seen as a power resource rather is a part of pooled interdependency.

The last main conclusion drawn was through establishing patterns of actors' perception regarding images of problems and obstacles due to these problems, the existence of which helped determined clarity of values within the network. The element of conflict resolution within the network was clearly established through data analysis, where conflicts are resolved through power dynamics within the network and roles and responsibilities of actors. Reflecting on literature, when clarity of values is analysed in a network, irrespective of what influences this relationship, a dependence is still established.

## 5.4 Discussions

### *What is the role of Interorganizational relationships on the level of effectiveness of Flood Risk Mitigation?*

The answers to the sub questions in the above sections collectively helped answer the main research question. Based on the conclusions drawn, it can be established that a strong relationship exists between components of IRs in policy implementation networks and Effectiveness of FRM in the context of Sindh, Pakistan. The findings of the research strongly align with academic theory of both IRS and EFRM, which emphasizes the social component of IR patterns existing within FRM networks. In the case of FRM Sindh, an important conclusion drawn in this research is that while strong interdependent relationship patterns in IRs are recognized in the findings, it is not a guarantee for the positive outcomes of processes as IRs only steer the implementation of policy frameworks, playing a role in outcomes. Literature in chapter 2 pointed towards conclusions from similar research projects conducted to analyse IRS, that did not signify whether interorganizational relationships had an improving effect on the quality of services, yet the continuity of services was improved (Rogers & Mulford, 1982). It should also be noted that IRs are ‘unknown unknowns’, where inter-actor decision making is characterized by uncertainty and complexity, because many other factors could be influencing the policy implementation outcomes. IRs are influenced by social aspects, where the intersection between governance and behavioural aspects for decision-making renders it impossible to make an accurate assessment of outcomes of actions, hence highlighting a grey area of positive and negative outcomes (Kominis, et al., 2021). From analysing IR patterns within the FRM network of Sindh Pakistan, the similar observation is recorded, that while it is difficult to analyse an improving effect of IRS on FRM networks, but the continuation of services attributed to interorganizational relationships and interdependences was established. This observation could be linked to the fact that the criterion for measurement is difficult in complex interorganizational networks owing to multi-actor environments with varying goals, hence different ways of measuring effectiveness.

Moreover, this research found that patterns in IRs do not exist in isolation, but rather are interdependent upon each other. The relationship patterns of IRs strongly influence each other and hence effect the performance of their outcomes. Although the extent to which each relationship of interdependency played out in patterns of actors’ environment and effected the outcome of FRM is debatable, yet dependency and exchange were observed to be the most enabling factors for IRS in FRM.

Another interesting conclusion is that the actors within the networks are considered as the main arteries through which IRS takes place. The fragmentation between actors of legal frameworks from the actors in networks implementing them directly effects the FRM system. This disconnection is a direct consequence of hierarchical institutionalization, where the practices of planning, water and sewage organizations have a more bottom-up and problem-orientated institutionalization, and practices of risk and vulnerability addressing organizations have a more top-down compliance-oriented institutionalization. This disparity in terms of how interorganizational networks operate, pulls the network of actors apart, destabilizing policy cohesion, implementation, and governance. The resultant technical, managerial, institutional, and financial gaps are a standing example in this case study. This shows an interesting dynamic in the context of South Asia and similar centralized and traditional hierarchical multi-actor governance structures. Since policy networks formulate within the context in which policy processes are exercised, thus establishing a relationship between the context and process in which policy making and implementation is done. Consequently, the complexity in policy making and policy practices originates from several interdependent factors which can be attributed to the variety of diverse actors that influence the process, changing preferences of these actors, and the complex interactions of strategic actions and perceptions of problems and solutions that continually shift. The practical value for developing such an approach to interorganizational coordination and governance in disaster risk is explained through a quote by an expert during an interview conducted for the research:

*“It is our wish to avert risks. But countries don’t run on wishes, you know. You need to have a plan, a constitution, some jurisdictional provisions. So, in the same way flood risk mitigation also needs to have a clear line of action and a clear governance structure that is transparent. Because if it would have been so obvious we would have seen it work.” E2*

## **5.5 Recommendations for future research**

The analysis of the case study research has revealed rich and deep qualitative insights around the link between IRs in policy process implementation networks and effectiveness of FRM. This offers an alternate approach to policy networks in disaster risk governance from an interorganizational and social perspective and is valuable to add to and complement the scientific approaches to flood risk governance. Since no evidence was found of a research or analysis of FRM in Pakistan from a network perspective, this research has contributed to academic relevance. Furthermore, IRs are relevant within the similar geographical context of

South Asia, applicable to many urban areas and to similar governance structures. The opportunities to extend this study for further investigation are; i) to compare the previous three National Flood Protection Plans with the current one and examine causality of IRS within EFRM, ii) a quantitative or mixed method research could provide a rich numerical understanding of behavioural and social science domains which could serve as a valuable contribution to discussions around interorganizational theory and their relevance in disaster risk management and governance frameworks, iii) the area of flood risk reduction could be expanded to other types of disaster risk reduction in the context of climate change to enable research on a wider scope, which would be extremely beneficial due to the growing global concern of effects of climate change.

## **5.6 Recommendations for policy making**

This research was done with the objective of studying the policy practice gap in terms of IRs that affect the actions of interorganizational actors in the governance of FRM policy networks, and to provide recommendations on improving flood risk mitigation governance in centralized and traditional hierarchical policy arenas, thus using Pakistan as a case study. The findings from this study have produced interesting suggestions for how this performance can be improved in policy implementation networks by addressing the aspect of policymaking.

The first important recommendation is to consider the policy process from a point of view of the local actors implementing policies taken from upper levels of government in accordance with their specific interests, goals, and perceptions. By involving local actors that implement policy decisions and designing policies from their perspective, the disintegrated fragmentation and resultant unpredicted effects can be analysed and addressed proactively. A key aspect to implementing in this regard would be considering the IRs that emerge in policy implementation networks analysed in this study. Secondly, a starting point to streamline and functionally adapt IRS perspective could be taken through a thorough investigation and research for convergence of systemic challenges faced by the actors in the network.

Furthermore, this study has expanded the main concepts of dependency and exchange as the core of IRS, highlighting the opportunities for enabling actors in network through addressing the institutional, technical, managerial, and resource gaps that exist in the FRM networks. When this vision would be developed further, integration of roles between national, provincial, and local governments could be achieved, decentralizing the governance structure while adapting the institutional provisions. Although it is noted that the relationships discussed in



this research are particular to the case study of Sindh and Pakistan, other countries in South Asia and urban areas where centralized and traditional hierarchical governance structures exist, this approach could be transformative in activating the relationships, coordination, and engagements of policy networks. Furthermore, the degree to which improvements in coordination and governance can be made by analysing IRS are at times uncertain due to the subjective nature of social relationships, the continuance of services delivered, and effectiveness of outcomes could be improved.

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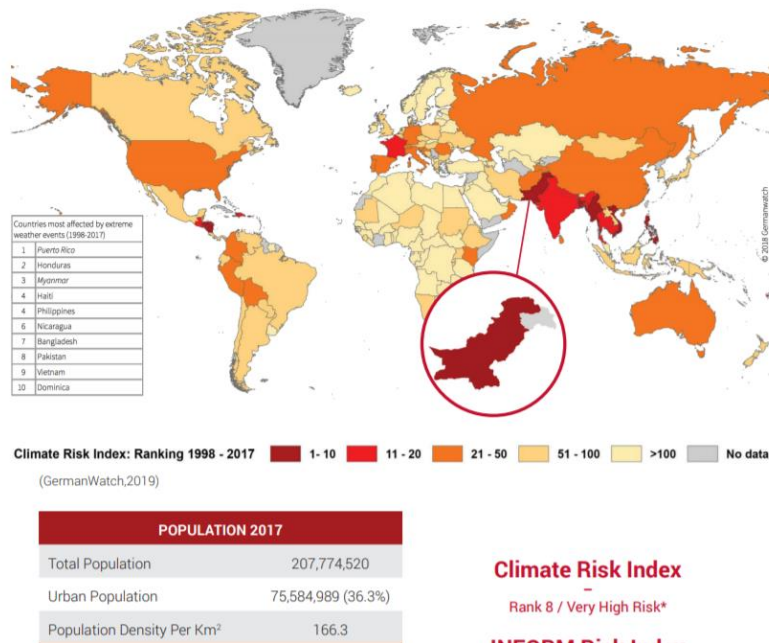
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# Annex 1: Figures and Tables

Figure 29 Climate risk Index Pakistan, Source: Germanwatch, 2019



Source: Germanwatch 2019

Figure 30 Coding used for variable of IRs. Author, 2021

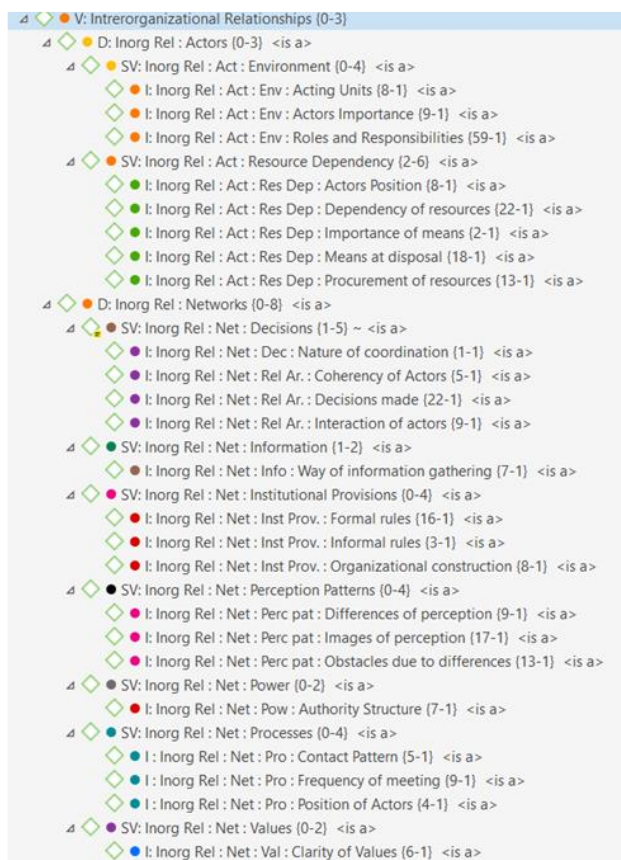




Figure 31 Coding used for variable EFRM. Author, 2021



Figure 32 Coding used for dimension of Problem Situation. Author, 2021

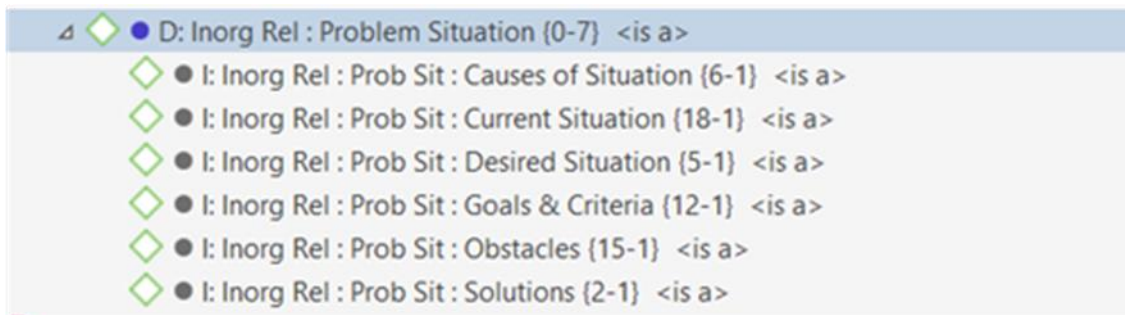


Figure 33 Structural measures in NFPP-IV, Source: Ministry of Water Resources, 2020

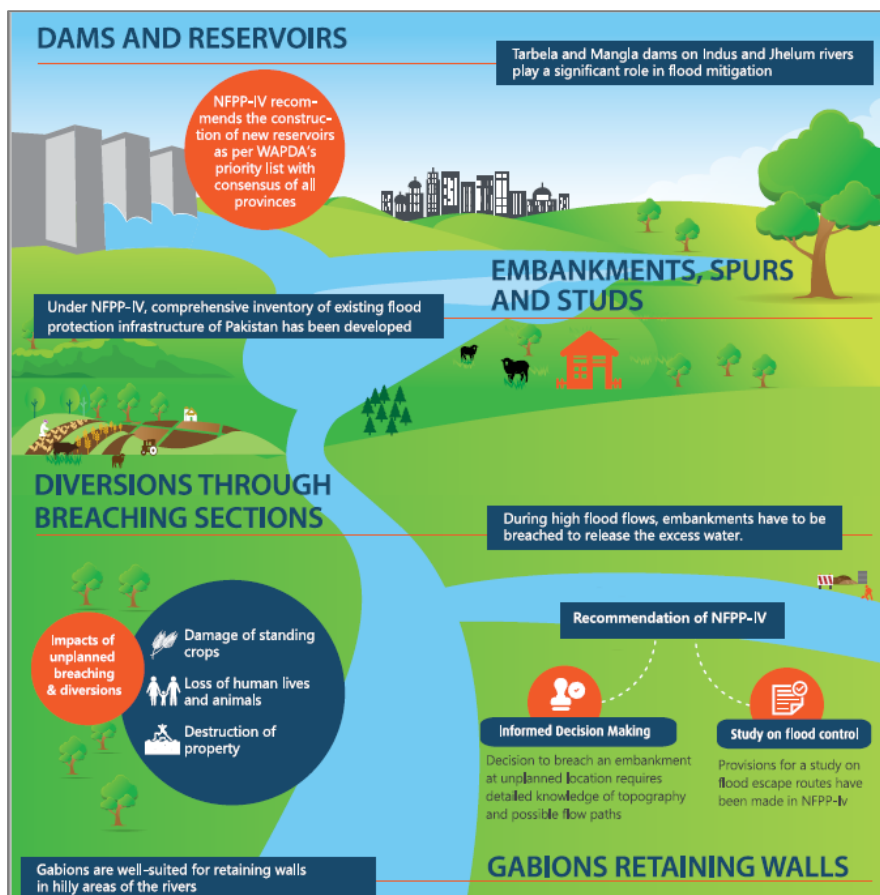


Figure 34 Non- structural measures in NFPP-IV, Source: Ministry of Water Resources, 2020

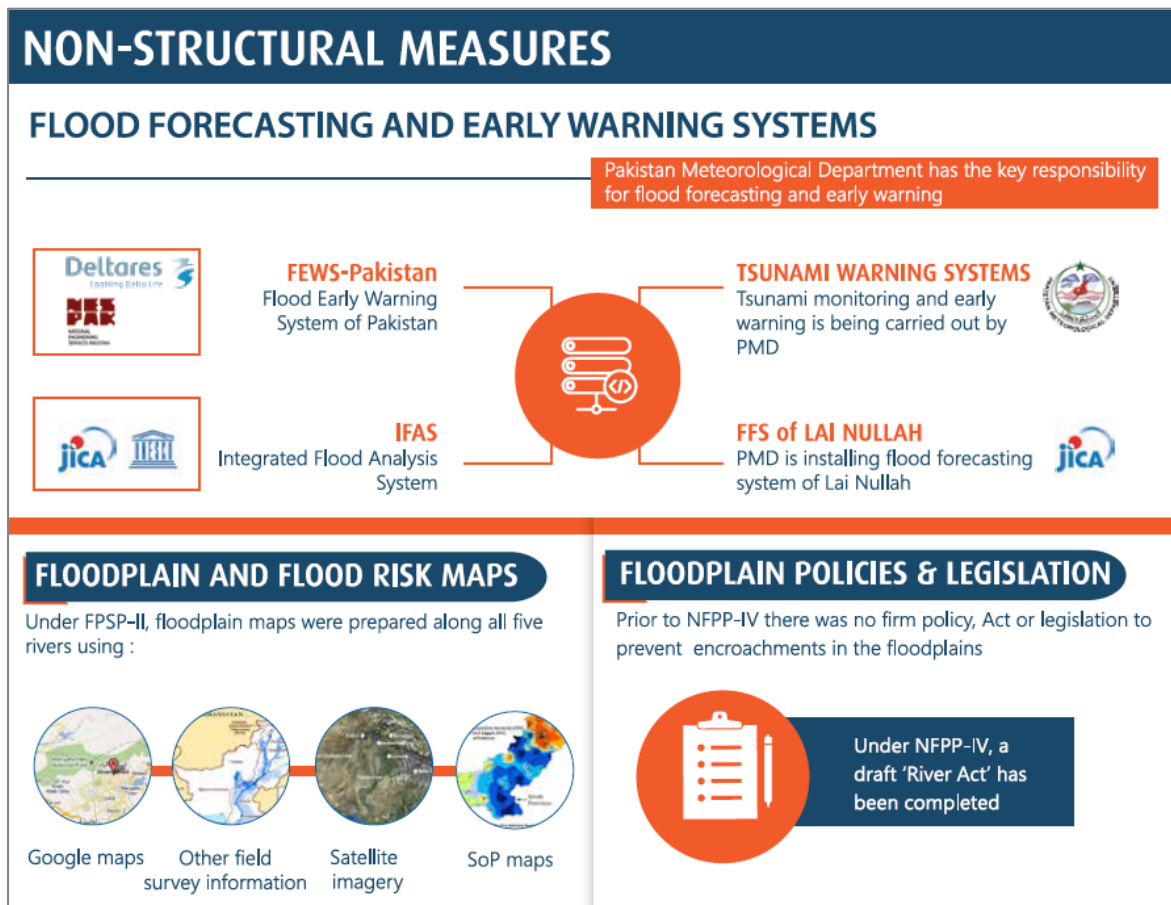
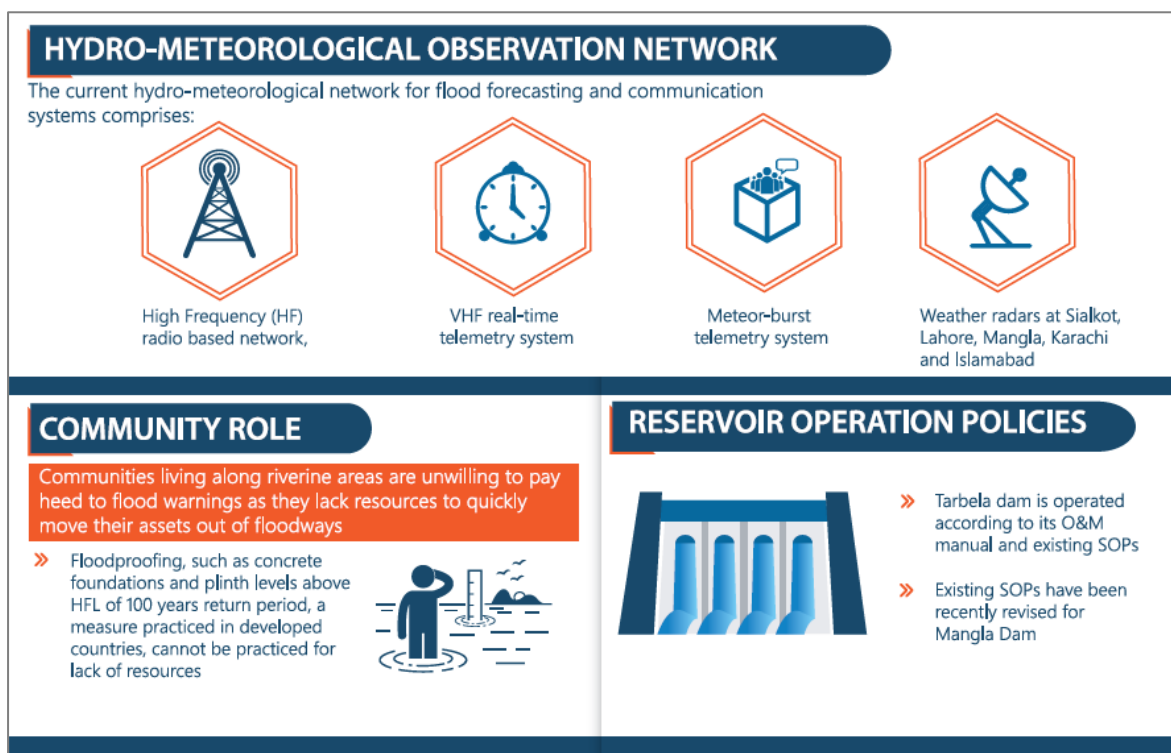
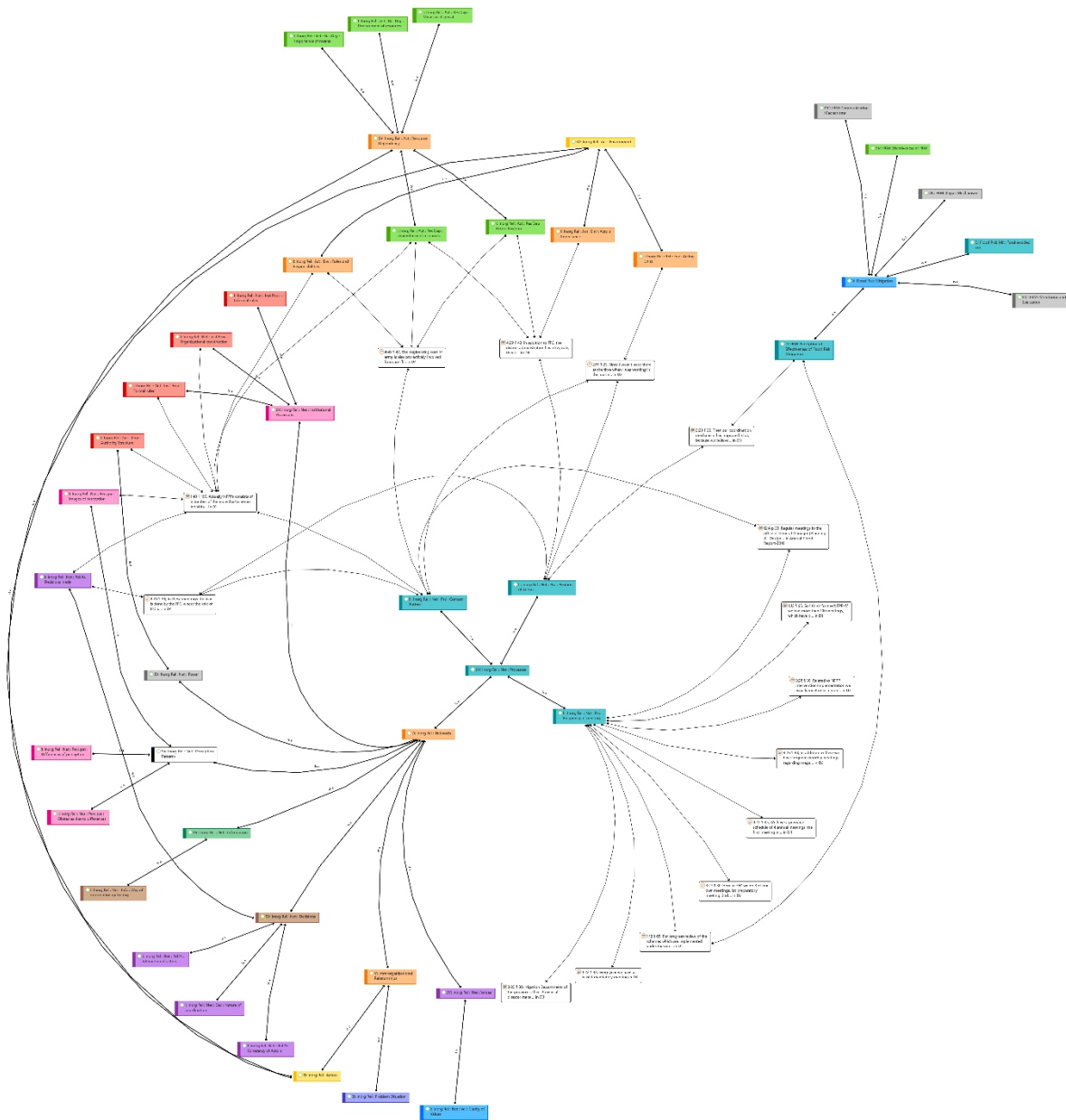


Figure 35 Non- structural measures in NFPP-IV, Source: Ministry of Water Resources, 2020



**Figure 36 Network diagram of Processes showing relationships with other sub-variables extracted from Atlas ti.**  
 Source: Author, 2021





## Annex 2: Research Instruments and Time schedule

### Interview Guide: Government Officials and Experts

**Institute of Housing and Development Studies**  
**Erasmus University Rotterdam, Rotterdam, The Netherlands**  
**MSc Urban Management and Development UMD17**

**Research Topic:** The role of Interorganizational Relationships in the level of effectiveness of Flood Risk Mitigation. A case study of floods in Sindh, Pakistan

#### A. Introduction

- i. **Introduction of yourself:** Masters student at IHS EUR, Urban Management and Development.
- ii. **The purpose of the interview:** A thesis research; a qualitative study what role Interorganizational relationships have on the level of effectiveness of Flood Risk Mitigation. The respondent's interview will provide significant insight for the research.
- iii. **Duration of the interview:** XX minutes
- iv. **The nature of the interview:**, Some open-ended questions related to the respondent's experiences and perception, followed by a few closed questions and then some background information.
- v. **Privacy and anonymity:** Interview conducted with complete confidentiality, answers will not be traced back to the interviewee and a transcript could be sent if the interviewee requires.
- vi. **Informed consent to participate and record the interview:** Consent already taken in written before conducting the interview. Inform that all the data will be anonymized. Furthermore, I want to indicate that purpose of recording is researchers own analysis, not to be shared with any third party and will be deleted after transcribing the interview. Do you consent to the information you provide during the interview to be used for scientific research and education?

**Note:**

- *The order of closed and open-ended questions could be reversed if the researcher feels the need to do so.*
- *It is important to note here that not all questions or same questions will be asked from every organization/actor, since their knowledge or ability to respond could be limited to the sector they work at and hence the questions either might not be relevant, or the researcher might get an invalid response.*

#### B. Interview questions

**B1: Opening Questions**

Two opening questions to make the respondent feel comfortable and to initiate the discussion on the topic.

**B2: Open ended Questions**

**Variable 1: Interorganizational relationships IORs**

**Part a) Problem Situation, Preliminary Problem definition**

(Mapping a problem situation or initiative as starting point for further analysis)

Regarding Flood risk mitigation and NFPP-IV.

1. What does the current or expected situation look like?
2. What are the (undesirable) consequences that flow from that?
3. What are regarded as the causes for this situation?
4. What is the desired situation?
5. What goals and criteria underlie this?

## Actor Analysis

### **Part b) Identify actors involved**

1. You work at this organization as XX. Can you tell me a bit more about your roles and responsibilities?
2. Who are the actors involved in your organization that work for Flood Risk Mitigation and NFPP-IV? Can you tell me about their roles and responsibilities?
3. Can you elaborate about the other organizations/actors involved in implementation of NFPP-IV?
4. Which actors in the network are important to realizing own objectives or policy goals? Which actors have an interest in finding a solution to the problem situation?

### **Part c) Resources: Analyse actor positions and dependencies**

1. What resources does your organization provide?
2. Can you tell me about what resources do the actors/organizations provide for the Project?
3. how important are these means, and can they be acquired elsewhere? (Probing: are actors critical, dedicated and/or comparable?)
4. is there unilateral or mutual dependency?
5. Procurement of resources: Direct/Indirect

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## Network Analysis

### **Part d) Power**

1. How is the power to utilize and allocate resources distributed within your organization?
2. How is the power to utilize and allocate resources distributed within the organizational network?

**Context/Probing questions:** *Is there a Clear centralized authority structure / ambiguous authority structure/no central authority structure, power depends upon need for resources*

### **Part e) Decisions/Relevant arenas**

1. How and where are decisions made that are important to the policy implementation of FRM?
2. which actors interact in which context? (Sector, policy content, ad hoc etc.)
3. how coherent are these groups of actors?
4. do these groups of actors have relations with each other (linkages)?

**Context/Probing questions:** *Do parties retain their autonomy within mutual adjustment where coordination is done by voluntary informal rules and spontaneous interactions. Does no authority exist, and coordination is achieved by negotiation of rules? Do the organizations formulate a joint authority structure to which some authority is given?*

### **Part f) Processes**

1. While coordinating within your organization, how many times and how often do you connect monthly/annually etc?
2. While coordinating with other organizational actors how many times and how often do you connect which actors interact frequently and which infrequently? Frequency of meeting
3. which actors have a varying contact pattern, and which do not?
4. which actors are central and peripheral in the network given their contact pattern?
5. Within your organizations do your exchanges of coordination take place through a central authority or how are the exchanges structured?
6. With other organizations do your exchanges of coordination take place through a central authority or how are the exchanges structured?

### **Part g) Institutional provisions**

1. what formal rules and juridical procedures apply?
2. what informal rules can be distinguished
3. what meeting and consultation procedures or other organizational constructions exist in the network that structure the policy game?

### **Part h) Information**

1. How is Information gathered within your organization?
2. How is Information gathered within the organizational network?

**Context/Probing questions:** *Is there a scientific way of gathering information/Strategic information gathering/information is a power resource possessed by different actors.*

**Part i) Values**

1. How are values (objectives and targets) viewed within your organization?
2. How are values (objectives and targets) viewed within the organizational network?

**Context/Probing questions:** Are they clear/ambiguous/conflicting.

**Part j) Perception Patterns**

1. what perceptions do actors hold about problems, solutions, and their environment?
2. to what degree do these perceptions correspond to those of other actors?
3. What obstacles could be caused by differences in perception?

**Variable 2: Effectiveness of Flood Risk Mitigation**

*Note: Probing questions will be asked to elaborate on the responses from the interviewee*

**Part I) Effectiveness of Flood Risk Mitigation**

1. How is effectiveness of Flood Risk mitigation perceived and measured in the implementation of NFPP framework and other flood risk protection works?
2. What is the Actual Annual Flood damage in previous years/since the implementation of NFPP-IV?
3. What is the Actual no. of fatalities in previous years/since the implementation of NFPP-IV?

What is the number or area of effected areas due to floods in previous years/since the implementation of NFPP-IV?

**B3: Closed Questions**

Some Important closed questions in the format of multiple choice to ensure response and eradicate biasness in giving socially desirable answers.

- 1) **(Power)** How do you feel that the power to utilize and allocate resources distributed within the network?
  - a. a Clear centralized authority structure
  - b. ambiguous authority structure
  - c. no central authority structure, power depends upon need for resources.
- 2) **(Decisions)** This is how decisions are made within your organization?
  - a. Parties retain their autonomy within mutual adjustment where coordination is done by voluntary informal rules and spontaneous interactions.
  - b. No authority exists, and coordination is achieved by negotiation of rules
  - c. The organizations formulate a joint authority structure to which some authority is given
- 3) This is how decisions are made within the organizational network
  - a. Parties retain their autonomy within mutual adjustment where coordination is done by voluntary informal rules and spontaneous interactions.
  - b. No authority exists, and coordination is achieved by negotiation of rules
  - c. The organizations formulate a joint authority structure to which some authority is given
- 4) **(Information)** This is how Information is gathered within my organization
  - a. There a scientific way of gathering information
  - b. There is a strategic information gathering protocol
  - c. Information is a power resource possessed by different actors.
- 5) This is how Information is gathered within the organizational network
  - a. There a scientific way of gathering information
  - b. There is a strategic information gathering protocol

<p>c. Information is a power resource possessed by different actors.</p> <p>6) <b>(Values)</b> This is how values are viewed within my organization</p> <p>a. Goals and objectives are always clear</p> <p>b. Goals and objectives are sometimes ambiguous</p> <p>c. Preference is given to a social solution over policy outcomes</p> <p>7) <b>(Values)</b> This is how values are viewed within the organizational network</p> <p>a. Goals and objectives are always clear</p> <p>b. Goals and objectives are sometimes ambiguous</p> <p>c. Preference is given to a social solution over policy outcomes</p>
<p><b>Background Questions:</b></p> <p>a) Gender:</p> <p>b) Age:</p> <p>c) Organization:</p> <p>d) Level of Organization:</p> <p>e) City in which organization is:</p> <p>f) Role in Organization:</p> <p>g) Size of Organization:</p>
<p><b>C. Concluding remark/question</b></p> <p>This is the end of our interview. Thank you very much for your time and consideration. If you have any questions to ask, please feel free to do so.</p>

## List of Respondents

**Table 21 Table for list of primary data (interview respondents) and secondary data**

<b>Code</b>	<b>Quota</b>	<b>Respondent's Description</b>	<b>Source</b>	<b>Interview Duration</b>
<b>G1</b>	Government Official	Oversee NFPP implementation, including technical scrutiny, monitoring and evaluation	Primary data	100min
<b>G2</b>	Government Official	Provincial level development, construction, implementation, and maintenance of flood protection infrastructures.	Primary data	63min
<b>G3</b>	Government Official	Oversee NFPP-IV implementation, including technical scrutiny, monitoring and evaluation.	Primary data	59min
<b>G4</b>	Government Official	Provincial level development, construction, implementation, and maintenance of flood protection infrastructures.	Primary data	72min



<b>G5</b>	Government Official	Planning, development, and operation of infrastructure to control flooding.	Primary data	52min
<b>G6</b>	Government Official	Oversee NFPP-IV implementation,	Primary data	43min
<b>G7</b>	Government Official	Collecting hydro-meteorological data including river and rainfall from telemetric system installed.	Primary data	35min
<b>G8</b>	Government Official	Oversees flood forecasting, warning, management, and research.	Primary data	46min
<b>G9</b>	Government Official	Consultant for Engineering Solutions of Flood Protection Infrastructures.	Primary data	30min
<b>G10</b>	Government Official	Carries out site survey and prepare plans for dredging/desilting of drainage channels.	Primary data	27min
<b>E1</b>	Expert	Expert with exceptional knowledge of the flood risk protection and disaster management projects.	Primary data	69min
<b>E2</b>	Expert	Journalist with exceptional knowledge of the flood risk protection and disaster management projects.	Primary data	56min
<b>E3</b>	Expert	Expert with exceptional knowledge of the flood risk protection and disaster management projects.	Primary data	23min
<b>E4</b>	Expert	Expert with exceptional knowledge of the flood risk protection and disaster management projects.	Primary data	37min
<b>Documents</b>				
<b>D1</b>	Official Document	National Flood Protection Plan IV	Secondary data	-
<b>D2</b>	Official Document	Annual Flood Report 2010	Secondary data	-
<b>D3</b>	Official Document	Annual Flood Report 2015	Secondary data	-
<b>D4</b>	Official Document	Annual Flood Report 2016	Secondary data	-
<b>D5</b>	Official Document	Annual Flood Report 2017	Secondary data	-
<b>D6</b>	Official Document	Annual Flood Report 2017	Secondary data	-

<b>D7</b>	Official Document	Annual Flood Report 2019	Secondary data	-
<b>D8</b>	Official Document	Annual Flood Report 2020	Secondary data	-
<b>D9</b>	Official Document	Official Report Floods NDMA	Secondary data	-
<b>D10</b>	Official Document	Official Report Floods NDMA	Secondary data	-

## Interview Excerpts

### Section 4.1 Case Study

**Quote 1:** *“...as then there were no significant floods in the country drought conditions were prevailing and it (the plan) was turned down, although it does not look suitable, but it was not given importance at the higher level for approval”- G1*

**Quote 2:** *“So, the Planning Commission advised us to review and analyze things and remove schemes which have already been taken up by concerned agencies and departments, so those should not be part of the umbrella PCI. That's why the cost has reduced and now the immediate requirements have reduced to 96 billion.” G1*

**Quote 3:** *“The federal government will share 50% of costs and 50% will be shared by the provincial governments for implementation of the NFPP-IV subprojects.” E1*

**Quote 4:** *The provincial governments were included in this decision-making due to project delay and agreed to share the cost distribution among themselves and to report to the federal government accordingly.” E4*

**Quote 5:** *“So, 47 number of important schemes were formulated to be implemented on vulnerable points of river.” – G3*

**Quote 6:** *“And yet, Sindh was the most devastated province. So, it shows that there something didn't work.” – (E2)*

**Quote 7:** *“When this mighty river enters in Sindh, apart from upper areas this is flowing in a cutting, but whenever it comes to the boundaries of the province it flows on the ridge, and contained between the two bunds (dikes), from 3 barrages it travels almost 600 miles to enter into the Indus River. So, it flows on the ridge and then when flooding happens, we have a 10-mile shape course flow. There are more than 47-50 vulnerable pints, here we need to take 100 percent precautionary measures during flooding season.” G4*

### Section 4.2 Data Presentation and Analysis

#### 4.2.1.1 Diversity of Actors/Environment

**Quote 8:** *“The second main function of the FFC is to technically examine and technically clear give and give the administrative approvals for sub-project's PCIs prepared by the provinces. Then we send*

*these to the Ministry of Water resources. The ministry approves these and allocates budgets, and then execution is done by provincial irrigation departments (PIDs)” (G1)*

**Quote 9:** *“So, within the framework of NFPP, PID holds a major responsibility, first and foremost role is to monitor and regulate the irrigation water to the land of more than 13million acres of the Sindh agriculture.” G4*

**Quote 10:** *“Apart from that during flood season all the provincial departments have the responsibility to protect the embedment’s from reaching any unforeseen incidents. For that the department, special secretaries, chief engineers around the clock have duties to monitor super floods as per our manual.” G3*

**Quote 11:** *“Federal government has very little involvement in the implementation of the project, so physical implementation of the flood forecasting warning system is done by WAPDA and PMD and civil infrastructure is executed by the PIDs.”*

**Quote 12:** *“And apart from material purchasing, we also procure several machinery and equipment needed, and all along the dikes we have machineries deployed because the need of machinery in a timely manner is very critical if there is any urgent need, breech of dikes or any major incident. In addition to this we have human resources like the police, rangers and army when needed because during flood season, the possible need is coordinated in pre-flood meetings by all actors.” (G4)*

#### **4.2.1.2 Resource Dependency**

#### **4.2.1.3 Power**

**Quote 13:** *“In order to secure the technical viability of the schemes, we are here to facilitate the Ministry of Water Resources, and all the powers of releasing the financial resources, those rests with the Ministry of Water Resources. They provide us the resources for the schemes which are cleared by them. And then from our office, these funds are distributed to the provinces for implementation.” G1*

**Quote 14:** *“Federal Flood Commission issues letters at the top level to ensure that the funds released to provinces for construction of flood protection works are transferred to respective PIDs and then to field formations for expeditious completion of these works as the undue parking of Federal PSDP funds in provincial chest is badly compromising the purpose of their release.” (D8)*

**Quote 15:** *“Flood Forecasting Division (FFD) is responsible for Operational Hydrology (flood monitoring/forecasting) in the country and issues all types of floods forecast and warnings across the country to different stakeholders, government functionaries and disaster management agencies.” D5*

**Quote 16:** *“We procure materials ourselves and we have certain rules according to organizations like SEPPRA and PEPPRA according to which we use emergent class resources.” G4*

**Quote 17:** *“For that the department, special secretaries, chief engineers around the clock have duties to monitor super floods as per our manual. So, we monitor low and high flood points and the capacities and in this situation the department's staff from the top to bottom all are assigned respective duties at designated vulnerable points. So, we work around the clock during the season and along with that arrange materials, equipment, and resources when and where needed.” (G4)*

**Quote 18:** *“Therefore, the resources to manage, mitigate and fight floods are immediately assured, including the monitoring of the situation and defence structures, everybody involved does their work with a lot of sincerity because we know the unfortunate circumstances that could arise if our schemes do not work against the magnitude of heavy rainfalls or floods.” G4*

**Quote 19:** *“time and again we assure that we have the human resources deployed over there who are technically capable and experts at flood risk mitigation and ensure their own safety as well”*. G2

**Quote 20:** *“In addition to these, we require materials and resources from the agricultural department and the forest department. We interact with WAPDA as well because sometimes we must take temporary lines from them. We don’t coordinate with NESPAK as they are a consultant agency, so we do not depend upon them.”* G3

**Quote 21:** *“The quantum of work is huge, because the river demands continuous attention, and as climate change is accelerating, the flow, pressure frequency and all other specifics have increased, although we have structural measures now to mitigate the risk, but according to the intensity of the situation we must give a lot more attention.”* (G6)

**Quote 22:** *“So honestly, we are unable to address and give attention to the complete requirements of our province, but priority is always to provide the best on a need-based approach and give priority to projects that need to be completed”*. G4

#### **4.2.1.3 Decisions**

##### **4.2.1.4 Relevant Arenas**

**Quote 23:** *“Roles, responsibilities, and decision-making power are clearly defined for every department and organization as an authority”*. G3

**Quote 24:** *“For everything else that needs to be done and decisions that need to be taken, there are already defined procedures every department and organization follows it. You can check all these rules in FFC website and read annual report of 2020.”* G1

**Quote 25:** *“For example, when it comes to decision making, if someone must access or operate at the breaching section of a river, there is a separate committee for that, a convener, and its respective members. Its not that if there is one setup at federal government level then that is the only body to take all the decisions, the decision-making capacity varies situation to situation and there is a protocol for that. For every activity and every issue, we have a separate decision-making authority. For e.g., technical clearance power rests with the scrutinizing committee of FFC, the administrative power of any scheme up until 2 billion is taken by DDWP of MOWR. If the resources required exceed this limit, then it goes to the Planning Commission, that have their own limits up until a certain amount, if more financial resources are required then they go to ECNEC.”* G4

**Quote 26:** *“Major decisions regarding technical issues are taken in meetings of IRC, Indus River Commission as per the manual, we have 18 chief engineers and 30 AC’s all of which are members of the IRC. The Minister chairs these meetings and every year we have at least 4 mandatory meetings where the issues discussed are those of Indus River, flood after effects, precautionary measures all these are discussed and all schemes are discussed in this meeting as well, where each chief engineer brings a project report of their sub-project and presents the vulnerabilities and issues in their jurisdictions and how technically risks can be averted, then all the provincial members of Sindh give their feedback and the most appropriate scheme is given approval and cleared for funding to be implemented. So, all the major decisions are taken in these meetings. But the power to take immediate and urgent decisions during floods rests with the Chief Engineer on the site.”* G4

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